34. Mikael Böök, *Nätbyggaren: En undersökning av den moderna posten* (The Net-builder: A Survey of Modern Mail), Helsinki 1989.
35. Cees J. Hamelink, 'Global Communication: Plea for Civil Action', in B.V. Hofsten, ed., *Informatics in Food and Nutrition*, Stockholm 1991, pp. 5–8. See also 'Communication: The Most Violated Human Right', Inter-Press Service dispatch, 9 May 1991 (ips.news on APC).
36. Edward Woodhouse, 'New Section Project: The Political (Re)Construction of Technology', in *Science and Technology Studies Newsletter* (American Political Science Association), vol. 5, no. 1, December 1992.
37. Cees Hamelink, *World Communication – Disempowerment and Self-Empowerment*, London 1995.
38. This is a basic theme argued by Thyssen in several of his works, for example *Nutiden: Det overfyldte rum* (The Present: The Overcrowded Room), Copenhagen 1993.
39. Thanks to Fritz Florin, Culemburg, the Netherlands, for reminding me of this.
40. Cf. Thyssen, *Nutiden*, pp. 109 ff., and Castells, *The Information Age*.
41. Chris C. Demchák, 'Cyberspace and Emergent Body Politic', *Policy Currents*, vol. 4, no. 4/94, pp. 1, 6–9.
42. *Ibid.*, p. 6.
43. *Ibid.*
44. A summary of the theory is found in Habermas, *The Theory of Communicative Action*, ch. 3.
45. Renate Holub, *Antonio Gramsci: Beyond Marxism and Postmodernism*, London 1992.
46. A main bone of contention between the USA and western Europe in the concluding round of GATT negotiations (December 1993) was over immaterial production – the content of information technology.
47. Bo Eneroth, *Hur möter man vackert?* (How Do You Measure Beautiful?), Gothenburg 1989.

2

Going for IT

A starting point for this analysis is that it is meaningful to study the emancipatory uses of information technology. The social experiments studied here are not construed, or even planned. They are not laboratory cases, or publicly financed 'projects' under controlled conditions, but actual events and organizations serving real movements for social and political change. This means that these uses are difficult to monitor and categorize. This is especially true in a situation of dynamic expansion and change – in the words of many network builders, 'networking is spreading like wildfire', and even experienced network builders have difficulty in keeping abreast of what is happening.

A new technology does not just happen. It is created and introduced. The spread of computer technology, in the form of personal computers, and computer-mediated communication is a vivid example of this proposition. These two phenomena were not planned, or even wanted, spin-offs of high-end technology. The history of the development and spread of these technologies illustrates one meaning of 'better' use.

Computer Lib: Round I

The technology, developed by the military and large corporations and used in the academic world, depends on 'leased lines' – physical cables used solely (dedicated) for data transfer. These are expensive and someone has to pay, the someone being either the taxpayer or the consumer of corporate products and services. This technology has also depended on large, centrally placed computers known as

'mainframes'. Individual users were connected to the mainframe through their terminals. This technology was presented as The Technology, something understood by the few and in the hands of the still fewer. This attitude aroused the fears of many and the literature of the period abounds in works of warning about the dangers of the new information technology. These warnings were not only, or even primarily, technological so much as political fears of the technology winding up solely in the hands of the already powerful. These fears were fuelled by the fact that through the 1970s the politics of information technology was restrictive.

Through the 1960s, and into the 1970s, IBM was the overshadowing actor on the computer market. The technology was geared to big customers and compact, inexpensive computers for the general public were not part of IBM's strategy at that time, though this was technically possible.[1] This left room for others to enter. The 'others', described by Steven Levy in his collective biography *Hackers: Heroes of the Computer Revolution,* were several sets of young computer enthusiasts. One first group had its roots in MIT's computer laboratory in Cambridge, Massachusetts. Fighting their way to access the state-of-the-art computers of the time – gigantic machines that batch-processed cards and paper tape – these first hackers broke ground in developing ways to do interactive computing. Probably more important than the technical advances made was the formulation of what Levy calls 'the Hacker Ethic'. This was a new way of looking at machines, a new relationship between people and computers – that is, a new 'technology'.

The Hacker Ethic was first and foremost a hands-on approach to computing. Instead of first theorizing about what could or could not be done before implementing, the hackers set about doing it, fixing ('debugging') errors along the way. The term 'hack' refers in the new language of computerese to this way of doing things. Hacking a solution means sticking to a task until it works, jumping around barriers, if need be with wire and soldering iron. A 'good hack' is the simplest and aesthetically most pleasing solution to a problem. Thus the Hacker Ethic was intensely anti-bureaucratic and against hierarchical social organization. You were judged by what you could do, not your social rank, or age (many hackers were high school kids). Partly as a reaction to the secretive, white-robed priesthood of computer science, the Hacker Ethic proclaimed that information

wanted to be free – including computer codes. All tools for computing should be available to everyone and locked doors were there to be cracked open – not for profit, but just because the art and science of computing could not develop in a closed environment. This attitude of openness went hand in hand with a fun-and-games approach that soon developed its own aesthetics. This was the flip side of strict computer logic and perhaps a creative necessity for finding new solutions. It also was a critique of the dominant utilitarian approach to computing. The early hackers had a hard time conceiving of computing for profit. They wanted the power of the computer. Having fun with computers was justification enough; a new 'life space' was opening up. The Hacker Ethic was thus very anarchistic, and it is not just this author who, as a project leader, has discovered that trying to get computer hackers to follow an organizational plan or time chart is like trying to herd cats.

Steven Levy, like this author, uses the term 'hacker' in its original meaning rooted in computer pioneering. In this usage, the connotations are positive: free spirits breaking down barriers to knowledge. However, because of many cases of misuse of the unleashed power of personal computing, the term became tarnished, even discredited. The hacker became either a 'nerd', a social recluse, or a 'cracker', a criminal hacker. A whole literature developed around this. But there is a solid argument, as presented below, for retaining the term 'hacker' in its original, historical sense.[2]

While the East Coast software hackers described above maintained a certain elitism, it was in California that the egalitarian hardware hackers flourished. This important group is described by Theodore Roszak in the following way:

> But by the end of the 1960s, there was another species of hackers on the horizon, emerging mainly on the West Coast [of the USA] from the ranks of the antiwar movement. These were the radical or guerrilla hackers, who were destined to give the computer a dramatically new image and a political orientation it could never have gained from Big Blue [i.e. IBM] or any of its vassals in the mainstream of the industry. At their hands, information technology would make its closest approach to becoming an instrument of democratic politics.[3]

One early meeting of socially concerned hackers, with involvement in the Vietnam war protest movement, took place in the spring of 1970 at the University of California in Berkeley.

> They deplored the fact that the computer was being monopolized for profit and power by the same military–industrial complex that already controlled every other major technology. Yet they were also convinced that their profession held the key to a vital participatory democracy. That key was information.[4]

The ideological, social and even technological roots of the development of the personal computer, which enables decentralized computer-mediated communications, thus go back to the Berkeley free speech and anti-war movements of the 1960s. The search for, and development of, a 'people's information technology' provided a powerful impetus for later developments.

Several community-oriented projects and social experiments were started. Out of 'Resource One', a community data base, a project called 'Community Memory' emerged in the Bay Area. This was an electronic bulletin board. While these early experiments were local and still tied to existing, mainframe technology, they were proving a point: that information, and information in electronic form, could be much more than an industrial or commercial commodity. Breaking out of the existing technology was the next step.

> From its beginning, the microcomputer was surrounded by an aura of vulgarity and radicalism that contrasted sharply with the mandarin pretensions of the high tech mainstream. This is because so much of the new, smaller-scaled technology was left to be developed outside the corporate citadel by brash young hackers – especially in California, where socially divergent types had gathered along that strip of the San Francisco peninsula which was coming to be called Silicon Valley. By the mid-1970s, small groups of these hackers had begun to meet in informal rap sessions where computer lore was freely swapped like gossip over the cracker barrel in a country store. The feel of these meetings was deliberately down-home: a self-conscious rejection of the stilted corporate style.[5]

One of the most colourful and productive of these 'funky town meetings' was the Homebrew Computer Club in Menlo Park, near the Stanford University campus. Much of what took place there has become legend in the folklore of the cybernetic revolution. It was at Homebrew that Stephen Wozniak, together with Steven Jobs, presented his new microcomputer in 1977: the Apple. Two years before this, several hackers in Albuquerque had started circulating the first microcomputer, a mail order kit named the Altair (after an alien planet in the *Star Trek* television series). The Altair, backed by the

Whole Earth Catalog, became a success and harbinger of things to come, and was from the start perceived as a technology of liberation.[6]

The West Coast group is what Steven Levy calls the 'hardware hackers' – people who were actually building new machines and using the type of interactive software developed by the first generation of hackers at MIT. He also chronicles the emergence of a third generation, the 'game hackers'. The aspect of fun had always been part of the hacker culture and 'getting the machine to do something' seems to have been easily conceptualized and implemented in the form of games. These were either arcade games imported into PCs or 'Star Wars' and/or 'adventures' played on PCs, mainframes and around the Net. That recreational computing would have such an appeal perhaps surprised many – but again, the corporations and academic world were both tardy in presenting 'useful' applications for personal computing. The phenomenon is witness to the holding power of the technology and to the strong appeal of gaining access to a 'free space', a place devoid of regulation, including the control of utilitarian demands of the workplace and social responsibility. In other disciplines this is known as 'play', something children are seen to need to do in order to learn and grow but sorely out of place in the world of adults who are denied this life-space.

To paraphrase Walter Benjamin, secularized societies based solely on money have to construct ways of interpreting existential experience. The vast popularity of the televized fairy tales known as soap operas support his observation – as does the spread of certain types of computer games. It is perhaps in the sense of being in control that is a major component in the holding power of the computer. Novelty obviously has its own attraction but so does the sense (true or false) of personal empowerment. Computer games provide escape and entertainment, sometimes something more. Through symbolic representations of the world and through the power of narrative and fairy tale, the computer-game culture provides avenues of interpretation for both understanding and manipulating experiences in symbolic form. As Bruno Bettelheim has pointed out, going through the trials and tribulations, constantly making choices, usually between good and evil, is the essence of the fairy tale. There is great interpretive and therapeutic power here, for both children and adults.[7]

In this adventure game subculture, there is a strong presence of Tolkien. Some of the earlier 'dungeons and dragons' adventure games

broke out of the confines of the machine, developing into person-to-person, interactive 'live' theatre.[8] The interactiveness of computer adventure games enhances the feeling of being in control, not of reality of course, but of the experience and interpretation of reality, with alternative outcomes and perhaps a heightened sense of possible meanings. Meaning needs company. When it later became technically and economically feasible to create a multi-user dimension (MUD), the adventure games quickly picked up on this. Like solving riddles, these can also be intellectually stimulating. So it is not surprising to find that rather sophisticated simulation software applications are packaged as games.

The game hackers soon discovered that there was a very large market for their software, as did many of the hardware hackers. Some arrived on this new technological frontier with dollar signs in their eyes and went straight for the goldmines. New companies were set up that produced new machines and software for them, forcing the big computer corporations to take the PC revolution seriously. Stewart Brand, founder of the *Whole Earth Catalog*, put it this way:

> I think that hackers – dedicated, innovative, irreverent computer programmers – are the most interesting and effective body of intellectuals since the framers of the U.S. Constitution.... No other group that I know of has set out to liberate a technology and succeeded. They not only did so against the active disinterest of corporate America, their success forced corporate America to adopt their style in the end. In reorganizing the Information Age around the individual, via personal computers, the hackers may well have saved the American economy.... The quietest of all the '60s subcultures has emerged as the most innovative and powerful.[9]

In the early days of the microcomputer (and perhaps even today) most enthusiasts were not quite clear why they wanted this powerful piece of technology. ('Recipes for quiche?' 'Cataloging records?') In hindsight, however, it is clear that the emphasis was on 'powerful': wresting at least part of this technology from the military–industrial complex was an act of empowerment, not unlike learning to read and write, or perhaps even the right to vote. In the words of Lee Felsenstein, a pioneer of Homebrew and the microcomputer revolution,

> They just wanted to get their hands on the technology and control it from below. In 1978 personal computers found their first big function: communication. Alan Kay had been saying for years that a computer was first, second and thirdly a communications tool. Ward Christensen and Randy Seuss opened a BBS in Chicago in February of that year, and the rest is history. The number of BBS systems is unknown and probably unknowable. All this in spite of primitive software technology.... This was indeed a demand-driven application, and it is important to note that the demand was not for official, certified, top-down information, but for contact with other people having kindred interests.[10]

What Ward Christensen had developed was a protocol that allowed for error-free transfer of data over a modem and telephone line. This was another step in 'capturing the technology' from the corporations, the military and academic networks who were (and still are) operating on platforms of leased lines. The difference may at first glance seem a mere technical difference but the argument being put forward here is that this is of crucial social and political significance. The democratization of the technology has meant increasing access. 'Access' means availability to citizens both in a technological and economic sense: cost and ease of use; and, of course, that the technology is there, physically, and that there is some meaning to its use. A technology that is too expensive has limited access. Likewise, if it is too difficult to use, it will not be used. If it has no meaning, it will be seen as irrelevant.

Running off newly available PCs and modems, countless Bulletin Board Systems (BBSes) started appearing. More often than not, these were run by amateur hackers, fascinated by the new technology. Much of the content was 'introvert' in the sense that it dealt with the technology itself: exchanging computer programs and ideas on computing (plus a lot of nonsense). But out of this BBS culture of interaction developed many things of lasting importance. One was cost-consciousness and anti-commercialism. Since the BBS hackers were paying their own way, ingenious ways of cutting costs emerged. FidoNet is one; the development of a culture of public domain (no cost) and shareware (use first, pay later) software is another.

Running a BBS means running a piece of software that will answer the phone when a user (i.e. the user's computer) calls in and provide some services: exchange of mail, information in other forms, program swapping. This is what a stand-alone BBS does. But most BBSes go beyond this since the bottom line has been to save money. So a BBS in one place exchanges mail and other material with another BBS in another place. In this way, a user only has to dial in to the

closest BBS, saving long-distance phone costs. Much like the amateur short-wave relay networks in the earlier part of the century, a BBS network known as FidoNet developed. The basic principle of the FidoNet is that a BBS need only make a relatively short-distance call to another nearby BBS to exchange material to and from nearly any place around the world. Since telephone cost is not only distance but time as well, some sophisticated programming has come out of the BBS culture, as well as providing both a market and impetus for the development of high-speed modems.

The hacker/BBS culture is non-commercial, at times aggressively anti-commercial. The best expression of this is the development of public domain and shareware software. This culture has always been critical of the high pricing of computer software. Many feel that this pricing sets up barriers to access to information technology. Some might argue that no one should 'own' the intellectual property basic to basic democratic (electronic) communication – like trying to patent the English language. Many programmers develop their software as 'shareware'. This means that the software is distributed free of cost; if the user decides to use it, then he or she sends payment to the author of the program. This system is based on trust. And it works: many excellent programs live their lives as shareware and develop into commercial packages. Others are put in the 'public domain' and become freeware, usually with the provision that they not be sold separately or as part of another package. This has kept a constant pressure on commercial vendors of software to keep prices down. One advantage of program development within the public domain/shareware culture is that the software develops here in closer interaction with, and input from, users.

More dramatic hacker pressure on the computer corporations came from other developments as well. The appearance of the Apple II in 1977 started the race for the PC market – though it took quite a while for all the actors to realize the potentials here. IBM introduced its PC and soon innumerable IBM 'clones' (copies) were popping up everywhere. Competition has been intensive in the rapidly expanding IT marketplace, with 'more and better' being hyped on the consumer. A prerequisite for the volume sale of computer equipment has been the development of an 'information ideology'. This ideology, or 'cult', has been criticized by many, notably Theodore Roszak in his book *The Cult of Information*. Increasing amounts of

information do not necessarily lead to more knowledge, and much of what is termed the 'computer revolution' is advertising hype with the sole purpose of pushing products on the consumer.

In 1984 another important step related to access was taken. Apple introduced its first Macintosh and the race of the graphic user interface (GUI) was started. What Apple did was to address the issue of ease of use of the technology. Their solution was to leave the text-based command structure of the programmer's world and to offer a system that was much easier to understand and use for 'normal people'. Much of this has become advertisement cliché but the basic idea was to lower the threshold of technical competence needed to start using computer technology. In their GUI choice, Apple raised prices, one of the other parameters of access. Other companies followed suit. The ever more sophisticated graphics, sounds, bleeps and blinking require more powerful computers, and the computer one buys never seems to be complete, given the rapid pace of innovation.

From hacking to communications activism

The 1980s witnessed the further development of the computer revolution from below. This was the closer symbioses of hacker computer knowledge and the commitment of political activism. A new breed of hackers began emerging: the communications activists who started putting 'small scale' computer-mediated communications technology to social use. Their efforts took several directions. One dealt with the content and social uses of the new technology and another with the technology itself.

One development was the growing awareness within progressive communities – especially the peace and environmental movements – that computer-mediated communication could be a powerful tool for their work: gathering and spreading information and enhancing communication between and coordination of individuals and groups locally, nationally and globally. The other, parallel development was the change in the technology itself: computing power was dropping in price and more and more tools for computer-mediated communications were being taken out of their mainframe environments and put into affordable personal computers (PCs). Before there was an Internet running on a universal standard, there were other global

networks, some dedicated to putting the new technology to meaningful social use.

Stand-alone BBSes began exchanging data with each other: email, software and 'discussion fora' (sometimes called 'conferences' or 'newsgroups'). When the same data is found in various separate computer-mediated communications systems, we say that it is a mirrored, or distributed system. A widely known system of this type is the USENET, a collection of thousands of newsgroups, open to all. Some types of software, such as the UNIX operating system, are easier to use than others in this kind of system, since communications is built into the operating system, unlike DOS-based systems. Until 80386 processors that allowed for true 32-bit computing were available for PCs, UNIX had to be run in minis or mainframes. As PC hardware became more powerful, and more powerful per dollar, communications software began spreading and developing among the communications activists, who carried the hacker revolution one step further.

One group doing communications development work was found, not unexpectedly, in Menlo Park in the San Francisco Bay Area. From the early 1980s, this group, Community Data Processing (CDP), handled the technical side for the communication activists on the other side of the Bay who were building up PeaceNet and EcoNet, servicing the peace and environmental communities. From this nucleus, several other sister nets appeared, eventually housed together in what is now the Institute for Global Communications (IGC). The IGC and CDP became something of a technical hub for what would later become an international federation, the Association for Progressive Communications. What the 'techies' at CDP managed was to port out a mainframe email and conferencing system to an 80386 PC environment and further develop this into a distributed email and threaded conferencing system. They were first, or among the first, to do this, in an environment that largely held that this could not be done. Each host server, known as a 'node' in such a distributed system, contains the same core of information. This means that an APC user calls to the closest 'node' (APC station) instead of making an international call, or paying for some type of Internet linkage. Before the arrival of a standardized Internet, the nodes connected via high-speed modems. Smaller systems, without leased lines connecting them to the Internet, are still using high-speed

modems for their linkages. The tools forged by the communications hackers were brought to social use by the communications activists. The result of this synergy between hackers and activists was that low-cost host servers could be, and were, set up around the globe, directly in the service of individuals and groups working for social change and with issues of planetary survival.

As the Internet and the World Wide Web expanded in the 1990s, new tools were made and new methods of operating introduced. For example, mailing list technology could provide both a tighter control and less information overload than the sometimes cumbersome conferencing (newsgroup) systems.[11] As commercial service provision became less expensive and more widespread, communications activists, especially in the North, began turning to activities other than providing basic access.

The Association for Progressive Communications (APC) is the largest non-commercial NGO network specifically serving the peace and environmental community. The APC operates a distributed email and conferencing/database system as well as electronic publishing and distribution of several news services on a fully global basis. This is run on a non-commercial basis with the specific purpose of strengthening civil society. The goal of the APC is stated in its original charter:

> APC aims to provide a globally interconnected electronic communications network dedicated to a free and balanced flow of information. APC's member organizations serve people working toward goals including peace, the prevention of warfare, elimination of militarism, protection of the environment, furtherance of human rights and the rights of peoples, achievement of social and economic justice, elimination of poverty, promotion of sustainable and equitable development, advancement of participatory democracy, and non-violent conflict resolution.[12]

Organizationally, the APC is a federation of legally and financially independent organizations, each running a 'node' or main station in the global communications system. There is a pooling of technical and organizational resources and a system of cost-sharing.[13] (For history, see info-box.)

In one sense, the APC and like-minded organizations picked up the UNESCO chips after this inter-state organization was pulled off the board as a result of its Third World advocacy of a New World Information and Communication Order. The communication activists

started constructing a model for a new global information order with a hands-on, bottom-up approach. One field of activity not covered in this study is the work done by other United Nations agencies such as the UNDP (United Nations Development Program), the UNV (United Nations Volunteers) and the NGLS (United Nations Non-Governmental Liaison Service) in supporting, initiating and facilitating the use of ICT for development, social service and change. The linking of the inter-governmental work of these agencies to NGO networking became visible in the ICT work for the series of UN summits held in the 1990s on various issues of global concern. NGO electronic networking fitted well into the UN strategy of allying with NGOs around the world to lobby for the issues and to be the watchdog over the implementation of inter-governmental agreements.

The 1992 Rio Summit on the environment was something of a breakthrough for global NGO computer networking. This Summit was a revival of UN world summitry intended to focus global attention on areas critical to planetary survival. Other inter-government meetings would follow, and at each there would be a parallel meeting organized by and for NGOs. So a system of global lobbying was built into these meetings, with thousands of participants. This put new demands on informational services, for both broadcasting to the media and communication between participants. This communication was carried on before, during and after the actual conference, the latter as a type of watchdog system so that all the resolutions did not just disappear somewhere in verbal space. Starting with the Rio Summit, the APC has provided electronic information services for the following World Summits called by the United Nations.

As pointed out by Ian Peter, then at Pegasus Networks in Australia, the distribution system provided by the APC networks soon became a major organizer and distributor of UN material for NGOs and governments alike. Because of the speed and ease of electronic communications, the work of these conferences probably became more effective.[14] Shelley Preston, in her article 'The 1992 Rio Summit and Beyond', states that 'these on-site information exchange services were unprecedented at a United Nations conference.'[15] What the Rio Summit meant for the communications activists was that they were no longer being treated as computer nerds on the fringe,

The APC: a brief description

The Association for Progressive Communications (APC) is a global network of networks whose mission is to empower and support organizations, social movements and individuals through the use of information and communication technologies to build strategic communities and initiatives for the purpose of making meaningful contributions to human development, social justice, participatory democracies and sustainable societies.

Initiated in 1990 by 7 founding members, APC is the largest computer network in the world dedicated to NGO networking. One of APC's key operating principles has been to share technical and organizational development knowledge with emerging networks, particularly in the developing world, to build global networking capacity. APC maintains close relations with over 40 partner networks in Africa, Asia and other regions considered not commercially viable by mainstream service providers. Many of APC's partners provide the only NGO computer networking in their country and, therefore, an indispensable link to the global development community. APC's continued support for regional networking development has enabled these networks to undertake collaborations of their own, and to build a local APC presence.

In 1997, APC is a consortium of 25 international member networks, offering vital communication links to over 50,000 NGOs, activists, educators, policy-makers, and community leaders in 133 countries. This dramatic growth reflects a heightened consciousness and use of networking technology by community organizations around the world, as well as a clear recognition that APC has been successful in advocating and facilitating full global access to communications technology and information-sharing, particularly for those in the South.

In providing computer networking services to the local social change community, each APC member network operates independently; however, they offer many services in common and face similar development challenges, though often at a different pace from each other. APC's role has been to coordinate the delivery of common networking and content services across all member networks; to provide a platform for facilitated international APC user communities and projects; and to assist the ongoing operation and development of member networks to meet their evolving needs, as well as those of social change movements around the world.

Source: APC International Secretariat – Brazil * Supporting Electronic Networks; Amalia Souza, Program Coordinator * Email: amalia@apc.org December 1997.

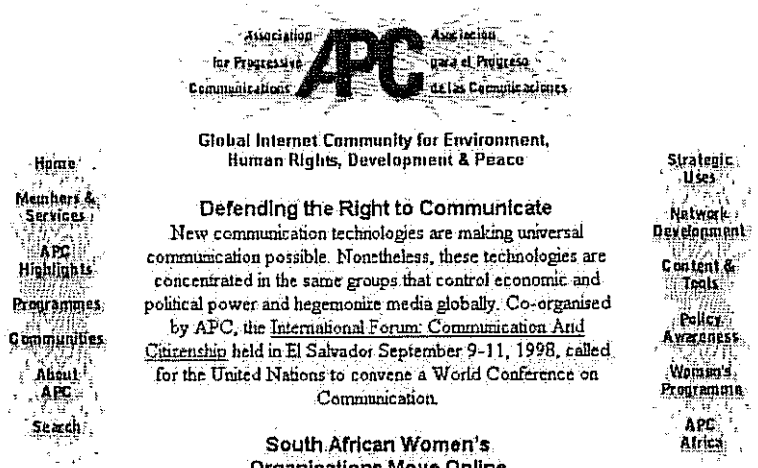

FIGURE 2.1 APC homepage <http://www.apc.org/english.html>

but that non-governmental, non-hierarchical groups could put together and operate an informational distribution and communications system that was more accessible and meaningful than what commercial or government organizations were providing.

The Internet

What is the Internet?

What is known as the Internet is a decentralized, interconnected myriad of computer networks. One history maintains that its decentralized architecture developed out of Cold War military–strategic considerations in the USA to have a computer communications system that would survive a nuclear attack. If part of the system were destroyed, communications could be routed through the remaining parts of the network. The civilian adaptation of the military net became the academically oriented ARPANET in the USA. Most of the early networks were purpose-built, intended for example for a closed community of scholars. The business community had several networks. In the mid-1980s the British JANET and the US NSFNET (National Science Foundation) started a process toward establishing standards so that the various networks could connect to one another. Technically and organizationally this was a rather complicated matter, involving decisions on protocols, gateway and management systems.[16]

The USA took the lead here, with US public spending making the project economically feasible. Since this funding would not continue inevitably, the NSF advocated getting businesses interested in using the information infrastructure that was being built, first at the local and regional levels. Eventually, commercialization of what is now known as the Internet took place.

> NSF's privatization policy culminated in April 1995, with the defunding of the NSFNET Backbone. The funds thereby recovered were (competitively) redistributed to regional networks to buy national-scale Internet connectivity from the now numerous, private, long-haul networks
>
> The Backbone had made the transition from a network built from routers out of the research community (the 'Fuzzball' routers from David Mills) to commercial equipment. In its 8½ year lifetime, the Backbone had grown from six nodes with 56 kbps links to 21 nodes with multiple 45 Mbps links. It had seen the Internet grow to over 50,000 networks on all seven continents and outer space, with approximately 29,000 networks in the United States.

> Such was the weight of the NSFNET program's ecumenism and funding ($200 million from 1986 to 1995) – and the quality of the protocols themselves – that by 1990 when the ARPANET itself was finally decommissioned, TCP/IP had supplanted or marginalized most other wide-area computer network protocols worldwide, and IP was well on its way to becoming THE bearer service for the Global Information Infrastructure.

The Internet Society's history of the Internet attributes the spread of the Transmission Control Protocol/Internet Protocol (TCP/IP) standard to the openness of the NSF in spreading its documentation. The TCP/IP is an open communications protocol that took shape in the late 1960s and 1970s under the guidance of Bob Kahn. Four ground rules were critical to Kahn's early thinking:

- Each distinct network would have to stand on its own and no internal changes could be required to any such network to connect it to the Internet.
- Communications would be on a best effort basis. If a packet didn't make it to the final destination, it would shortly be retransmitted from the source.
- Black boxes would be used to connect the networks; these would later be called gateways and routers. There would be no information retained by the gateways about the individual flows of packets passing through them, thereby keeping them simple and avoiding complicated adaptation and recovery from various failure modes.
- There would be no global control at the operations level.

While the organizational context for the development of what became Internet standards was somewhat different from that of the hackers, the geography (southern California, MIT) and time frame were the same. So, not surprisingly, the 'Internet ethic' is not unlike what has been called the 'hacker ethic'. There are even more parallels. In 1978, and again in 1988, AT&T/Bell Labs were offered what was then 'the Internet' by US government agencies for free. But they turned the offer down.[17] So the development of what we now know as the Internet was left in the hands of the co-operating community of programmers and communications activists.

Distribution of documentation of TCP/IP was not done by the usual academic methods, but more by what has been called the hacker methodology ('information wants to be free'). This started in 1969 with a system known as the Request for Comments (RFC) series of

notes. First distributed by snail mail and then by email, FTP and WWW, these notes became a system of interaction between researchers and hands-on operators, all contributing to a co-operative accumulation of knowledge and development of a shared communications system.

> As the current rapid expansion of the Internet is fueled by the realization of its capability to promote information sharing, we should understand that the network's first role in information sharing was sharing the information about its own design and operation through the RFC documents. This unique method for evolving new capabilities in the network will continue to be critical to future evolution of the Internet.

Over the two decades of Internet activity, there has been a steady evolution of organizational structures designed to support and facilitate an ever-increasing community working collaboratively on Internet issues. A key actor here is the Internet Society.

> The recent development and widespread deployment of the World Wide Web has brought with it a new community, as many of the people working on the WWW have not thought of themselves as primarily network researchers and developers. A new coordination organization was formed, the World Wide Web Consortium (W3C). Initially led from MIT's Laboratory for Computer Science by Tim Berners-Lee (the inventor of the WWW) and Al Vezza, W3C has taken on the responsibility for evolving the various protocols and standards associated with the Web.

The Internet is becoming increasingly commercialized. Originally, commercial efforts mainly comprised vendors providing the basic networking products, and service providers offering the connectivity and basic Internet services. The Internet has now become almost a 'commodity' service, and much present attention has been on the use of this global information infrastructure for support of other commercial services.

The 1990s witnessed the development and rapid adoption of tools for navigating the Internet ('browsers') and for organizing and reading information through a standardized hyper-text mark-up language (HTML). Together, these are commonly known as the World Wide Web technology, which allows users easy access to information linked across the globe. More and more products are available to help organize that information. Many developments in technology are

aimed at providing increasingly sophisticated information services on top of the basic Internet data communications. This calls for increasingly sophisticated software and hardware. Some companies are trying to capture the market. The Internet is an evolving system and will continue to change as computing and communications patterns change. This occurs not just because of technical innovations but also according to the uses of the technology.

The politics of the Internet

The Internet is often seen as the basic infrastructure or backbone of that virtual non-place called 'cyberspace'. The commercialization of computing and networking has led to much hype on the graces of high technology. Public discourses have again been carried on about our individual and collective digital futures. The standpoints both reflect basic values and approaches sketched out above and discuss the more specific phenomenon of global networking. The 'politics of the Internet' is increasingly becoming an area not only of academic discourse but of real political conflict. This is around issues of access, governance, ownership and investment, and degrees of autonomy. In keeping with the Gramscian view of the pre-eminence of conflicts over the control of the mode of information, some even predict future 'net wars' and 'cyberocracy'. Perhaps this future is already here, at least judging by some of the literature. David Ronfeldt puts it in the following way in his essay 'Cyberocracy is Coming'.

> What new 'ism' or 'ocracy' may arise? The purpose of this paper is to suggest that 'cyberocracy' is coming. This term, from the roots 'cyber-' and '-cracy', signifies rule by way of information. As it develops, information and its control will become a dominant source of power, as a natural next step in man's political evolution. In the past, under aristocracy, the high-born ruled; under theocracy, the high priests ruled. In modern times, democracy and bureaucracy have enabled new kinds of people to participate in government. In turn, cyberocracy, by arising from the current revolution in information and communications technologies, may slowly but radically affect who rules, how, and why.[18]

Writing from a Fascist prison in the 1920s, Antonio Gramsci analysed the emergence of industrialized culture and the dominating influence of the consciousness-creating information sector. Control over consciousness means hegemony. So while 'cyberocracy' may be a new term, the phenomenon is hardly new. The argument put forward here is that the computer revolution is an attack on an existing cultural and informational hegemony, with victories on a few fronts. This political struggle can be described in several ways. Two Swedish journalists, Lars Ilshammar and Ola Larsmo describe it in their book *net.wars* in the following way.

> For the battle has begun. On the one side are the radical democratic activists with lots of idealism and know-how: on the other side terribly rich corporations. The struggle is about the future public space. The communications revolution that people have talked about for a long time has begun to be filled with a social and political content.[19]

The opposing sides in the struggle have been given many different names, depending upon one's ideological and methodological perspective. But there is a conflict here over both the content and the technology to produce and deliver the content. The computer revolution opened a door for non-hegemonistic individuals and groups to counter the consciousness-creating hegemony of the cultural and informational elites, who are now trying to push that door closed again. But since the computer revolution also created a market for PC peripherals and networked communications and information retrieval, the industry is also working against itself. Broadened access means more money, but also the possibility of losing control and sprouting innumerable alternatives to hegemonistic media. The caveat here is that business is only interested in those people who can pay, thereby excluding the potentially more dangerous global majority who cannot pay for the equipment and services. Since the market maintains an impetus toward ever more sophisticated machinery, it helps maintain the class-differentiating nature of computing, with some exceptions. One exception is those companies who realize that there is a profitable low end of the market, especially when added on to other services such as telephones and digital television. Another exception would be those groups, organizations and movements who consciously adapt and develop technologies to widen access, especially for people in the South. Since access is such an important aspect of using ICT, it will be treated in a little more detail.

Barriers to access

There are several types of barriers to access to the benefits of computer-mediated communications. These aspects will now be dealt with, one by one.

Money Not everyone can afford a 'modern' computer, whatever that may be. By constantly 'upgrading' software that needs ever more powerful machines to operate on, many people are simply denied access to what is defined as necessary to take part in the information revolution. Now, much of this is hype. The widest personal use of CMC, electronic mail, can be run off the simplest PC; no graphics required. In fact, even text-based uses of the WWW can be accessed with a very simple machine. Another cost is for connectivity: for most people in the world access to a personal telephone is still a luxury far beyond the horizon. Access to electricity can be a major barrier.

There is a political economy of the bandwidth, for the simple reason that cables and connections that can operate at high and super-high speeds cost money. Simple email and other text-based communications can be done at 'slow speeds'. But video-on-demand or game-playing over the Internet requires lots of speed (bandwidth). So the list of different types of ICT technologies presented on page 51 is also a graph of its own political economy.

Ease of use A major barrier to using CMC (and computers) is ease of use. Running the machine (any machine) can be difficult, especially one that only does exactly what you tell it to and has zero per cent error margins. The early computers were designed for, and by, computer specialists who never imagined that the computer would become a household appliance. When computer manufacturers decided that there was a consumer market for these machines, they then began looking for ways to increase 'user friendliness'. This easiness of use had to be weighed against cost since – as things were to develop – greater user friendliness usually means higher cost (which this author finds very unfriendly – like having a friend invite you out for dinner and then letting you pick up the bill).

Language The *lingua franca* of computers is English. For many, using a computer is a test of their knowledge of this language of globalism.

Types of information and communications technology

Email Electronic mail is basically one-to-one communication, with a digitalized piece of information sent from one user to another user's mailbox on any host that maintains a valid mailbox for that user. Copies can be sent to other users' mailboxes. Email technology has been expanded so that many-to-many communication is possible through the use of *mailing lists*. Email can be done either online or offline.

Conferencing Electronic conferences are thematically indexed folders of communications. The user of a conference can read, reply to topics or write a new topic, depending on the type of conference. Some are read-only, some are open to all for both reading and writing, and some are closed, open only to accepted members. Some conferences are moderated, with the moderator letting users in and sometimes editing the material. Conferencing can be done either online or offline. Newsgroup is another name for an electronic conference.

FTP The File Transfer Protocol is a tool for moving files from a server to your service provider's machine, and then moving them (downloading) to a user's machine. Retrieving files through FTP can be done either online or offline.

Gopher This is a tool that creates menus that allows a user to access network resources by moving an on-screen pointer. A gopher can point to text files, telnet sites for linking to another remote computer, and other types of data. Basically online.

World Wide Web A program that works through hypertext links to data, allowing a user to explore network resources from multiple entry points. WWW has for many become synonymous with the hypertext servers connected to one another via the Internet. Basically online. The WWW can be either text-based or, in its most popular form, use a graphical interface. The WWW is moving rapidly toward webcasting with audio and video.

In this author's opinion, the development and spread of operating systems, manuals, programs and instructional materials in languages other than English has not proceeded very fast. With linguistic dominance comes cultural dominance. Many in the South are beginning to fear that the spread of ICT might mean McCulture strengthening its hegemonic grip.

Connectivity CMC rests upon being connected to a server that in turn is connected to other host servers. Until now, the usual way to do this for ordinary people is through the telephone line. Non-ordinary people, like college professors, can sit in front of their computer, or computer terminal, connected through a physical, direct wire to a server, in turn connected through cabling to other host servers. So, at a minimum, a user has to have access to a phone line that can be used for dialling a server, or go to a place where a terminal connection is available. Obviously, the easier the connectivity, the wider the use.

Information overload Information overload is a widely experienced phenomenon. This is not only due to computers, but is a fact of modern or post-modern life. Having too much to choose from can sometimes be inhibiting and may pose a barrier for some people. But there is another aspect to information load that is more specific to computer-mediated communication and the informational relationship between North and South. That the North has a technological advantage is obvious, an advantage that may be increasing and one that may turn out to be a keystone in maintaining all the other advantages that the North has over the South. So there is some scepticism among would-be users of the new communications technologies that this may open the door to yet another wave of informational dominance from the North (see page 55 for two examples).

Irrelevancy Going out on the Net means becoming exposed to information that may be experienced as irrelevant, or worse. Electronic junk mail gets dropped unrequested into my emailbox, just as junk paper mail gets dropped into my paper mailbox. This spamming is a real problem for many, if for no other reason than that it clouds some of the more positive uses of email in mists of irrelevancy.

Reliability Since email and Internet services are both new and nowhere near universal, a real concern is whether or not my email really gets there, and gets picked up and read. Do the servers really connect to one another? Did I use the correct address? This is in addition to concerns over my own software and hardware problems.

Availability of know-how It requires training to use the new technology, even if one of the lasting contributions of the computer revolution in the form of the dispersion of personal computing has been to lower the knowledge threshold. While computers tend to become easier to use, an input of education is required. A lack of this is a serious barrier.

Computer culture There are several aspects of the internal computer culture that tend to act as barriers to access. One is the development of a special lingo called computerese. Mastery of this language defines who is in and who is excluded. The computer culture has been predominantly 'pale and male': another way of preserving and extending white male supremacy. More of this later. The computer culture has been marketed in a yuppie package. What has been called the 'politics of the interface' reflects this.

Even the interface on the personal computer has its own politics. The politics of the GUI – Graphic User Interface – be it Macintosh or Windows, is clearly that of corporate culture. Both the terminology and the desktop iconography reflect this. There are clocks and calendars, filing cabinets and spreadsheets, telephones and clipboards. The message is clear: we are to order our lives in a business-like fashion. Why a business desktop? Why not a kitchen? Or a playground? A garden? Or a woodworking shop? A village?

Fear of misuse One barrier to access is also the fear that the new technology is, or might be, used for criminal or retrograde purposes. Several pieces of legislation have been propelled by these fears of criminality, of pornography, trafficking in child abuse, of hate mail being pushed on people, racist propaganda, and so on. These fears and the phenomena that arouse them are real and have to be taken into account when discussing the spread of ICT. One such fear is that the spread of ICT might mean the end of privacy. Not one 'Big

Brother' watching us all, but lots of little brothers spying on and bothering each other.

The politics of the link Information overload and putting 'the world's biggest library', the WWW, in the middle of a seemingly endless shopping mall confuses many people. Another barrier to access is not being informed about what is available. During my work on this book's chapter on Bosnia, I tapped nearly all available sources of information on the WWW. I became aware of how linking was politicized. 'Linking' is the phenomenon of providing access for one's own website (home page) to another, or other 'pages' or websites. When provided and used well, this is the heart of 'surfing the Internet': one source leads to another, to a third and so on. The intelligent and service-minded webmaster can lead his readers to other information, as well as himself avoid duplication of effort. So linking can be used to establish virtual communities of interest. But linking can also be used politically, as the examples described on the next page show.

During the intensive period of NATO intervention in the war in Bosnia, I analysed not only the grassroots networking taking place, but also government uses of CMC and Internet broadcasting as well as the commercial media. The Cable News Network, CNN, a major actor in the war in Bosnia, was already using the WWW to re-broadcast its material, as well as providing complementary material that could not be provided on television. As a part of its WWW service, CNN also provided 'links' to other sources of information on the WWW. What were these links? The CNN provided links to WWW sites maintained by the Serbian government but not to the grassroots peace movements. This pattern was not unique to CNN, but was also followed by other media corporations. This choice of links is even more puzzling when we consider that the media, especially CNN, were pointing to the Serb government of rump-Yugoslavia as a main perpetrator in the conflict. This pattern may be general: that the media corporations do not 'down-link', meaning censoring of sources that could provide alternatives, media substitution. On the other hand, the grassroots networks, like the ZaMir Transnational Net in the Bosnian conflict, provided ample 'up-links' to the media corporations.

Access disparity and info-dumping: two examples

In a conversation with a colleague at St Joseph's College in Turichuapalli in southern India, the topic of the information gap arose. Not surprising, since the professor in question lectures to my students about the causes and effects of globalization. One problem he faces, especially apparent when his students are doing graduate research, is the availability of material, even on India. Comparing notes, we easily surmised that it was easier for me and my students, sitting at our computers in Sweden, to obtain material on India than it is for him and his students, sitting in India, in the midst of what they are studying; and that this information gap is probably growing due to the way in which the world is wiring up. The spread of the Internet and WWW is a top-down process, since it involves initially considerable sums of money and access to other resources. So in India, it is the information brokers who are first out and it is not surprising to find many Indian daily newspapers as well as magazines available on the Internet. Sitting in Stockholm, I have direct, immediate access to *The Hindu*, published in Chennai, along with other economic publications, while my professor friend, further down in the same state, does not. This was in 1997.

Another example is a story told to me by a participant in a computer training seminar I taught at in New Delhi. This was for NGOs doing social and development work. Many of these organizations have contacts with support groups in the North. One gentleman told me about his first nightmarish experience with electronic mail. As soon as their support group in the USA found out that they had installed email in their office in India, they started sending large amounts of information via email to their Indian friends. And the Indian organization discovered that a whole month's salary was spent merely on the connection costs for picking up this information dump. Although well-meant and sent with good intentions, it was still an information dump and a drain on local resources.

Electronic colonialization A very real fear in the South is that of cultural penetration from the North by means of the new information and communication technologies. This is both in terms of form and content. ICT is seen by many as a new tool for spreading 'world culture', a euphemism for 'McCulture' in the popular sphere and the paradigm of Western science as the definition of knowledge, subduing culture-specific forms of knowledge.[21]

Using intellectual property rights clauses in international trade agreements, the North can maintain domination of the software needed to operate the technology. The concentration of information resources and online publics in the North means that much of the digital information circulating the globe originates in the North. Even within social movements there has been a wariness towards distributed conferencing since this can be experienced as expensive, as info-dumping, and as a way for the North to impose Northern definitions of relevancy. One result is that it is email that has so far been the major demand from movements in the South. The mailing list tool, described on page 57, seems to be growing in popularity in the South, since it decentralizes a selective control of information and of who may participate. Concretely, Northerners can be excluded from Southern discourses.[22]

Barrier jumping

Barriers are there, according to the hacker ethic, to be jumped. Realizing that most people in this world do not have access to computers, phones, modems and Internet accounts, several technological tools have been developed to at least provide access to high-end information with very low-end, bare-bones technology (see page 51). These types present us with a simple political economy of CMC. Access depends directly on the amount of money you have – and where you are living. Technologies have been developed that build around the fact that it is email that is the type of CMC most readily accessible and this in an offline mode to keep connect time to a minimum to save money. For email, nearly any computer suffices and nearly any modem. A litmus test of the political economy of a network, or CMC system, would be how seriously it takes this supposition. Just a few examples of the possibilities are presented here.

The one-to-one communication of email can be expanded through *mailing lists*. These are topical lists to which one subscribes. Some are

'read-only' while others are 'interactive', meaning that a subscriber can contribute by sending an email to the list, which then gets added on to. In this way, a discussion and information exchange can be carried on. While some lists are maintained manually, there are several different software packages running on computer hosts that can automate this. Thus email can become both one-to-many and many-to-many. Otherwise, it is the *conference* that was developed first as the tool for many-to-many communication. But since not all servers do conferencing and not all users can afford online participation in conferences, cost-cutting tools have been developed. Some hosts repost conferences as mailing lists. Since this can entail large volumes of information, this can be done in two steps. First, a user can request an index. After receiving and examining the index, the user can then request specific items in the list (conference). In this way, a user can avoid becoming an 'information dump' as described above. This is then a way of trying to avoid superfluous messages in electronic discussion fora. There are also software packages that allow for offline conferencing. Offline readers can thus be for both email and conferencing.

Larger chunks of information are sometimes put into what is known as an *FTP archive*. Using what is known as anonymous FTP-mail, files can be requested by email from the archive. For those who can afford longer connection times to a host computer, either leased line or modem, and have the necessary machines, there is the high end of surfing the WWW at websites and gopher archives, and so on.

Computer Lib: Round II

One challenge to commercialized information technology, with a strong inherent trend toward monopolistic control, is coming from the GNU project and the Free Software Foundation. The basic idea here is very simple and straightforward: computer software is a set of tools and should be made available to everyone. No one should own these tools, since ownership can mean denial of access, either through pricing and/or regulation (depending upon who claims ownership). The legal technique used to keep free software free is anti-copyright copyrighting. 'Free' here does not relate to price but to control. This is the GNU General Public License (GPL). Under

the GPL, authors 'copyleft' their programs so that no one can take out patents on them or further applications or versions of their components. This reverse use of intellectual property rights may seem complicated at first but is a clarification of some basic issues of information technology. *If* this technology is, as many claim, reshaping the world *and* the way we perceive the world, *then* it is extremely important, from a democratic viewpoint, that the basic tools of this reshaping and perceiving are accessible to all. I have already made this point in an analogy: as an author I can copyright this book but neither I nor anyone else can copyright the English language.

One important project following the copyleft path is Linux. This is a near-UNIX operative system first developed by the Finnish programmer Linus Torvalds. Many others have added to its development, in terms of the kernel, system and application. And this is the whole point: the creation of a community of programmers developing operative systems and applications with each other. This is done through openness, sharing and crazy experimentation. This is a repetition of what Stephen Levy described so well in his book *Hackers – Heroes of the Computer Revolution*. But instead of a small group sitting in an MIT lab, the new community is global. Yet the culture and ethic persist.

I have noticed an interesting phenomenon since the arrival of Linux around 1991. Nearly every programmer, systems administrator and, to a lesser extent, salesperson I have met knows about Linux and usually has a copy running on his/her own PC. And, scratching the surface, I discover that most have a fairly good sense of why they do this: as a gesture of independence in the face of an increasingly monopolistic world of computing that is closing in on itself. Open systems are challenges to the imagination. They can be changed, made to do new things, *played with* in a field of autonomous action.

Other software applications of importance have been, and are being, developed in the spirit of the GPL/copyleft arrangement. Examples are the widely spread email program Eudora from the University of Illinois in Urbana, the PINE ('Program for Internet News and Email') package of software from the University of Washington for DOS, Windows and UNIX platforms, Minuet from the University of Minnesota, and the Arachne project from a group in Czechia. Arachne is an attempt to produce a full-fledged WWW package for both clients and servers.

A challenge to Microsoft's monopoly on operating systems for PCs is coming from the Linux Community. The Linux Community is a community with a cause, some critics say 'a religion'.[23] There are many projects, coordinating bodies, a grant fund, a journal, online publications and a global network all providing the 'glue' for the community. GLUE also stands for 'Groups of Linux Users Everywhere'.[24] The cause is explicit: to keep software 'free' ('in the sense of free speech, not free beer'). And the concrete meaning of this is to provide an operative system platform that challenges Microsoft or any other corporation that tries to close things in. This challenge is through price and flexibility. Since there are no copyright or patent fees on the kernel, and there is an abundance of freeware, this is especially attractive to the South and educational institutions. The flexible openness of Linux appeals to many businesses and challenges the intelligence and creativity of many users and programmers, who are invited to make it better.[25]

> In a sense, GPL provided a written constitution for the new online tribe of Linux hackers. The license said it was OK to build on, or incorporate wholesale, other people's code – just as Linux did – and even to make money doing so (hackers have to eat, after all). But you couldn't transgress the hacker's fundamental law of software: source code must be freely available for further hacking.
>
> In March 1994, the official Linux 1.0 appeared, almost as a formal declaration of independence. By then the user base was already large, and the core Linux development team substantial. Among the thousands of files Linux contains, there is one called simply Credits. In it are the names, addresses, and contributions of the main Linux hackers. The list runs to more than 100 names, scattered around the world. Almost uniquely for a hacker project, Linux has huge and comprehensive sets of FAQs, how tos, and general help files (see, for example, the Linux Documentation Project)....
>
> Staying on top may prove increasingly difficult for Microsoft. The latest version of Linux – release 2.0 – offers 64-bit processing (NT and many Unixes are only 32-bit); symmetric multiprocessing, which allows the simultaneous deployment of several chips in a system; and networking more advanced than that of any other operating system.
>
> A related advantage of Linux's developmental structure is that security fixes typically turn up faster than from commercial suppliers. For example, when a 'Ping of Death' assault of multiple, low-level messages crashed several operating systems worldwide, a quick patch to Linux enabled the attack to be thwarted in a couple of hours. 'Somebody posted a report of

> the ping,' recalls Alan Cox, author of the fix, 'so I just sat down, fixed it, and posted the fix straight back.' Users of other operating systems had to sweat out their vulnerability far longer.
>
> ... Yet Linux's importance lies not just in the size of its installed base, but also where those users are found. 'More than 120 countries are represented according to Alvestrand. 'And Linux is a real power in the less developed countries – in some cases growing faster than the Internet.'[26]

Besides the academic community, businesses started to pick up on Linux, one source even stating the opinion that probably more development work had gone into the latest Linux kernel than went in to Windows NT. And Linux is moving beyond 'catching up' into true development. A free operating system has appeared, produced by a community of advocates, in the second round of computer liberation.

As the boundaries between an operating system (OS) and the Internet become more and more blurred, systems such as Linux may come and go. But what is increasingly being known as the 'Open Source Movement' is growing. And it is not confined to academic ivory-tower programmers, reclusive hackers or computer radicals. While including these elements, the movement is being institutionalized and is gaining ground in the business community. More and more professional software producers are putting their packages on the Linux platform. In 1998, Netscape (re)joined the movement and released its source code, inviting the broader community of programmers to join in on developmental work. SUN (Stanford University Networks) has joined Linux International. As pointed out by the *Linux Journal*, it is not only possible for software developers to make money working on an open source philosophy; it may even be counterproductive for the economy as a whole to continue the system of intellectual property rights for most software.[27] This question and the debate around it may prove to be of central importance, and will be returned to in the concluding chapter.

Types of Alternative Network

A network is a system for receiving and transmitting information. A network can be based on computers, computer terminals, other types of electronic equipment, including just plain telephone lines. The terms 'network' and 'networking' have both technical and sociological meanings. Sometimes the meanings overlap – as they do here in a definition provided by John Quarterman in his book *The Matrix*:

> Network users group together in a variety of ways related to the underlying technology or to mutual interest. The networks and conferencing systems themselves produce communities of convenience of people with access to the same services and interfaces. More specialized communities form from interest and accessibility, whether on a single system or across several.
>
> ... Networks may be not only communities of convenience, but also communities of interest. Many of them form around people who are involved in the same sorts of activities. Here are some examples of communities of researchers, of communities formed around certain kinds of facilities or around the use of certain software, and of political communities.[28]

There are networks for scientific research and for business-computer centres. Some are built around operating systems, both large and small. Computer networking is used by political communities. Quarterman points out that there is a tendency to connect small, independent facilities to one another.[29] The reasons for this are several: the general impetus to a broader access, perhaps an inherent dynamic. For many network makers, the medium is the message – that is, communicative action is in itself a political act. In the words of Graham Lane, 'networking becomes a way of life'. The application of information technology as computer-mediated communication may be network-creating, in that it in itself links groups and individuals otherwise isolated from each other, as well as facilitating communication and information distribution within already established networks.

Communitarians

Although the original Community Memory project at Berkeley – the terminal at Leopold's Records – was closed down, the type of thinking and practice it represented took root. The thinking here was to use the new technology to salvage and reconstruct a disintegrating social vortex through computer networking. More and more studies were showing that local communities, defined as social networks, were falling apart, families were becoming isolated and individuals were, to use Robert Putnam's phrase, 'bowling alone'. In his book *The Spirit of Community* Amitai Etzioni argues that the defence and reconstruction

of democracy needs to be based on a revitalization of civil society, based on communitarian values.[30] While philosophers and academic analysts were studying the need for the reconstruction of civil society, others, following the 'hands-on' approach, were doing something about it.

One communitarian use of computer-mediated communication is the WELL (Whole Earth 'Lectronic Link). This system developed out of a desire to provide a means for people to exchange information and ideas, to communicate. Through his books *Virtual Reality* and *The Virtual Community,* Howard Rheingold has made this Bay Area bulletin board system one of the most widely publicized experiments in community computing. (In computerese, 'virtual' means 'in the computer' or 'on the Net' as opposed to 'outside the computer' – that is, the real world and real-life communities.[31]) While the WELL has never seemed to have shed its 'yuppie' (or post-pothead) image, many other experiments in community computing have emerged. The goal is not to have people disappear into virtual worlds of the computer and networks ('surfing alone') but to make people known and visible to each other in the real world; in other words, to strengthen 'natural' or local communities.

In North America, entire networks of community networks and FreeNets have emerged. Academic interest in these networks has been aroused. There are several evaluations of these types of networks, their structures, and even the economic impact on their communities. Since these community networks are electronic networks, a good deal of (self-)interest in them is reflected on the Net – that is, the World Wide Web. So a natural starting place for resources is the WWW Virtual Library, which maintained a starting guide to these community networks, as well as writings on and around them.[32] Kim Gregson at the School of Library and Information Science, Indiana University, has compiled a bibliography and resource guide on community networks.[33] In her study *Communities On-Line*, Anne Beamish found that community networks were finding it difficult to reconstruct civil society.

> Most community networks are rich in local information, ranging from job opportunities to minutes of the city council meetings. But, surprisingly, in spite of the intention to increase a sense of community and democratic participation, many community networks provide limited opportunity for public debate and discussion. In addition, most community networks do not provide electronic access to elected officials or municipal government staff.[34]

In Britain, the Manchester Host is an example of a government-funded attempt to explore the possibilities of strengthening a local community in transition through community computing. This has been replicated elsewhere in a whole system of 'FreeNets'.

Radical democrats

'Electronic democracy', like communitarian computing, has also become an area of both political and academic interest. This other use of computer-mediated communication is what radical democrats see as something of an electronic town-meeting. Besides pursuing a public discourse of issues and opinions, the technology could make it possible to conduct online voting. While this approach may help to re-enfranchise the electorate, it still has problems in dealing with the selectorate – those who set the agenda and choose those who set the agenda and pose the questions. However, the possible uses for strengthening direct democracy are still young and experimental.

Another, not so radical, use of CMC is for increasing the information flow between elected and electorate. One can now email many heads of government and other political decision-makers, and get an automated response thanking one for viewpoints offered or questions asked. Opening the conduits of information technology has shown for many a politician that this is yet another way of lobbying for interests and favours and perhaps not the hoped for electronic agora for considered public discourse.

Another brand of radical democrats are the 'e-activists'. The approach here is that electronic communication, information broadcasting and retrieval *in itself* has the power to transform. New forms and areas of communication and information exchange are made possible by the new information technologies. These high-tech forms and areas are seen as the new arenas for action. Politics becomes 'cyberpunk' and freedom of thought and expression is taken seriously, in a vein reminiscent of the Berkeley Free Speech Movement of the 1960s. A 1997 example of this electronic activist culture can be found at Steve Mizrach's *Activism Subpage.*[35]

The world of cyber-whatever is severely framed by real politics in a very real world. Here are just a few of the framing factors: electricity

– who gets it, at what price and at what quality; phones, or other types of connectivity – who gets it at what price and at what quality; computers – who gets them; the software necessary to run the computer – who owns it and who controls its development and which applications can be used on the operating system. All these factors are determined politically, not only in the sense of rich people/poor people but also in terms of laws and regulations concerning pricing in monopolies, patents and intellectual property rights. This emerging communications and information regime is drawing up an arena for politics in the information age.

Perhaps in a realization of a growing distance between e-activism and real-world social movements, an organization called «NetAction» was founded in 1996 'in order to promote effective grassroots citizen action campaigns by creating coalitions that link online activists with grassroots organizations' As a part of this, a collection process was started of 'information about the early uses of the Internet for political advocacy and organizing.'[36] The Political Participation Project at the MIT AI lab has resulted in some studies, for example Mark S. Bonchek's study on how increasing use of CMC may facilitate political participation.[37] Many studies are still at the survey stage, often within the confines of statist definitions of democracy.[38]

Libertarians have been quick to pick up on the possibilities of technology for protecting and enhancing free speech and open news flows. So it is not surprising that many interesting experiments in the use of Internet-based audio and video – that is, radio and television – have a libertarian flavour. RealNetworks (formerly Progressive Networks) seems to be carrying the technological banner with their development and the wide distribution of their software packages (RealPlayer) and support to their project WebActive. Numerous actors are arriving at the Internet from a history in public – that is, listener-supported traditional – radio, for example Pacifica Radio (see Webography). The new forms of 'webcasting' are opening up new channels for 'the other news' and for a highly decentralized system of production and distribution of radio and television. The supersite One World Online has started a radio news service, providing redistribution of radio programmes and a network of radio stations and organizations producing audio materials for Internet distribution.

Communications activists

The emerging grassroots networks are examples of the conscious development of a communicative praxis that uses while questioning the ideological and power base of existing information technology. These 'people-to-people' or NGO networks are outside the industrial–business–governmental sphere. They link intentional communities. These are real-world communities of purpose, people joined together in common causes. Some co-operate with inter-state agencies, public information monopolies, the academic networks and the amateur 'hacker' networks. These new NGO networks offer something innovative and dynamic. Quarterman, stressing the sociological aspects of networking, suggests that these may be the 'true' networks, since they are non-commercial, with human communication as their primary, often only, goal.[39]

Unlike the communitarian and radical democratic uses of CMC, the communication activist approach has not received much attention outside its own sphere. Little systematic academic 'knowledge' has been produced in the sense of this area being announced as a new field of research, with bibliographies being compiled and grants pouring in.

There are exceptions, of course, but it may be that these exceptional treatments of the uses of CMC for social change may contain some answers to this state of affairs: that this tool may be empowering to the point of being dangerous to the planetary status quo. It will be argued that the social movements that use the technology subordinate this use to social and political purposes and do not believe that there is a technological 'fix' to social and economic problems. So scholars looking for 'computerization movements' would be disappointed by communications activists. In other words, the communitarians and radical democrats provide much more independent importance to the technology than the social activists do. Another reason may be that it is hard to be 'objective' in the sense of traditional positivist science. As John Dewey put it long ago, there are two types of knowledge: that of the spectator and that of the actor or participant. It seems that studying how CMC is being used for social and political change appeals mostly to the latter category. Most of the studies on this, including the present one, have been done by people who are or have been actively

engaged in what they are writing about. There is a very good qualification to the above, namely in the work done by Internet pioneer John December in his online *CMC Magazine* (1994–99), which covers many areas of social uses of computer-mediated communication and his resource link. But then, he, too, is a 'participant'.

The next two chapters present examples of how CMC has been used by social movements and voluntary associations. Before turning to these examples, here is a brief review of some more widely known effects of CMC.

Some Basic Effects of Computer-Mediated Communication

The creation of differentiation is part of post-modern life.[40] ICT creates differentiation and, with it, the proliferation of subcultures. Some go even farther, claiming the collapse of geography in a 'global de-localization', or 'glocality'. One of these subcultures is the email community, with a strong and expanding foothold in the academic community. Here, there is a subculture within the subculture of academia with a differentiation between those who have it (email) and can use it and those who don't or can't. The difference is between those travelling in a mythical cyberspace and those still in the pedestrian stone age of snail mail and paper memos.

'Email' has emerged as a whole new genre of writing, and is being treated as such by large groups of teachers and scholars.[41] Electronic communication has a strong drawing power. And, as a number of studies would suggest, one-to-one email is probably the single largest use – depending, of course, upon how one defines 'use'. Put in another way: from the user perspective, most people use CMC for electronic mail to some other person. The reasons are obvious: electronic mail saves time and, calculating marginally, even money. This is especially true in the rural South (see pages 68–9).

Many a high-school teacher and college instructor can testify to the enormous drawing power of the online, multi-user programs such as the MUDDs ('Multi-User Dungeons and Dragons') that distract from course-work. Some learning institutions have even banned these from their systems since students would rather communicate than do their homework. Part of the growing folklore of the Net are the various uses of the 'chat' areas, where users can log in and communicate with one another in real time. One such use of chatting is that of digital lonely hearts clubbing, with people finding friends and mates. This is another example of the drawing power of the technology for communication.

When presenting the possibilities of CMC to new groups and demonstrating a specific system (in my case, APC) for new groups, one request always arises. This is to look through the user database to find out if there is someone on the system who is known to someone in the audience. This usually starts off with real persons, and expands into shared membership in an organization or common interest area, sometimes a specific geographical area. Since CMC use is spreading rapidly, some point of connection is usually found. I once had a young second-generation Estonian refugee in Sweden find that his uncle in Tallinn was using the system, and quickly sent a message to him. (This was when the KGB was still opening papermail.) A group of students and teachers in a Swedish folk high school (community college) found, during one such demonstration, that people they knew and knew of in Brazil were connected to the system. Greetings were sent and everyone was impressed.

De-medialization

Why do people get impressed by this? The postal system, in spite of everything, is still the most universal system for communicating. Everybody has a letterbox and pen and paper is more accessible than a computer, modem and telephone. One answer is, of course, technological novelty. There is still some magic in electronic letters and screens, the blips and burps of the future. But there is something more. There is a stronger presence; the persons I am communicating with are, in some way, present in my act of communicating. This is perhaps due to the speed of communication (and the fact that most people don't really understand how it works). The aspect of *performation* is stronger: by sending an email message I am not just communicating a portion of information; I am also establishing an invisible electronic linkage that can be used later. It becomes a symbolic act. I have become part of an interaction, perhaps a network.

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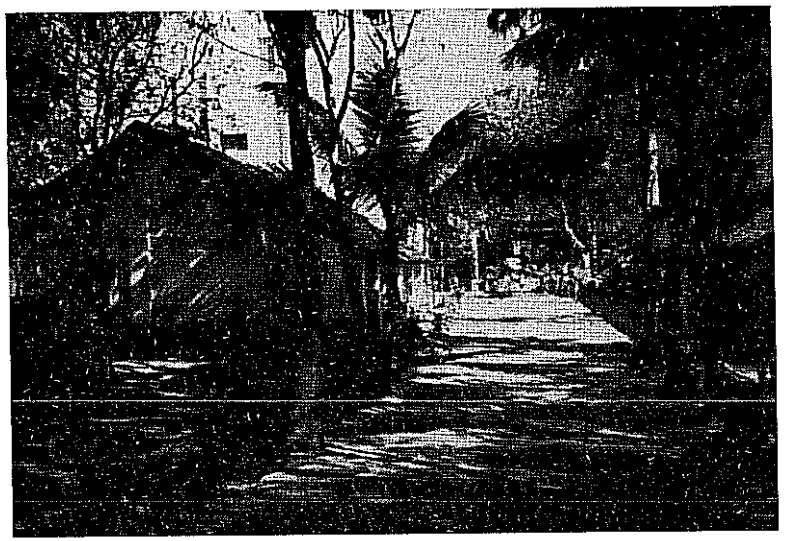
Internetting from Vellakulam...

Vellakulam is a very small village on the Marakkanam Road, about half way between Tindivanam and Marakkanam on the Coromandel Coast of Tamil Nadu in south India. An Indian social action group, the Village Community Development Society (VCDS) has a training centre here. In the field since 1980, the VCDS is working with and for the local community of Dalits (outcastes or untouchables) and women, providing non-formal education for working children, quarry workers, handicapped children, and more recently redeveloping non-chemical farming. The VCDS services about sixty villages. The training programmes are geared toward social change by developing a local, rural grassroots leadership that can guide the process of democratization. An important part of this work is linking up to other SAGs (social action groups) around the district, the State of Tamil Nadu, India and the world. Sending a letter through the postal system costs one rupee for national mail and eleven rupees for an international letter. So electronic communication makes economic sense, especially for international communication.

Sending a fax from the booth in Tindivanam, 14 kilometres away, costs about Rs. 100 per page, Rs. 20 to receive a fax. The daily wage for a female agricultural worker is about Rs. 30, a kilo of rice costs a minimum of Rs. 16. Now that the telephone is connected to the centre office, local and trunk calls can be made, but not international calls. Even using a fax machine at the home of someone in town, an international fax would still cost nearly Rs.100 per page.

With a hundred-dollar used laptop and a twenty-five-dollar modem, I can make a trunk call to Chennai (Madras) to EasyLink BBS, connected to the Internet. <www.xlweb.com> Since the lines are usually clogged, I set my communications program to auto and it keeps on churning until the call is placed, the email sent and picked up. The on-line time for several letters runs to about one to one-and-a-half minutes. The cost for a one minute call is Rs. 6. Now $125 may not seem like much, but it represents two months' wages in Vellakulam, or schooling for four handicapped children for a year. However, since a computer can also be used for word-processing



VCDS Centre in Vellakulam, South India – now part of our 'global village' (*J.Walch*)

and accounting, it replaces typewriters, calculators and ledgers, the marginal cost for CMC is more reasonable, when one counts in the savings on postage and faxes.

What can be done with CMC from this corner of the periphery? Walking through the gate, down the Marakkanam Road to the left, the basis for a report on the embezzlement of European Union funds for the desiltation of the village tank can be found. Or cycling the other way to the stone quarry, we can witness the World Bank funding of child labour – children breaking stones for the new national highway. Or further afield pogroms against Dalits.

The case study presented below is that of how communication activists organized the use of ICT in a war zone, during the war over Bosnia in the 1990s. On 25 May 1995 a marketplace was shelled, scores of men, women and children were killed and hundreds wounded (see Chapter 3 for an eyewitness account). The scene of the crime and close-ups of the victims were displayed on television in living rooms around the globe. What was the reaction to this 'genocide live'? What does 'knowing about genocide' mean? Analysts would, and probably will in future studies, agree that the media were actors in this conflict, and try to find ways of measuring when and how much the medialization of this war influenced the military intervention by the international community.

One fact of this intervention is obvious: that it took too long to materialize. Why? There are surely many reasons and explanations for this. But we need also to look into the contradiction of media such as television, a medium that regulates the viewer to a spectator, not a participant. Fortunately, some people refuse this role and can immediately start a support action when they see someone on the television suffering in some far away place. For most of us, medialization is comforting, a confirmation that we are not there. This is not moralizing: since the medium is one-way, I simply cannot respond. Computer-mediated communication provides us with a different possibility. During an academic demonstration of the use of ICT in the Bosnian war I took up an online conference dealing with refugees in ex-Yugoslavia. The index looks like this:

exyugo.refugee – exyugo.refugees

5/20/95 169*serbian police: another repression
ZENSKI_CENTAR@ZAMIR-BG.co
5/30/95 170*Women in Black Belgrade on refugee *gn:peacenews*
171*SPE/PISMA Mail Update May 30 *pnbalkans*
6/08/95 172*Human Rights Television/Bosnia *dschechter*
6/14/95 173*peace project-volunteers *engel@fnb46.zedat.fu-berl*
174*Counseling for Refugees? *espressoram*
6/16/95 175*Seeking Muhamed Imamovic *grrchicago*
176*SPE Requests Australian help *pnbalkans*
6/23/95 177*weeklu roundup *BETA_BG@ZAMIR-BG.comlink.*
6/29/95 178*SPE/PISMA Update June 28 *pnbalkans*
7/06/95 179*job opportunity in Croatia women's
CENZENA_ZG@ZAMIR-ZG.comli
7/14/95 180*GESELLSCHAFT FUeR BEDROHTE VOeLKER
GFBV-GERMANY@OLN.comlink.
7/20/95 181*1993: Abandonment of Bosnia *rbleier*
7/28/95 182*Predlog Zakona o drzavljanstvu *SRJ
H.ODBOR_BG@ZAMIR-BG.ztn.a*
8/08/95 183*Appeal from Bosnian Foreign Ministe *gn:support*
8/12/95 184*Magazine wants to hear from students *pnbalkans*
8/18/95 185*This is Tuzla *1 M.ADO@ZAMIR-TZ.comlink.ap*
8/31/95 186*–> Sarajevo Winter Appeal *pnbalkans*
9/10/95 187*BETA News Agency – Hels. odbor
BETA_BG@ZAMIR-BG.comlink.

Continuing my improvised demonstration, I took up topic number 185. This is what appeared (spelling corrected):

Conf? 185
M.ADO exyugo.refugees 7:02 PM Aug 18, 1995
(at ZAMIR-TZ.comlink.apc.org) (From News system)

Is there anybody out there can you hear my song.
This is Tuzla, so write before I get killed.

For me, a response was imperative.

Conf? 185.1
Topic 185 This is Tuzla Response 1 of 1
nn:jim exyugo.refugees 10:57 PM Oct 19, 1995

Yes, we hear you loud and strong, even in the cornfields of Indiana, USA.
Good luck...
Jim Walch and friends

At least one college teacher to whom I showed this sequence said she changed her idea about what computers should be used for. Others I have showed this to have concurred. So I started using this example in my teaching and found that generally my listeners are given something real and serious to think about. What can this be? In this type of communication, reality is not filtered. It becomes 'demediated'. I am a participant, not a spectator. Receiving reality in demediated mode can be very frightening. I have to think for myself. This aspect of ICT may prove to be of long-term importance since it may be a way to break the conceptual hegemony that mediated knowledge and information implies. But the lack of autonomous knowledge structures in which to incorporate the mass of new information is problematic. It is a major intellectual challenge to construct such autonomous conceptual structures.

Other effects

Networks seem to have effects on their users beyond their immediate practical uses. Human interaction increases. This can lead to increased productivity through increased and better use of ideas and documentation. Even informal communications tend to increase dramatically. With the spread of the Internet and the World Wide Web, with standardized tools, 'web publishing' can bring about dramatic changes in the patterns of knowledge distribution (see Chapter 4).

There are drawbacks, of course. One is *information overload*. This may lead to *information entropy* – that is, the lack of organization and structure. Adept users of these systems rapidly develop strategies for overcoming these drawbacks, sometimes at the price of isolating themselves from new and unexpected information and contacts.[42]

> That there is an over-abundance of information means that the chain from data to information to knowledge has become chaotic. Innumerable actors ('masks') gather myriads of data, which thus are transformed from a potential to a real existence. Data is organized in endless masses of information at all levels, from the infinitely small to the infinitely large. And they are presented to the public with accompanying demands for understanding and action. Information is systematized in innumerable knowledge systems, which are developed from different perspectives and out of different interests. There arises more knowledge than any actor can relate to. And knowledge does not coalesce as a whole. Chaotic masses of fragments arise when a society mirrors itself in thousands of mirrors at the same time. *Therefore, the tools for simplifying are not rational: rationality comes in the plural and is marked by the confusion it intends to transcend.* [translator's emphasis] All actors are struggling on chaotic markets, where they outbid each other's excesses, out-guess each other's guesses and try to know each other's knowledge. In this movement they are pressed into ever more abstraction. But not to wisdom since wisdom transcends and steers clear of the market.[43]

Ways of overcoming information overload become irrational, based on not so clear patterns or reasons of selection. Here are some ways this author has come across, with himself and with colleagues:

- *d)eletion* based on sender: unknown senders or reception of messages as part of a long anonymous chain letter are unceremoniously zapped ('I didn't ask for this junk mail so I am not going to read it').

- *m)ove* excess communications into files for later examination, far down on the priority list ('I'll do it later').
- *f)orward* to someone else for action ('I'm not responsible for this').
- *c)reate* secret mailboxes and email address ('This is for my real communication for a closed circle').
- *a)utomate* my answers. This is what the White House does on its widely publicized BBS ('Let's pretend we're interested').

To put this another way: in cyberspace, everyone has to become his or her own secretary, sorting and filtering the deluge of information pouring in, wave after electronic wave. These few examples illustrate the point that Ole Thyssen is making: that our sorting principles tend to become somewhat irrational in terms of content (but perhaps rational in the sense of survival). Selection becomes preferential and predetermined: some newspapers are not read and some television channels are not watched on principle because I already 'know' that I do not want to waste my time on 'trash'. Choice then becomes based on value, on a perception of the sender as a guarantee for the quality of the information sent. It can also be based on membership in, or identification with, a certain constituency. I subscribe to a certain information source because I subscribe to the values of those who are behind the information. There is nothing strange, or new, about this. The question, which Thyssen addresses, is whether the electronically 'overcrowded room' enhances both fragmentation of meaning and the proliferation of solidified subcultures. He argues convincingly that it does. In an often-quoted passage by T.S. Eliot, the poet asks what happened to the wisdom lost in knowledge and the knowledge lost in information.

As in the realm of material production under capitalism, the problem of cultural overproduction in cyberspace arises.[44] It is not a wasteland, but a jungle grown so thick that all overview is lost. In this thick undergrowth, the power to inform (and to become informed) implies the ability to cut a path. The trails that are staked out also impose meaning. And 'meaning' is to be understood in the sense that 'the manifest exists in the midst of the possible. (And vice-versa.)' The more possibilities, the richer the meaning. This includes symbolic meanings and possibilities.[45]

One effect of ICT, made very visible with the growth of the WWW, is that peripheral, dispersed groups can form communities of

interest. The meaning of this globalization of subcultures is probably not yet fully understood. Another effect, easily overlooked because of its simplicity, is the inter-organizational transfer of information. ICT makes it easy to study other organizations' materials, to quote, cut and re-use interesting things. This is automated in the practice of linking websites to each other. Again, the full meaning of this has yet to unfold but a safe prediction would be that this very simple type of inter-organizational transfer and moving about will contribute to the awareness of affinity between organizations. This reflection circles back into the discussions of civil society and self-consciousness of operating in this specific sphere, or these spheres, of human activity.

The social impacts of a technology such as computer-mediated communication have been seen in terms of changes in individual behaviour regarding knowledge, attitudes or actions.[46] Another approach to the social impacts of computer-mediated communication focuses on six aspects: information load, group behaviour, decision-making, productivity, media substitution and organizational structure.[47] The remainder of this study will, hopefully, bring out some variations on an aspect of computer-mediated communication that has been missed in previous studies: the ways in which people are brought together for meaningful action in new ways. In other words, how the use of computer-mediated communication creates networks of people. It should be remembered that our basic linguistic conceptualization of 'networks' and 'networking' is not just the linking of machine to machine, or people to machines, but of linking people to people.

This linking deals with inter-organizational relationships. Two aspects here are especially important. The first is *coordination*. CMC makes coordination of effort possible between organizations. This is more than increasing productivity and efficiency within an organization. There is a synergetic effect, the sum of the effort being greater than the separate efforts of the parts. The second is *discovery*. Computer-mediated communication helps individuals and groups with a common interest to find each other. This aspect of de-isolation may prove to be one of the most important long-term effects of computer-mediated communication.

A final effect will be suggested, that of *agenda autonomy*. Users of CMC, be they individuals, groups or organizations, have the freedom

to be heard and to set their own agendas as to what needs to be done. There is no institutional or media filtering. Of the 'thousand flowers' in this wild field many will wither, but many will grow on, nurtured by responses from like-minded people somewhere else, often from unexpected places.

Notes

1. Theodore Roszak, *The Cult of Information*, New York 1986, pp. 136 ff.
2. That this point be emphasized has been suggested by Dr Burkhard Luber, The Threshold Foundation, Germany.
3. Roszak, *The Cult of Information*, p. 138.
4. Ibid.
5. Ibid., p. 141–2.
6. Ibid., pp. 142–3.
7. Bruno Bettelheim, *The Uses of Enchantment. The Meaning and Importance of Fairy Tales*, New York 1977.
8. According to my son, who has written a book on this, the interactive 'live' theater movement in Sweden had by 1997, more active members than the largest political youth organization. See Henrik Soumenin and Tomas Walch, *Saga mot verklighet* (Fairy Tales for Reality), Stockholm 1998.
9. In Steven Levy, *Hackers: Heroes of the Computer Revolution*, New York 1984, p. 431.
10. Lee Felsenstein, 'The Commons of Information', in *Dr Dobb's Journal*, May 1993, pp. 18–24, 20.
11. This was suggested by communications activists at SANGONeT, Johannesburg, at a seminar on a draft of this study in April 1998.
12. APC Charter and Bylaws, posted in <apc.documents>, 5 August 1991 (on APC systems).
13. For an organizational study of the APC, see Susanne Sallin, 'The Association for Communications: A Cooperative Effort to Meet the Information Needs of Non-Governmental Organizations', Progressive Harvard–CIESIN Project of Global Environmental Change Information Policy, 14 February 1994.
14. Ian Peter's 1996 article can be found at <http://www.peg.apc.org/~ianp/welcome.html>.
15. Shelley Preston, 'The 1992 Rio Summit and Beyond', *Swords and Ploughshares*, vol. 3, no. 2, Spring 1994, also online.
16. This section is based on the paper by Barry M. Leiner, Vinton G. Cerf, David D. Clark, Robert E. Kahn, Leonard Kleinrock, Daniel C. Lynch, Jon Postel, Larry G. Roberts and Stephen Wolff, 'A Brief History of the Internet', version 3.1, 20 February 1997, at <http://www.isoc.org/>.

17. *NPR's Morning Edition*, 6 November 1998.
18. David Ronfeldt, 'CYBEROCRACY IS COMING', 1992, at <http://www. cyberocracy.org/cyberocracy.html>
19. Lars Ilshammar and Ola Larsmo, *net.wars*, Smedjebacken 1997, p. 24.
20. *BoardWatch Magazine* is active here.
21. See Leo Fernandez and Somen Chakraborty, 'Social Impact of Information–Communication Technologies', *Social Action*, vol. 48, no. 3, July–September 1998, pp. 253–67.
22. This was pointed out to me by communications activists working at SANGONeT, Johannesburg, during a seminar on a draft of this book in April 1998. SANGONeT is the Southern Africa NGO NETwork, found at <http://www.sn.apc.org>
23. See William Lee Valentine, 'Spreading the Linux Gospel', *PC Magazine*, 8 October 1996.
24. At <http://www.ssc.com/glue/>
25. See Bill Machrone, 'Free-software phenomenon revisited', *PC Week*, 11 November 1996, and 'Linux: Microsoft's real competition?', *PC Week*, 7 October 1996.
26. Glyn Moody, 'The Greatest OS That (N)ever Was', *Wired*, vol. 5, no. 8, August 1997. This article gives a good, non-technical reflection on Linux.
27. Guest editorial by Russell Nelson, 'Open Source Software Model', *Linux Journal*, August 1998, p. 10.
28. John S. Quarterman, *The Matrix: Computer Networks and Conferencing Systems Worldwide*, Bedford MA 1990, p. 21.
29. Ibid., p. 22.
30. Amitai Etzioni, *The Spirit of Community*, New York 1993.
31. Rheingold is not a social historian, nor does he present a political sociology or epistemology. This lapse leads him to believe that the first PC was a Xerox in-house workstation. The whole point of the computer revolution was capturing and spreading the technology from the corporations and the Net from the military.
32. Found at <http://www.rmsd.com/comnet/wwwvl_commnet.html>.
33. Found at <http://php.ucs.indiana.edu/~kgregson/main_menu.html>.
34. Anne Beamish, 'Communities On-Line: Community Based Computer Networks', MIT, February 1995, at <http://alberti.mit.edu/arch/4.207/anneb/thesis/toc.html>.
35. Cyberpunk is defined in the article 'Does the cyberpunk movement represent a political resistance?' at <http://www.clas.ufl.edu/users/seeker1/activism/cybpol.html>. One definition of cyberpunk is roughly what I term 'communication activism'. At <http://www.clas.ufl.edu/users/seeker1/activism/activism.html>
36. 'CYHIST Community Memory: Discussion list on the History of Cyberspace' <CYHIST@SJUVM.STJOHNS.EDU> From: Audrie Krause <akrause@igc.apc.org> 25 August 1996 23:40:03–0700.

37. Mark S. Bonchek, 'Grassroots in Cyberspace: Using Computer Networks to Facilitate Political Participation', The Political Participation Project, MIT Artificial Intelligence Laboratory, Presented at the 53rd Annual Meeting of the Midwest Political Science Association, Chicago IL, on 6 April 1995 (also online).
38. An example near to (my) home is a 'democracy@internet' survey conducted at the Swedish Royal Institute of Technology, dealing with how ICT can support democracy. <http://media.it.kth.se/democracy>
39. See Quarterman, *The Matrix*, p. 128.
40. Ole Thyssen, *Nutiden: Det overyldte rum*, Haslev 1993.
41. See, for example, Mike Sharples and Thea van der Geest (eds), *The New Writing Environment: Writers at Work in a World of Technology*, London 1996.
42. Starr Roxanne Hiltz, and Murray Turoff, 'Structuring Computer-Mediated Communication Systems to Avoid Information Overload', *Communications of the ACM*, vol. 28, no. 7, July 1985, pp. 680–89; Shoshana Zuboff, *In the Age of the Smart Machine: The Future of Work and Power*, New York 1988. See Quarterman, *The Matrix*, pp. 28–9, 43–4, for additional sources.
43. Thyssen, *Nutiden*, p. 121.
44. Ibid., p. 128.
45. Ibid., p. 132.
46. Everett Rogers et al., *Communication Technology: The New Media in Society*, New York 1987, pp. 150–51.
47. Charles W. Stenfield, 'Computer-mediated Communications Systems', *Annual Review of Information Science and Technology*, no. 21, 1986, p. 168.