Social Transformation in an Information Society: Rethinking Access to You and the World

Social Transformation in an Information Society: Rethinking Access to You and the World

by William H. Dutton, Director, Oxford Internet Institute

Published in 2004 by the United Nations Educational, Scientific and Cultural Organization 7, place de Fontenoy F-75352 Paris 07 SP

Preface

UNESCO has fully supported the World Summit on the Information Society (WSIS) preparatory process from its beginning, and has succeeded in defining and promoting its positions while setting the ground for its contribution to the Declaration of Principles and the Plan of Action that the Summit is expected to adopt. UNESCO's proposed elements for inclusion in the Declaration of Principles and the Plan of Action are based on its mandate, which leads it to promote the concept of *knowledge societies*, rather than that of global *information society* since enhancing information flows alone is not sufficient to grasp the opportunities for development that is offered by knowledge. Therefore, a more complex, holistic and comprehensive vision and a clearly developmental perspective are needed. The proposals are responses to the main challenges posed by the construction of knowledge societies: first, to narrow the digital divide that accentuates disparities in development, excluding entire groups and countries from the benefits of information and knowledge; second, to guarantee the free flow of, and equitable access to, data, information, best practices and knowledge in the information society; and third, to build international consensus on newly required norms and principles. Knowledge societies should be firmly based on a commitment to human rights and fundamental freedoms, including freedom of expression. They should also ensure the full realization of the right to education and of all cultural rights. In knowledge societies, access to the public domain of information and knowledge for educational and cultural purposes should be as broad as possible providing high quality, diversified and reliable information. Particular emphasis should be given to diversity of cultures and languages.

In knowledge societies, the production and dissemination of educational, scientific and cultural materials, the preservation of the digital heritage, the quality of teaching and learning should be regarded as crucial elements.

Networks of specialists and of virtual interest groups should be developed, as they are key to efficient and effective exchanges and cooperation in knowledge societies. ICTs should be seen both as educational discipline and as pedagogical tools in developing effective educational services.

Lastly, these technologies are not merely tools, they inform and shape our modes of communication, and also the processes of our thinking and our creativity. How should we act so that this revolution of minds and instruments is not merely the privilege of a small number of economically highly developed countries? How can we ensure access for all to these information and intellectual resources, and overcome the social, cultural and linguistic obstacles? How should we promote the publication on line of increasingly more diversified contents, potentially a source of enrichment for the whole of humanity? What teaching opportunities are offered by these new means of communication?

These are crucial questions to which answers must be found if knowledge societies are to become a reality, and offer a world-wide space for interaction and exchange. They are also questions which the actors of the development of these technologies – States, private enterprise and civil society – must answer together.

On the occasion of the World Summit on the Information Society, UNESCO intends to make available to all participants a series of documents summarizing some of the most worrying questions which have just been mentioned. These will help participants to take the measure of the upheavals brought about by the emergence of the new information and communication technologies (NICTs), and will deal with the potential for development, the difficulties encountered, possible solutions, and the various projects implemented by UNESCO and its many partners.

Abdul Waheed KHAN
UNESCO's Assistant Director-General
for Communication and Information

Acknowledgements

I have developed the ideas in this publication with the assistance of many colleagues at the Oxford Internet Institute (OII), where I am Director and a professor, and during previous periods as Director of the UK Economic and Social Research Council's Programme on Information and Communication Technologies (PICT) and as a professor at the Annenberg School for Communication, University of Southern California. I thank them all for the insights and research evidence that have helped to enrich my own work.

I am particularly grateful for Malcolm Peltu's assistance as an editor and colleague in helping me to clarify and communicate these ideas to a wider audience. Kunika Kono helped design and render several figures and illustrations. I also owe my thanks to staff of the Division of Information Society and Social and Human Sciences Sector of UNESCO in Paris for reading and offering valuable comments on earlier versions of this manuscript.

William H. Dutton

Table of contents

1. Introduction: opening and closing access pathways to your future

*'While technology shapes the future, it is people who shape technology, and decide to what uses it can and should be put, '*Kofi Annan, United Nations Secretary-General

The Internet, World Wide Web, mobile cellphones, digital television, and numerous other new electronic information and communication technologies (ICTs) are opening fresh pathways for transforming the way we live, work, learn, and communicate. A strategic opening, redirecting, or closing of opportunities is central to the bringing of diverse and substantial social and economic benefits to people across the globe. At the same time, decisions that affect the design, accessibility, and use (or non-use) of these technologies could open or close the wrong gates and shut out individuals, communities, countries, and regions from the fruits that can be reached by those who can better control access to themselves, and from themselves to the world. The degree to which the use of ICTs brings positive or negative transformations to your life or makes no difference at all depends not only on the choices made by many individuals, communities, organizations, and governments around the world, but also by you.

1.1 How ICTs can change your home life and the boundaries of your neighbourhood

If you have a personal computer (PC) in your household, and choose to connect to the Internet, you are making a strategic personal decision to open a door to your home and redraw the boundaries of your 'local' neighbourhood. From a chair in your home you will be able to access a rich array of texts, data, pictures, video images, online 'virtual' shops and banks, and many other sources of information and services on the millions of interconnected computer sites that form the World Wide Web on the Internet. You will also be able to enter 'chat rooms' and discussion groups on the Internet where you can meet and engage with people around the world you would never have met otherwise, some of whom may become long-term friends. You will also be able to use electronic-mail (e-mail) and instant messaging to keep in regular touch via the Internet with family, friends, and

business colleagues near and far, in ways that greatly extend and enhance the communication possible from a telephone.

However, being connected to the Internet can also open doors to uninvited guests who could harm you or your family. You could receive unrequested and unwanted 'spam' e-mails that might offend you by including sexually-explicit material or might enter your home PC with an attachment containing a virus that could disable your computer. The Internet's ability to allow you to become involved in rewarding online contact with people you have never met or seen physically could also be used by paedophiles who assume fictitious virtual personalities to make contact with children in your household. And the ease with which you can use the Internet to arrange meetings with friends in your neighbourhood could also be used by terrorists located around the world to orchestrate an attack.

When you have an illness or medical condition, your access to the Internet could become a gateway to contacting fellow sufferers around the world to exchange helpful advice and information that empowers you to seek medical assistance and engage in a more informed dialogue with your family, friends, doctors, and nurses. But the information you obtain, and the medicines you can order via the Internet, may be irrelevant or even dangerous to your health, making it more difficult for healthcare professionals to assist you.

From your PC and other new ICT-enabled devices and media you can also gain access to many new entertainment sources, such as multi-channel interactive digital television or devices that can store over half-a-million songs. You could share music and video computer files directly with other Internet-enabled PC users through networks known as 'peer-to-peer' because they don't rely on retrieving files from centralized computers. Such music-exchange systems have posed serious challenges to the commercial music business. On its Website, one company summarizes a widespread belief that this represents 'a revolution in how you can discover, buy and share songs, movies, games, software, documents and images'. However, its claim that this 'could make life better for everyone' was hotly contested by the music and movie industries when the first shots were fired in the revolution at the turn of the century with the offer of free music downloads. This initial free operation was closed down by protests from powerful copyright holders, but the implications of this revolution continue to be worked through in the

negotiations and struggles between copyright holders and consumers (see Section 4.3.1 below).

You could also take your ICT-enabled 'virtual home' with you wherever you go through the use of digital wireless and mobile technologies and devices. These include the portable 'laptop' PC, cellphone, or a multifunctional handheld 'palmtop' computer-based device, such as a personal digital assistant (PDA) or 'third-generation' (3G) cellphone that could integrate all or some of the capabilities of an Internet-accessible multimedia computer, telephone, diary, address book, notepad (perhaps with handwritten input using an electronic pen), calculator, digital camera, and game station. These can be of great benefit in keeping you in touch with your social and work life, anywhere and at all times. Such digital mobility can also help to protect your safety and that of your family, for example by enabling cellphone calls at times of distress or the tracking of devices that have been stolen or used in crimes. But they can also add to your stress if you never have time to yourself or to relax away from work. And many of the devices could enable your location and your ICT-based actions to be recorded, which could be used against you as a mechanism of unwarranted surveillance.

1.2 Electronic gateways to the wider world

The social transformations that could result from the growing use of ICTs also depend crucially on decisions made by organizations and individuals outside your household, many of whom have great economic leverage, political power or technical expertise.

1.2.1 For liberty and oppression

Imagine that you lived in a country with an authoritarian government. The government would be likely to promote ICT development to support economic development, even if it threatened to erode government control over access to information. It would even permit individuals access to the Internet from 'cybercafes' and other locations. This would allow you to express your opinions not only to fellow citizens locally, but to the whole online world. However, the techniques designed to enable the Internet to be a free-flowing and open exchange of information also make possible the tracking of sources

and destinations of messages and information. This gives governments and others with appropriate knowhow and technical capacities the opportunity to trace Internet traffic and the location of Websites. Authorities can also close cybercafes, install automatic Internet filters to check lists of prohibited key words and terms, or implement blocks that limit or ban the use of particular search engines and politically- or culturally-sensitive Websites (Zittrain and Edelman 2004).

Despite these kinds of potential outcomes, many governments and citizens in the 'post-September 11 world' argue that a degree of monitoring and control of Internet communication is vital to protect people from terrorism, fraud, and other 'cybercrimes'. This extends to the use of ICTs in the 'offline' physical world outside the Internet. For example, by early 2004 the UK was the 'most watched nation in the world', with over four million closed circuit television (CCTV) cameras, representing one for about every fourteen people in the country; in London, a person could be captured on such a camera about three hundred times in a day (Frith 2004). Although many claim this is an unacceptable breach of civil liberties, CCTVs are often introduced into public places in response to demands from local people to help curb crime in a neighbourhood or to identify offenders. Dramatic and well publicized successes have fuelled a 'surveillance spiral', in which surveillance leads to anxieties which lead to more surveillance.

Political movements or candidates for democratic office may be able to use the Internet to gain access to you to seek your vote and financial support by providing you with more information, about more issues and candidate opinions, than is covered in the mass media. Yet the same tools of political organisation and reach can be employed by organizations that promote hatred and violence against groups and individuals in order to raise funds, recruit members, and identify targeted victims.

'E-voting' using direct recording electronic (DRE) voting machines or via the Internet could make election processes more efficient and eliminate the kind of margins for human error that played a decisive role in the 2000 US Presidential election, when the final result had to wait for a US Supreme Court judgement on the counting of votes cast in Florida. This experience led to the passing of the Help America Vote Act of 2002, backed by $4 billion funding to support the introduction of DRE machines. In addition to improved

efficiency and accuracy in vote counting, supporters of these devices also point to benefits such as special capabilities for disabled voters; information displays in multiple languages; and warnings if a vote has not been registered correctly. They have been used by many millions of people in many countries.

However, some computer experts and others believe the potential benefits of DRE machines should not obscure potential significant dangers in their use, such as concerns that they are 'black boxes' that cannot be opened to provide a clear audit trail where discrepancies can be checked; problems with carrying out recounts; and an inability to provide strict safeguards against fraud (Ananthaswamy 2004; Kohno et al. 2004). Tests on DRE machines conducted for Maryland state authorities in the USA found it was possible to break the system's security, for example to cast multiple votes. These fears are crystallized in a comment by the commissioner of New York City's Board of Elections: 'To me it is a fundamental part of democracy that the votes be counted in a completely honest and transparent process. With e-voting, we turn over the vote counting process to computer programmers, who in effect count the votes in secret. We have lost a fundamental part of our democracy' (Ananthaswamy 2004: 7). The lack of adequate network security and ability to verify a user's real identity have been major barriers to widespread use of Internet-based e-voting.

1.2.2 In war and peace

Many of the most critical challenges arising from the use of the Internet and other ICTs result from new and proliferating engagements through online interactions and other electronic interfaces between cultures, political systems, religions, economies, and lifestyles that were previously less directly and intimately connected. This global scope has the potential to create a more peaceful and prosperous world in which individuals, teams, communities, governments, and other organizations share information and ideas to create and build knowledge, relationships, services, and other outcomes of mutual benefit.

On the other hand, a more troubled global outlook is envisioned by Samuel P. Huntington's thesis of a 'clash of civilizations', in which 'the fault lines between civilizations will be the battle lines of the future where 'the great divisions among humankind and the dominating source of conflict will be

cultural' (Huntington 1993; 1996). Social transformations tied to decisions about the use of ICTs reach deep into, and entwine with, the everyday lives of people living in societies embedded within civilizations that are often based on very different social, political, religious, and other cultural perceptions and behaviour. This interconnection of civilizations could become both a potential source of conflict and a medium through which battles are fought, including attempts to occupy and control the 'cyberspace' of ICT networks as well as physical land.

For instance, the former Yugoslav government's military intelligence launched a 'cyberwarfare' campaign against the NATO Alliance's operations in Kosovo in 1999 (Beaver 2003). This involved first disrupting the operation of a NATO Headquarters computer system by bombarding it with two million e-mails. NATO's Website was then replaced with another site containing misleading information but with a Web address so close to that of the real site that it was picked up by many Web search systems as if it were the official site. NATO experts overcame these problems in a few days, but much valuable information and time had been lost.

Another sign of a new era of cyberwarfare has been the television pictures of the use of 'smart' computer-controlled missiles that have become a distinctive feature of many conflicts since the early 1990s. The missiles carry powerful, compact on-board ICT capabilities that enable precise targeting and manoeuvring of the weapon. Pilotless bombers, automated robot landmine detectors, and many other smart weapons are continuously joining the cyberwarfare armoury.

1.2.3 In crime and punishment

A similar technique to that used in creating a false website has been employed in financial frauds. For example, spam has been sent to customers of a real bank asking them to go to a false Website with a similar address and look to that of their bank. At the false site, the customer is asked for confidential account and password details, which are then used by the cybercriminal to take money from a real account. The most common form of cybercrime is invasion by viruses, which is equivalent to burglary of your home that causes damage even if sometimes nothing is stolen. 'Hackers' with much computing expertise also often try to break into supposedly secure

computers, sometimes just for the fun or the intellectual challenge of doing so, but often in order to commit fraud or to inflict other damage to the hacked-into system.

Police forces throughout the world are being trained to become more effective cybercrime fighters. As cybercriminals operate across the globe, this includes greater multinational cooperation, such as through the establishment in February 2004 of the European Union's European Network and Information Security Agency (ENISA). In addition, crime prevention is increasingly using ICTs such as CCTVs and computerized biometric techniques based on the science of measuring physical human properties like fingerprints, facial features, and eye characteristics such as iris scanning; CCTV and biometric technologies can be fused to provide automatic identification. Meanwhile, cybercriminals seek to use ICTs to outpace cyberpolice, as indicated by a case in the UK where a criminal gang stole millions of pounds by setting up their own CCTV and credit-card copying equipment near automatic cash machines (Chittenden 2004). This again highlights how the continuing struggle to find a balance between security and civil liberties depends to a considerable extent on choices made about ICTs.

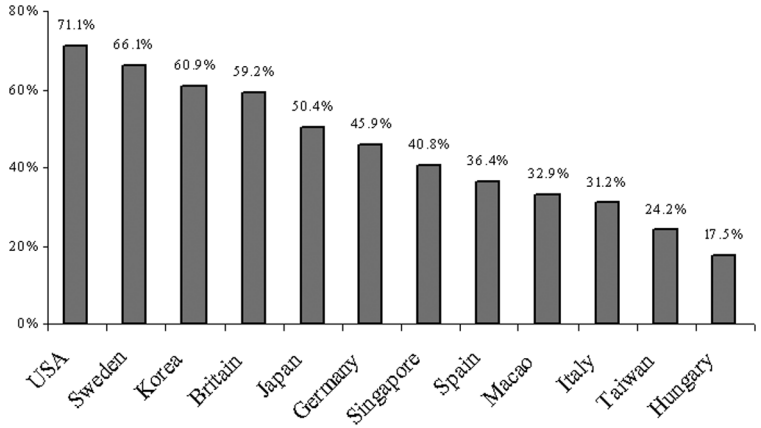
1.3 Understanding the access revolution and its digital divides

All the examples given above have a common theme at their heart: how people design and use ICTs to change the way they gain access – electronic and physical – to each other and to a huge variety of information, services, and technologies offered by business, government, and local communities. This process of 'reconfiguring access' creates more than just new connections. It also enables the opening and closing of new forms of personal, social, and economic capacities, relationships, and power-plays. Without physical access to ICTs there is obviously no choice about how or whether to use a capability. But having this kind of access does not in itself indicate how it will be used or what kinds of outcomes will emerge. To understand how those outcomes are shaped, insight is needed into the complex environments of the arenas within which access is negotiated between many different stakeholders and players.

One of the most notable areas in which the traditional notion of physical access to ICTs has been prominent is in concerns about the 'digital divides'

between developed and developing countries. As United Nations Secretary General Kofi Annan (2003) has explained: 'The "digital divide" is real. It is actually several gaps in one: a technological divide in infrastructure, with 70 percent of the world's Internet users living in the 24 richest countries, which contain just 16 percent of the world's people; a content divide, with nearly 70 percent of the world's Websites in English and a frequent lack of locally meaningful material; and a gender divide, with women and girls in many countries, rich and poor alike, enjoying less access to information technology than men and boys.' There are also divides between developed countries. In the case of Internet use, nations vary widely in the proportion of the public with access to the Internet (Figure 1.1). And within countries, Internet access tends to remain demarcated on the basis of wealth (Figure 1.2), age, skills, literacy, cultural background, class, disability, and many other factors.

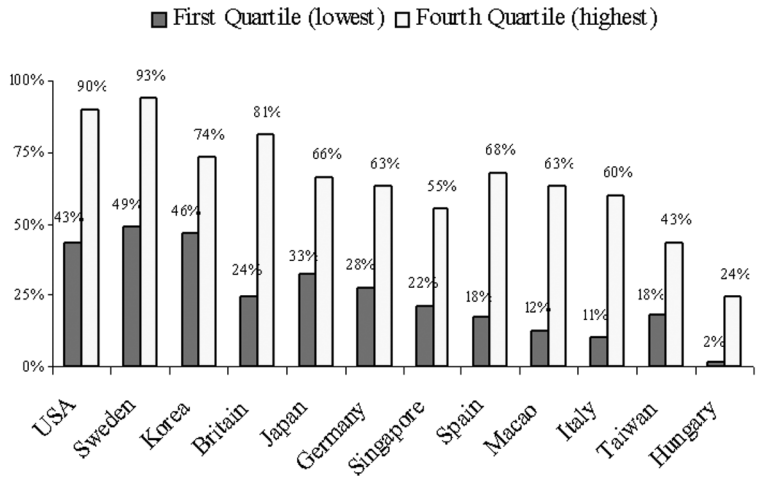
Figure 1.1. Percentage of the population with access to the Internet, circa 2003



Source: World Internet Project, see http://www.worldinternetproject.net/

There is much debate about the precise nature of the digital divide. For example, the *World Telecommunication Development Report* from the International Telecommunication Union (ITU) explained that there is a 'statistical divide' between developed and developing countries in terms of data about ICT access, even at basic physical levels. According to this report (ITU 2003),

Figure 1.2. Percent of public using the Internet: lowest and highest economic quartiles, circa 2003



Source: World Internet Project, see http://www.worldinternetproject.net/

by 2003 about 60 percent of surveys of Internet users had been carried out in the world's wealthiest economies, with no surveys in the 59 poorest countries. Figures from surveys on Internet access in some developing countries have produced results that are very different to earlier estimates, as in Jamaica where an estimate of 5 percent Internet access was raised to 23 percent after a detailed survey.

Despite the uncertainty about the statistical details, there can be no doubt about the existence of substantial divides between the developed and developing worlds (UNESCO 2003). For instance, UNESCO Director-General Koïchiro Matsuura (2003*a*) has pointed out that in 2003 more than 80 percent of people in the world had never even heard a dial tone, let alone surfed the Web. But although such data on physical access are relevant pieces of a wider social picture, a more important overall issue is to gain an understanding of the social and economic dimensions of different kinds of divide.

1.4 Beyond the information society: reconfiguring access for social transformations

This publication argues for a fresh approach that moves beyond the limitations of the 'information society' concept that has been the most common way of signifying the broad, interconnected range of social and economic changes tied to ICTs. Rethinking access in the way proposed here opens a broader understanding of the term 'access' in relation to ICTs than the traditional definition that referred primarily to physical access to ICT infrastructures, systems, and devices. It also widens the object of that access from information, as implied by the term 'information society', to include people, services, and technologies. Key concepts in this new reconfiguring access approach have been illustrated in this introductory section through a number of brief examples.

Section 2 places these ideas into a broad historical context by outlining the nature and limitations of current understandings of the information society, as a background against which to highlight the value of the greater flexibility and broader scope of the new framework. It discusses how these new insights uncover and simplify the complex social, cultural, psychological, and economic processes underlying the social transformations in the real-world contexts in which people live, work, and make decisions about the design and use of ICTs.

Section 3 summarizes the main competing perspectives that have contributed to current understandings of the societal implications of ICTs. The main ways in which the design, production, dissemination, use, and consumption of ICTs can open and close personal, social, and organizational opportunities is explored in Section 4. The next section identifies the main social factors that facilitate or restrict your ability to take an active role in inventing your own future through the choices you make about ICTs. Section 6 describes examples in a number of different arenas of activity to show how ICTs could help to create different kinds of local, regional, national, and global futures. Key policy implications are discussed in the final Section 7.

2. The information society and social transformation

2.1 Defining the post-industrial view of the information society

In the 1970s, the American sociologist Daniel Bell (1999 [1973]) articulated a compelling vision of the 'information society'. He argued that information was the defining resource of a new 'post-industrial' phase of economic development, just as raw materials were the core resource of the agricultural society and energy of the industrial society. The central technologies, techniques, and knowhow for this new era would be those involved in the storing, processing, managing, distribution, communication, and interlinking of information.

At first, these technologies were referred to as information technology (IT), but this was broadened to ICT to recognize the growing convergence of computing, telecommunications, and other related techniques and methods that use electronic digital media. ICTs range from the large centralized databanks and administrative systems of the 1960s to the microchip that unleashed miniaturized power in the form of today's desktop and portable PCs, mobile cellphones, powerful scientific supercomputers, video games, and many other forms of electronic hardware and software all increasingly linked through the Internet, World Wide Web, and other electronic networks.

2.2 Insights gained from the information society vision

2.2.1 The economic significance of information work

Since Bell's formulation of the term in the 1970s, the 'information society' concept has been used in such diverse ways that it can no longer be understood as anything more specific than a generalized notion of the growing centrality of ICTs to social and economic development. From this broad perspective, the information society remains a valuable focal point for identifying trends in post-industrial society. The most significant of these is a shift in the majority of the labour force from agriculture (the primary sector) and manufacturing (the secondary sector) to services (the tertiary sector).

Growth in information work has contributed to the expansion of the service sector. This was first seen in advanced industrial economies, but is increas-

ingly also emerging in developing countries in south and east Asia through the growing use of electronic networks to provide ICT support, financial services, and call-centre operations that can be accessed from around the world.

The information sector forms a new layer of economic and social development, without replacing other sectors. Information work is also important to every sector of the economy. Therefore, the occupational shifts associated with the information society do not necessarily imply a decline in the relevance of agriculture or manufacturing to local or global economies. Instead, it indicates a diminishing need for labour within the primary and secondary sectors as ICTs are used to redesign the business and organizational processes through which work is accomplished.

According to Bell (1999 [1973]), forecasting, planning, and managing complex organizations and systems would be central problems in the information society because of the complexity and scale of the emerging new social and economic systems. He predicted this would lead to a growing management need for systematic foresight approaches that replace the previous reliance on common sense or reasoning based on surveys and experiments. Such recognition of the importance of knowledge and its codification includes an increased demand for high-status 'knowledge workers': specialists who understand how to design, implement, and work with data, knowledge, information systems, simulation, and other ICT-based techniques.

2.2.2 Policy influences

Politicians, business managers, administrators, researchers, and others have appropriated the information society idea to shape policy and practice. For instance, it has influenced many governments in all areas of the world to try to anticipate and nurture the information sector and ICT infrastructures in local, national, and regional economies. Many national and regional initiatives in the 1990s sought to build electronic 'information superhighways'.

There are also many global and local efforts aimed at coordinating effective policies to address the 'digital divides' that have come between those with and without access to ICT infrastructures and the knowledge to make effective use of that access. These include ICT development programmes sponsored by

UNESCO, the ITU, World Bank, and other non-governmental organizations (NGOs). For example, the UNESCO/ITU sponsored World Summit on the Information Society (WSIS) between 2003 and 2005 has a Plan of Action (WSIS 2003*a*) that aims to assist the building of educational and learning infrastructures to help ensure that everyone can gain the necessary skills to benefit fully from the information society (Guttman 2003). Many projects aimed at sustaining specialist knowledge workers include 'e-science' programmes that establish advanced high-performance computing and network capabilities for use in research and university education (David and Spence 2003).

2.3 Limitations of the information society perspective

2.3.1 Expectations for predictable progress

This discussion of the basic ideas that have propelled the information society concept into public consciousness highlights not only the increasing significance of ICTs as a new strategic resource, but also the substantial value gained from understanding the social, political, cultural, institutional, and economic factors that shape outcomes from the design and use of the technology. However, popular conceptions of an information society fail to provide adequate insights into the technology's role in social transformation. A key reason for this is indicated by Castles' (2000: 2) critique of traditional views of development and globalization: 'The very notion of *development* often implies a technological belief in progression towards a pre-fixed goal: the type of economy and society to be found in the "highly developed" western countries. Social transformation, by contrast, does not imply any predetermined outcome, nor that the process is essentially a positive one.'

From the information society perspective, technology is usually seen as the engine driving such a 'development' progression through a series of inevitable economic stages: agricultural, industrial, information, and whatever comes next, such as the 'knowledge society'. However, there is no consensus about the identification and validation of such stages. A lag of about one to two decades exists between the invention of a radically new technology and its impact on the way things are done, as it takes time for people to change habits and beliefs before accepting a new way of thinking and behaving. And such

lags do not always eventually yield to 'progress' or a new stage of development.

2.3.2 Misunderstanding the role of the information sector

The information society's predictions about changes in work, technology, and power have also been widely challenged (e.g. Freeman 1996*a*, *b*; Castells and Himanen 2002). For instance, the shift in attention towards the information-based service sector and away from other parts of the economy does not address the degree to which employment in services is itself subject to displacement by manufactured consumer goods, such as the washing machine or PC. Advances in ICTs can also be used to reduce employment among information workers, as in the replacement of support and administrative staff by automated electronic banking, shopping, welfare payment, and other transactions.

At the same time as affecting every other sector of the economy, ICT innovations have of course stimulated new information industries, such as the providers of software, Internet-based services, customer service centres supported by ICTs ('call centres'), and mobile cellphone networks. Information-based services work has also become key to many old and new jobs, for instance in the working practices of teachers, researchers, consultants, journalists, doctors, and other professionals. The occupational shifts associated with the information society therefore do not necessarily imply a decline in the relevance to local or global economies of primary or secondary sectors. However, there is likely to be a diminishing need for labour within these areas, as organizations apply techniques that employ the capabilities of ICTs and associated management knowhow to redesign how work is accomplished.

Questions have also been raised about the belief that power in an information society will shift towards a growing cadre of knowledge workers. For example, research has found ICTs are generally adopted and used in ways that often reinforce existing structures of power and influence, rather than advantaging technocrats or systematically centralizing or democratizing power (e.g. Danziger et al. 1982; Dutton 1999).

2.3.3 A too-narrow focus on information

Most significantly perhaps, important problems are raised by the identification of information as the pivotal new central resource of the information economy. If information is defined to be only about 'facts', it becomes far too limiting as a depiction of the social role of ICTs. But if it is defined very broadly to encompass 'knowledge' or 'anything that reduces uncertainty', then information seems to be so all-encompassing that it becomes virtually meaningless. Moreover, information can create, rather than reduce uncertainty. As the poet T. S. Eliot noted, we can become 'lost in information'. This is indicated by concerns over increasing problems with information overload and difficulties in identifying reliable information. Russell Ackoff (1969) identified a number of incorrect assumptions which led to the development of management 'mis'information systems in the 1960s, all of which have direct parallels in the assumptions still guiding discussions about the Internet and related ICTs in the twenty-first century (Table 2.1).

A narrow targeting towards information underplays the essential role of telecommunications in an integrated and increasingly convergent set of information *and* communication technologies, as indicated in concepts such as the 'e-society' or 'network society'. It also fails to emphasize the riches that lie in the human and social capital that arises from knowledge and learning. UNESCO Director-General Koïchiro Matsuura (2003*b:2*) has argued that the significance of knowledge in social transformation means that a 'broader and more empowering vision' than the information society is needed; a vision that goes beyond issues of connectivity and technological development to encompass 'the potential for ICT to enhance human development'.

Information and the technologies that deal with it are also not new, as is implied by the information society vision. Throughout history, information technologies have been important in every sector and in many social transformations, from the emergence of handwriting and invention of the printing press to the electronic telegraph and digital ICTs. Likewise, all information technologies can be used to reconfigure access to information. The enduring centrality of access is the key to its value as a central theme in the social role of ICTs. What is new about advances in ICTs such as the Internet is how they create the potential for you – as a user and a producer – to have more control over shaping your access to information, people,

Table 2.1. Ackoff's 'misinformation' systems adapted to contemporary ICTs

Assumption about information	*Practical reality*
Users should get more information.	Most users suffer from an overabundance of information.
Users need the information they want.	Most users fail to consider, filter, and prioritize what they already have.
If users get the information they want, they will make better decisions.	Many people do not know how to understand or correctly apply complex or specialized information.
More communication will result in improved performance.	More communication can create conflicts, waste time, and displace more important work.
Users do not need to know how an information system works, only how to use it.	Lack of knowledge about an information system limits the ability of users to invent new applications, evaluate the information they are provided, and solve problems encountered in its use.

Source: Based on Ackoff (1969)

services and technologies around the world, although your choices about access can also cut you off from these same resources. This mediation through ICTs can be used in ways that make some social relations easier and others more challenging, some more flexible and others more fixed.

2.4 Social transformation with ICTs

The above analysis indicates that moving beyond the limitations of the information society framework requires a focus that encompasses more than just information and a view of social transformation that takes account of the unpredictable complexity and fluidity of human creativity and social interactions. A starting point towards such a new understanding is to recognize that ICTs, like all technologies, are inherently social because they are inextricably bound up with the vast number of choices and interactions enacted through an

interwoven web of co-evolving people, institutions, cultures, and technology. Technologies are also social in that they define, but do not determine, how people do things. This makes some paths more economically, culturally, or socially rational than others.

2.4.1 New forms of access to people, services, information, and technology

Rapid innovation in ICTs has offered ever faster and more versatile access to ever more information. Although this is of much practical value, the transformative social power of the technology is unleashed primarily through its opening and closing of opportunities for you to have control over shaping and reshaping your electronic and physical access and the terms of access to the knowledge and other resources you need to enable you to earn a living, learn, engage in political debate and action, meet people, choose your sources of news, information, and entertainment, and many other activities essential to determining your quality of life.

As has already been explained, ICTs reconfigure access to four key resources: people, services, information, and technology (Table 2.2). Knowledge and other ingredients essential to the building of human and social capital are intrinsic to each of these. Social transformations arise when you and others reconfigure the electronic and physical processes through which you access these vital social and economic resources.

There are many ways, by accident or design**,** in which ICTs can reduce, screen, and change the content and flow of information. Consider what routinely happens when a person looks for information about a topic on the Web. Abstracts are more likely to be found than full articles, and recent material rather than historical sources. Results of searches for a topic will be presented in a priority order, but the work of leading world authorities might be found side-by-side with the unsubstantiated views of ill-informed sources. As the number of sources found (‘hits’) could run into many hundreds or thousands, Web ‘browser’ search tools, such as Google, will filter and prioritize the selection. Hits ranked lower than the first screenful are likely to remain hidden and unexplored. However, Web specialists who understand the techniques that determine a browser’s selection could influence the prioritization ranking to lead users towards their own favoured Websites.

Table 2.2. How choices about the use and non-use of ICTs reconfigure access

ICTs provide access to	*Kind of ICT activities*	*Examples*
People Reconfigures how you interact with people; with whom you communicate; who you know, and where and when you interact with them.	Intercreativity between individuals and within groups; other one-to-one, one-to-many, many-to-one, many-to-many communication.	E-mailing, special-interest forums, and other interpersonal Internet-based interactions; talking or sending text messages by cellphones; collaborating in virtual' networked teams; learning through online lectures; playing online multi-player games.
Services Influences what you can do online, when you can do it, and how much it costs to do it; where and when you buy other products and services; who pays what to whom; and how it is paid.	Conducting electronic transactions and obtaining electronic services from distant or nearby sources.	Electronic and Web-based delivery of welfare payments, tax returns, and other public services; online shopping, banking, and other e-business interactions; online downloading of music, video, and graphical art; doctors viewing X-rays from remote locations.
Information Affects how and what you read, hear, see, and know.	Retrieving, analysing, and transmitting facts, images, video, sounds, statistics, etc.	Searching the Web; viewing online newspapers and radio and TV programmes; accessing a database; exchanging large amounts of multimedia or statistical data.
Technologies Shapes how and when you access the Internet and other ICTs.	Producing and using ICT knowhow, equipment, and techniques to shape access to, and use and consumption of, the Internet and other ICTs.	Providing and using wired and wireless telecommunications and Internet infrastructures; Internet service provision; Web browsers; network security; anti-virus, anti-spam and child-protection software.

Source: Adapted from Dutton et al. (2003: Table 2).

2.4.2 Changing patterns of social and economic interaction

ICTs do not just provide access to more people, many of whom you wouldn't be in touch with otherwise; they also change patterns of interaction between people, communities, and institutions. Most often, people use ICTs to complement and otherwise enhance face-to-face communication (Dutton 1999; Woolgar 2002). But people can and do choose to substitute telecommunications for face-to-face communication, or substitute e-mail for telephone calls, in order to reduce travel, save time, and extend the geography of human community. But inappropriate choices by individuals may also undermine, rather than enhance, valuable human contact by replacing it with a much less rewarding form of mediated communication.

Automatic telephone answering systems can keep you in better touch with your family, friends, and business colleagues or can help you screen unwanted calls and avoid contact with certain people, as can displays on telephones that tell you who is calling. E-mail encourages informal communication, but an overload of e-mails, including spam messages, can block communication flows. And the value of a mobile phone in enabling you to telephone people while you are travelling can be offset if it causes you stress and interrupts many social interactions with those in your physical presence.

A growing number of companies use electronic supply-chain networks to link themselves directly with suppliers and retailers for tasks such as automatic ordering and just-in-time (JIT) delivery. If suppliers are not online, even if they are across the street, they become invisible in the 'virtual' world of the Internet. However, the costs of keeping pace with the latest in business communications can be a barrier for the many small businesses who cannot afford advanced services or equipment and do not have the expertise to support sophisticated ICT-based applications.

2.4.3 Choices shaping social and economic inclusion or exclusion

An understanding of the significance of the reconfiguring of access through choices about the use and non-use of ICTs highlights how personal, social, cultural, economic, political, and technological factors are reshuffling society, influencing who's in and who's left out. Debate over the digital divide recognizes this dynamic in advocating more universal access to technologies,

but this concept only scratches the surface of a far more encompassing range of issues. Shaping access involves a political process of conflict and negotiation over who gets access to whom, how, and when. The unpredictable outcomes of these processes determine the degree to which ICTs are used to improve or impair the quality of your life and bridge or widen social, economic, and technical divides around the world. As United Nations Secretary-General Kofi Annan (2003) commented: 'While technology shapes the future, it is people who shape technology, and decide to what uses it can and should be put.'

Box 2.1 shows how people are transforming a variety of personal, social, institutional and other activities with the support of appropriate ICT infrastructures and knowledge capacities. The choices made by people in bringing about such transformations do not take place in isolation from the real-world arena in which you and other people participate: as policy makers, parents, doctors, teachers, researchers, students, farmers, factory workers, ICT users, digital-content providers, media consumers, managers, public administrators, clerks, call-centre workers, engineers, and a multitude of other actors.

One important kind of social transformation illustrated in Box 2.1 relates to decisions about the use of ICTs in the design, production, consumption, and ownership of news, information, and entertainment media. Strategic choices in these activities now take place in a context where the Internet, Web, and other new digital media offer alternatives to traditional broadcast and print media. These new media enable new sets of producers to reach new audiences, such as teenagers making Internet radio programmes, 'bloggers' keeping personal Web logs in war zones, or activists creating a Web hub for environmentalists around the world. But it also allows large media conglomerates to consolidate and extend their power bases by gaining control over integrated multimedia services. The outcomes of these 'media games' could have vital effects on society.

There are a multitude of arenas in which other 'games' involving ICTs take place: economic development, consumer protection, small businesses, communities, households, global corporations, not-for-profit enterprises, complete industries, schools, universities, hospitals, libraries, government departments, NGOs, individuals and organizations with interests in Intellectual Property Rights (IPR) and copyright protection in fact, in almost every area of social and economic activity.

Box 2.1. Opportunities for enabling social transformation with ICTs

- Reinvigorating democratic processes using new forms of interaction to transform relations between government and its citizens.
- Using ICTs such as the Web to rethink and improve the delivery of a variety of public services, for instance through electronic welfare payments, Web access to government information, the sharing of specialist teaching among classrooms in different locations, and public access to online art galleries and museum exhibits.
- Enabling analysts and planners in less developed countries to gain access to government services and market information from round the world to help inform local decisions and services.
- Opening up new forms of interpersonal collaboration through a 'virtual nearness' using electronic networks that enable people to inter-act, inter-create, inter-discuss, and inter-negotiate in ways that would not be feasible otherwise, for example in establishing:
  - novel worldwide Internet-based forums in which new levels of dialogue and interaction are developed among geographically-disparate communities with converging interests, such as farmers and agricultural experts, people with similar medical ailments, or individuals and groups lobbying for policy changes;
  - professional-level cooperative team work, such as geographically-dispersed research or policy-development teams;
  - people from different cultural, economic, and geographic environments working together to create their own radio and TV programmes.
- Users becoming so engaged with the technology that they begin to produce their own digital content, for example through Web sites set up by individuals and small groups offering news and views from a myriad of perspectives not seen in mass media, or by students videoing interviews with older people to contribute to local-history education.
- Students of all ages, in all parts of the world, undertaking their own research and obtaining information via the Internet and through distance learning, rather than relying only on using books and being near a library or teacher in a classroom.
- Families and friends keeping in touch with one another more easily and frequently by e-mail, text messaging, and wired and wireless telephones.

Source: Based on Dutton et al. (2003) and Dutton et al. (2004)

The term 'game' is used here to indicate an arena of competition and cooperation structured by a set of rules and assumptions about how to act to achieve a particular set of objectives. Social outcomes can then be seen to emerge from the interactions between the outcomes of a number of games in a larger system of action: an 'ecology of games' (Dutton 1992). Players often

act in many games at the same time, taking different roles in different games. Each game interacts with the outcomes from other games and the behaviour and decisions of all actors affect the behaviour and decisions of other actors. All players therefore have a role in shaping outcomes although players will have different strengths in terms of their power to influence overall decisions.

2.4.4 Rethinking access: the reconfiguring access framework

The notion of the information society was based on a traditional view of the societal implications of technology that saw 'access' to a technology as an independent force leading to patterns of use that result in predictable impacts based on features of the technology. This seems to be commonsense, but it is overly simplified and misleading.

The reconfiguring access perspective, on the other hand, does not view access as an independent force, but as an intermediate outcome. It sees the strategic and everyday decisions made by individuals, groups, and organizations about whether and how to design and use (or not to use) a social technology like the Internet as reshaping access. An ecology of decisions by a vast number of actors open and close pathways to people, information, services, and technologies in ways that have implications over the longer term for the relative communicative power of any specific actor (Figure 2.1). Reconfiguring access changes the relative 'communicative power' of actors, which Nicholas Garnham (1999*a*) defined as the capacity to command the knowledge, economic, and technological capacities to access, design, produce, use, own, and control the governance of communication media. These 'digital choices' do not take place in isolation, but are in continuous interaction with outcomes from digital decisions taken by a multiplicity of actors in an ecology of interconnected games in many arenas, which may or may not be directly tied to ICT innovations. Outcomes from other games are among the complex mix of social factors that shape digital choices (see Section 5).

Underlying conflicts, divergences, and power structures within and between games involving the reconfiguring of access often make it difficult to reach agreement. This explains why the information society is not on a predetermined path that will produce predictable results. Instead, outcomes are shaped by the negotiations and interplay between actors in each game and how

Figure 2.1. The reconfiguring access framework

Adapted from Dutton et al. (2003) and Dutton (2004)

outcomes from one game affects others, such as new telecommunications regulations that open or close options in the economic development and other games.

One value of this perspective is that it captures and anticipates the role of players in games not directly focussed on broadband, the Internet and other ICTs, such as in community-development activities or organizational design. Another is its ability to explain how stakeholders, from individuals and NGOs to global corporations and governments, can have an impact on outcomes that could take different courses depending on the decisions made. ICTs could also change the rules of some games in unpredictable ways by empowering some

players and constraining the power of others. For instance, governments committed to a competitive market can help less powerful players in ways that limit the power and freedom of manoeuvre of large players, while global power-broker companies can decide, or threaten, to move operations to other areas as a lever in policy bargaining.

This concept of 'reconfiguring access' is concerned with the protean, enduring, underlying processes of social transformation. It is therefore independent of any particular macro-level social forecast, such as of an information, knowledge, or network society. It also accepts that choices about ICTs can be driven by a variety of motives other than reconfiguring access. For instance, you might buy a computer to make it easier to work at home, or simply because others have done so. But this decision could also affect your access to new entertainment opportunities and electronic discussion groups.

The consequences of changes brought about by this reconfiguring of access could be profound and far-reaching. A relevant analogy could be the development of the printing press in Europe in the fifteenth century. This allowed control of the written word to move from scribes and priests to a much wider group of people involved in writing, printing, translating, and distributing texts (Eisenstadt 1980). Understanding these reconfiguring processes and their policy implications is therefore vital to each person, community, and private and public organization. It also shows how everyone in society has a vested interest in helping to shape access to themselves and to the world and that the choices they make *can* influence the outcome: you can reconfigure your own access to change your own future opportunities.

3. ICTs and society: the evolution of different perspectives

Advances in ICTs have generated many perspectives on what the technologies will mean for society. These can be viewed as themes within the broader approaches that have emerged since the 1960s from research into how society is affected by the growing role of technology. These alternative perspectives are more than just competing theories. The most influential ideas, such as the concept of an information society, play a significant role in shaping views about how the world works. This, in turn, influences the everyday and once-in-a-lifetime decisions of individuals, communities, firms, governments, and others.

The rest of this section provides a brief summary of the five broad and overlapping streams of research from which the ideas discussed in Section 2 emerged. These can be categorized according to each perspective's distinctive focus: technology, impacts, strategy, information, and the theme of this volume – access (Table 3.1).

3.1 Technology

Widespread fascination with scientific and technical ingenuity has meant that human progress has often been defined by the appearance of pivotal technical innovations: from the wheel to the microprocessor chip, plough to steam engine, abacus to computer, internal combustion to jet engine, printing press to the Internet and Web, spear to 'smart' computer-controlled missile. Digital ICT innovations have become key defining technologies as their significance has spread across all social and economic sectors, starting with the emergence of the 'computer age' in the 1950s and continuing into the twenty-first century with the global electronic networks symbolized by the Internet and Web.

3.1.1 Knowledge and control

Many assessments that have been made of the use of specific ICTs, such as computers (Mesthene 2000), television (Comstock et al. 1978), and the Internet (Selvin 2000). Although much attention has been focussed on specific technological artifacts, such studies have highlighted the importance of a wide range of related social, economic, psychological, cultural, organi-

Table 3.1. Perspectives on ICTs and society

Focus	*Key issues*	*ICT focus*
Technology	Role of technology in society. Understanding relationships between technical and social change	Effects of technological change on the control of social and technical systems.
Impacts	Planned and unexpected personal, social, economic, and other impacts and influences of new ICTs. Analysis and forecasting of impacts (e.g. roles of producers, users, consumers, and audiences).	Technical and social aspects of computers, interactivity of new media, and opening of new communication channels.
Strategy	Strategic use of ICTs within a variety of business, social, public administration, and other contexts. Processes shaping the design, implementation, and use of ICTs.	Information system and network design as strategic tools for achieving management, policy, social, personal, and other goals.
Information	Role of ICTs in advancing stages of economic development. Tracking growth of employment, industries, skills, and techniques related to the information sector.	Information as a new economic resource.
Access	Social, economic, and other consequences of reconfiguring electronic and physical access to people, services, information, and technology. Factors that enable and constrain social and technical choices about ICT design and use.	Strategic technical, personal, organizational, social, and policy choices shaping the reconfiguring of access in a variety of arenas.

Source: Adapted from Dutton (1999: Table 2.1)

zational, and political issues. For instance, social scientists have argued – correctly – that technology encompasses the knowledge that is essential to its use, not just the physical equipment. The control of technology is therefore bound up with issues of who has access to the skills, equipment, and knowhow essential to design, implement, and employ technology.

Changes in technology can restrict or expand access to these and other crucial resources. For instance, early mainframe computers depended on programmers with knowledge of specialized programming languages; in contrast, the simple point-and-click interactions of more recent systems opened up access to information on the Web that is stored on millions of computers around the world. Social choices, such as the decision to learn a new human or computer language, similarly affect access to technology, jobs, and people. The ways in which technical and social choices shape access to ICTs has been central to the technological perspective, but was often lost in a body of work that covered a myriad other concerns, from basic technical capabilities to the implications of computerized information on privacy, security, and copyright concerns.

A fear that technology is getting out of control and becoming an unstoppable force driven by an unelected high-tech élite has been a common concern since early discussions of computers and telecommunications in the 1950s (e.g. Ellul 1964; Winner 1977). However, more recent advances in ICTs have led many to argue the opposite: that the revolutions in microelectronics, personal computing, and Internet-based networking have a potential to become 'technologies of freedom' (de Sola Pool 1983) bringing greater devolved local empowerment by placing more control over the technology in the hands of users (Gilder 1994; Lessig 2002). Nevertheless, dystopian accounts of out-of-control technology continue to capture the imagination of wide audiences, such as Michael Crichton's (2002) scenario of nanotechnology preying on humans.

3.1.2 A two-edged tool that can heal or wound

Many examples have already been given of the two-edged 'for better and worse' thrust of ICTs, which is a characteristic of all technical change. Another is the contrast between the fear that the Internet and other ICT networks could isolate individuals and undermine democratic social processes

and the hope that the same networks could unlock new forms of virtual community built on shared interests (e.g. Katz and Rice 2002; Chen and Wellman 2004).

Such conflicting assessments mean that the public is often told that technology is on a predetermined trajectory, but with different experts forecasting different routes and outcomes. This includes some who see continuity rather than revolutionary change associated with the use of ICTs, for example arguing that the Internet has had little or no impact on major areas of social, economic, and political life (Winston 1998; Woolgar 2002).

The two-edged ambiguity is an underlying reason for the continuing social tensions surrounding technical innovations. With ICTs, these tensions have been most evident in concerns about the technology's role in contributing to major shifts in patterns of employment. ICTs can be linked with both the disappearance of jobs in some traditional industries, particularly in manufacturing, and with the creation of new employment opportunities, especially in services such as ICT consultancies, Internet service providers (ISPs), and digital animation in movies. Industry-wide reverberations of such innovations are fuelled by the technological convergence at the heart of ICTs. For instance, the growing cost effectiveness, versatility, and ubiquitousness of ICTs has changed the cost structures of telephone, film, television, and other industries in ways that make their sustainable outcomes uncertain (Gilder 1994; Galperin 2004).

To say that the technology can have positive and negative effects does not mean the design and development of ICTs are neutral. Technology, like policy, tells us how we are supposed to do things and makes some ways of doing things more rational and practical than another. The biases designed into technological artifacts and systems can be even more enduring than legislation, as well as creating a social and technical momentum that is difficult to reverse. For instance, the public funding and academic environment that nurtured the Internet and Web led to certain technical design and implementation decisions that have subsequently created much difficulty in adapting these facilities to wider business and social activities (Box 3.1). Unlike public policy, however, technological choices are made by individuals who are often not accountable to an electorate or the marketplace, and are frequently delegated to others as if they had no social significance. For example, one

highly respected technical expert, Jon Postel, made most early decisions on the assignment of names and numbers for Internet addresses, which later became a responsibility of the Internet Corporation for Assigned Names and Numbers (ICANN).

Box 3.1. Continuing influence of early Internet and Web developments

The Internet was initially funded by substantial public investments from the US Department of Defense's Advanced Research Projects Agency (ARPA) from 1968 (Denning and Lin 1994). Its growth and early development was encouraged through the making of its basic technologies and infrastructures available for free to academic and other research users, who also received much support from public funds. The Web emerged in the early 1990s from a similar environment, at the European Laboratory for Particle Physics (CERN) in Switzerland (Segal 1995).

Such communities are infused with a culture based on sharing information and results as openly and widely as possible, in order to take forward learning and research. The values of this 'Internet culture', based on sharing, generosity, and neighbourliness, are derived not only from the public funding provided to these ventures, but also from the investment of a great deal of intellectual labour and creativity given freely by research-oriented users. This would be unlikely to be forthcoming in a more commercial market.

These values did not eliminate problems with hacking or hate mail, for example, but they led to certain decisions about the technical design of the underlying architecture, for instance in terms of levels of security provided. However, these values, and therefore some of the capabilities that depend on them, are often in conflict with modern market values. For instance, the realization of market potential in a commercial environment often depends on protecting exclusivity using a definition of value involving Intellectual Property Right (IPR) agreements. And the market environments of e-business and e-commerce using the Internet prioritize profit and shareholder value. Thus, although many of the features of the underlying Internet and Web architectures are of great value to business and other non-research uses, overcoming restrictions imposed by some in-built features designed for their initial environments have caused technical, organizational, commercial, security, privacy, and other problems when the technology is applied in other contexts.

3.2 Impacts

3.2.1 Technological determinism

A fascination with technological innovation has contributed to a widely-held view that changes associated with such advances are likely to follow a logic largely predetermined by the technology. This kind of technological determinism has been the basis of many nightmarish science-fiction narratives, for example depicting futures where ruthless non-human 'cyber' beings and intelligent robots rule over people, or where autocratic human elites use television and the Internet for continuous social surveillance and control. These kinds of scenarios are frightening because they are projections of the uses to which actual capabilities of ICTs might be put. On the other hand, different extrapolations from real ICT features are used by technological enthusiasts to create visions of a utopian world of riches and leisure for all.

Two distinct streams of social research have investigated the realities behind these extreme visions since the 1950s. One grew from the study of technology and society to focus on the social impact, or social shaping, of computer-based ICTs; the other evolved out of investigations into the influence of the mass media: newspapers, radio, television, and film. They converged as computing and communication media converged into ICTs in the 1990s, for example when the Internet became a key medium for 'publishing' online news and delivering channels of multimedia communication. Current concerns about the information and knowledge societies, the digital divide, and related issues can be illuminated by an understanding of the investigations, findings, and analytical frameworks proposed from within these research streams.

3.2.2 The social impact of ICTs and social shaping of technology

Studies of the social impact of ICTs have usually been based on rational forecasts of the social opportunities and risks created by particular features of the technology. This led to many technologically-deterministic predictions that proved to be wrong because they failed to take account of the way outcomes from the use of a technology are shaped by unpredictable social, economic, organizational, cultural, and political forces (Dutton 1999).

Empirical research on the impact of computers in organizations often found that enterprises initially, and sometimes for many years, tend to use computers to make their existing information practices more efficient rather than for the more radical changes predicted. The technology frequently fails to live up to expectation in its first wave of implementation, thereby delaying the implementation of the capabilities needed for the transformation. However, the key underlying reasons for unexpected outcomes are non-technical, such as the management techniques used to guide the introduction of a new system. Psychological factors can also be important: predictions of the emergence of a 'paperless' office through the growing use of word processing and e-mail have not been generally fulfilled because of a failure to appreciate why people might prefer to continue to use paper, such its flexibility and the relative difficulty of reading an electronic screen.

Despite having access to advanced ICT-based planning and forecasting tools and methods, whole industries have been surprised by the outcomes of new capabilities. This was dramatically highlighted at the turn of the century when stock markets and the telecommunications industry around the world were shocked by the sudden collapse of many new Web-based 'dotcom' companies, into which investors had poured huge sums because of the expected boom in Internet-based 'e-commerce' commercial transactions. The key lesson from events like this is that technical and engineering feats do not in themselves translate into successful innovations in real social settings.

The dotcom crash was the result of poor business and financial decisions, not a failure of the technology. This is indicated by the continuing growth in the use of the Internet and Web for purely online 'e-business' enterprises and e-commerce sales transaction, as well as within most traditional 'bricks and mortar' business operations. The crash also indicated that the social-impact model of ICT innovation needs to be rethought, since it is an over-simplified depiction of social change based on deterministic assumptions that particular real or potential technical features will have predictable effects.

Much social research and analysis on the design and impacts of technologies has emphasized the decisive role played by social choices in determining ultimate outcomes (MacKenzie and Wajcman 1985; Dutton et al. 2004, Dutton et al. 2004). As a result, there has been a valuable shift in the focus of inquiry from the social impacts of technical innovations to the study of

psychological, political, geographical, economic, and other social as well as technical factors that shape technology and its impacts, often described as the social shaping of technology (MacKenzie and Wajcman 1985; Williams 1999). This has led to a greater emphasis on exploring the underlying 'processes' of technical and social change, rather than predicting their long-term impacts. These processes are more complex and unpredictable than the linear cause-and-effect model underpinning technological determinism.

3.2.3 Media influences on audiences

Studies of the impact of mass-media technologies have concentrated largely on the way information communicated through mass media reaches and influences audiences. This field of enquiry was triggered in the aftermath of the Second World War by concerns over propaganda and the political implications of radio and television on public opinion and voting behaviour. Early research tended to regard audiences as passive recipients of messages fired at them by the media, which echoes the technological determinism prevalent in many studies of the social impact of ICTs. Subsequent research helped to formulate more sophisticated models that recognize the more active role played by audiences in selectively processing and reinterpreting the meaning of messages, and by the social networks involved in mediating media messages and in shaping opinions and attitudes.

For example, mass media can influence the opinion leaders who most actively seek and use the media to gain information; these leaders, in turn, influence others. The media were also shown to play a critical role in 'agenda-setting' by deciding which issues to cover and prioritize in television news bulletins and newspapers. This demonstrated the significance of media 'gatekeepers', such as editors, producers, and journalists. Their decisions about whether and how to present particular news items and topics are important influences that contribute to, but do not determine, what people think about, ignore, and take for granted.

The issues raised and processes of access revealed in this research have much relevance to an understanding of the societal implications of current ICTs. An emphasis in such studies on the content of media messages and their influence on those exposed directly or indirectly to them helps to investigate

suggestions that the interactive character of digital media will make them more engaging and, therefore, more powerful in shaping attitudes, beliefs, and values.

The profusion of new media and channels can also segment audiences in ways that might erode the quality and integrative effect of the traditional mass media, thereby breaking up the common experiences of a community (Blumler 1992). This problem was anticipated in the early 1960s, when Marshall McLuhan (1964: 9) argued that there had been too much emphasis on the content of media messages, whereas 'it is the medium that shapes and controls the scale and form of human association and action'. His view that television's ability to create a 'global village' that instantaneously conveys sights and sounds around the world is reflected even more strongly in the availability of the Internet and satellite television. However, technological change has made assumptions of access to a mass audience more problematic.

3.3 Strategy

3.3.1 Policy and management

From the earliest studies of the impacts and influences of ICTs, it has been clear that the technology has potential strategic significance across all sectors of society, particularly given the technology's malleability in meeting human, social, and organizational needs in different contexts. This has made ICTs an important policy issue for government, business and industry, education, and many other sectors.

A focus on strategies involving ICTs, rather than the capabilities of the technology, has been most fully developed within the management field since the 1950s, when the computer came to be seen as an extension of, and means for realizing, prevailing management approaches and techniques. From this management perspective, the major implications of ICTs grow from the goals and strategies of managers as enabled by technological advances.

Developments in management information systems and database technology provide technical opportunities for managers to get access to information about decentralized as well as central corporate activities. My own empirical

research has found that those who control decision-making tend to adopt and use ICTs in ways that follow and reinforce existing centralized or decentralized patterns of control within organizations and society (Danziger et al. 1982; Dutton and Kraemer 1985). For instance, an increased emphasis in management strategies on reconfiguring organizational structures and processes to take advantage of the benefits of innovation and networking (Castells 2000 [1996]) has been supported by the use of ICT-enabled systems (Dutton, et al 2004).

A strategic perspective such as this moves beyond the constraints of technologically-determinist viewpoints by recognizing the inherently social nature of ICTs, in that they are designed, produced, and used by people employing knowhow, which is itself a social attribute. The outcomes of strategic choices about the design and use (or non-use) of ICTs can also have a long-term influence on social behaviour.

3.3.2 Strategic digital choices in many arenas

Managers are only one set of actors involved in a far more complex and interdependent set of decisions about the design and use of IT in organizations. For instance, a technical expert in a firm may be pursuing a solution that would be regarded as technically elegant among other specialists, with cost a relatively minor goal. At the same time, a top manager in the same enterprise may be primarily seeking cost reductions to meet corporate management targets, regardless of the specific technology employed. Business organizations are also just one of numerous arenas within with such digital choices are making significant contributions to shaping outcomes.

Global advances in ICTs, the inertia of technologies already in place, and the widespread application of ICTs throughout society place limits on the ability of any individual, organization, or nation to control the design, implementation, and use of ICTs in predetermined ways. The processes involved in making these digital choices, both within and between arenas, are marked by great inequalities in existing institutions, cultures, and social and technical systems that favour some viewpoints and actions over others, which increases the unpredictability of outcomes based on assessments of strategic aims. A more realistic view would therefore see outcomes as flowing from a process of social and technical decision-making by many different actors,

within a variety of separate but interrelated technical, organizational, social, and policy arenas.

3.4 Information and access

Section 2 highlighted the fresh and enduring perspective introduced in the 1970s by information society concepts. However, it also explained why the value of seeing information as the pivotal concept in the study of ICTs is limited: because the notion that 'information is power' at the heart of the information society vision fails to recognize that the crucial factor is not information *per se*, but the ability to control access to information, people, services and technologies. Overcoming this limitation was a key motivation for developing the reconfiguring access framework, as outlined in Figure 2.1 above.

3.4.1 Towards a new vision – beyond the information society

The reconfiguring access approach draws on the strengths and enduring understandings of previous social research streams that focussed on technology, impacts, strategy, and information, including theories of an information society. It will not replace other perspectives on ICTs, but can complement, integrate, and extend research from related perspectives.

For example, the importance of the technology and choices made about it is a key factor influencing the reconfiguration of access. However, the flaws of technological determinism are addressed by emphasizing that technical choices are just one step in a complex series of other social, economic, cultural, psychological, and other decisions. By recognizing that technology does matter, the reconfiguring access viewpoint also avoids a tendency in some early work within the social shaping of technology perspective towards a social determinism that draws the erroneous conclusion that technological change is of no particular significance.

Likewise, research on influences of the mass media contributes a number of key ideas to understanding access processes, such as the pivotal role of gatekeepers in all ICT-mediated communication, the significance of audience segmentation, and the difference between notions of a passive or active

audience. The continuing significance of access to information and the awareness of the crucial role of knowledge in reconfiguring access demonstrates how much the information society vision contributes to the proposed framework for analysing the reconfiguration of access to people, services, information, and technology.

3.4.2 Information politics and communicative power

A crucial overlap between the information and access perspectives lies in the 'information politics' surrounding communicative power. Garnham (1999*a*: 79) defined this in the following terms: 'ICTs have raised questions of social power ever since their birth with the invention of forms of writing. Once communication expanded beyond face-to-face interaction and natural human speech and gesture, the question of who commanded the cultural and material resources for communication and for what purposes became central to an understanding of the social order'. He also noted that the different abilities of individuals and groups to mobilize communicative power in pursuit of their goals have always been intertwined with ICT developments. But he stressed that an over-emphasis on technological issues, such as an increase in TV and other communication channels and media, does not address 'the deep-seated problem of the relationship between cultural producers and cultural consumers, or between different cultures, in societies characterized by division of labour and structured inequalities of wealth and status' (Garnham ibid.).

It must therefore be emphasized that actors who attempt to reconfigure access to serve their interests are not all equally capable of doing so. A top manager can exercise more control over technological change than an entry-level employee. A wealthy ICT-literate professional can use ICTs to better advantage than a low-income household with no member having a technical background. In addition, all actors pursue a variety of other objectives that might compromise rather reinforce their values and interests. For example, consumers give personal information to companies in order to get credit, caring more about their convenience at the time than privacy or fraud threats in the future.

An awareness of the strong influence of this kind of information politics in mobilizing communicative power to sustain and boost different individuals

and groups is central to the reconfiguring access vision. This enables it to act as an effective framework for analysing and addressing fundamental questions about the unequal distribution of communicative power and in identifying where, when, and whether ICTs can or cannot make a significant difference to that balance.

For instance, individuals or small groups could enhance their communicative power, if only incrementally and at the margins, through such relatively small steps as creating a Website, opening their own Web log diary to others, engaging in special-interest electronic forums, downloading free copyrighted material without paying, or developing specialist information and advice services. However, any such gains must be weighed in relation to the strategies of already influential corporations or government agencies, who can use many of the same approaches to enhance their own communicative power. Organization begets organization.

The reconfiguring of access model provides an opportunity to understand the vital importance of the effects of choices made by policy makers, individuals, communities, businesses, and others to reconfigure communicative power (Figure 2.1). In order to orient social transformations tied to ICTs towards more positive outcomes, these choices will need to encourage a wider social spread of the capacities needed to support more inclusive, fairer, and successful outcomes for more people, such as infrastructures to build and sustain an equitable distribution of knowledge, skills, health, technological innovation, and vigorous and open cultural and political institutions.

4. Social change tied to technological choices

ICTs encompass the old as well as the new, the physical as well as the electronic. A move from one technology to another, such as from print to electronic or analogue (e.g. electronic signals analogous to sound waves as used in traditional telephony) to digital, can change costs, complexity, and capacity in substantial ways. This indicates how choices among ICTs, and about their design and use, can open and close opportunities to undertake the transformation of social institutions and processes. An understanding of the nature of the technology itself is therefore important provided it is positioned within a context, like the reconfiguring access framework that also emphasizes the many associated social choices integral to shaping outcomes tied to ICT-enabled innovation.

4.1 The bias and flexibility of ICTs

One of the earliest 'technology and society' scholars, Harold Innis (1972 [1951]), argued in the 1950s that the communication infrastructure was more important than the basic mode of production in 'biasing' a society's social and political structures. He also identified distance, time, and control as key dimensions of access. For example, he explained that oral communication is less adaptable for transmission over long distances, less durable over time but more difficult to control centrally than the written word. This perspective continues to be relevant to digital ICTs, for example in the way they compress time and space to create the potential for either a communitarian 'global village' (McLuhan 1964) or more centralized control of economic production and employment.

Specific technologies can be inherently more compatible with some structures of control than with others. Innis suggested that print technology was more compatible with centralized control structures than was oral communication, as print was more capable of being transmitted over distance and retained over time. He also provided historical accounts showing that any communication medium can produce results that contradict any technological bias, which underscores the indeterminacy and countervailing effects of actual use. For example, a written memorandum might have more endurance than an oral instruction, but a flood of memos in an organization can lead to most being ignored.

Bias can also be designed into a technology (Winner 1986). Traffic engineers can design a street to speed or slow the flow of traffic, such as by placing bumps in the road to inhibit fast driving. The Internet and Web, as already explained, were designed to support free and open academic-style communication. Word processing, spreadsheet accounting, or 'slide presentation' software are built with specific assumptions about their modes of use, including default values for formats and other options that tend to become the most used methods. These sorts of technological biases make it less or more difficult, costly, or socially acceptable to adopt particular ways of driving an automobile, searching the Internet, preparing a document, or presenting a business plan. However, choices made by users and designers can ignore or modify the biases and constraints of a technology to create alternative courses of action and outcomes.

The great flexibility enabled by software systems means it is more the rule than the exception for ICTs to be used as tools to reinforce prevailing patterns of institutional control, rather than to impose a particular technological slant. ICTs can also create new patterns of communicative power. For instance, digital cameras, video-editing software, and the Web can be deployed to reconfigure access to the multimedia entertainment or news industry by providing new production and global distribution outlets for individuals and smaller enterprises. Such reconfiguring cannot on its own overcome deeper historical economic, social, and political imbalances of power, in this instance in competition between small emerging new-media players and large media corporations with much bigger existing customer bases and production, marketing, and distribution resources.

Despite the continuing strong financial and communicative power of established market structures and players, the incremental implications of a multitude of digital choices by individuals and less powerful groups can still contribute to reshaping alternative futures, both for individuals and wider outcomes. For instance, IBM held a huge and seemingly unstoppably dominant position in the computing industry until the early 1980s. Then, radical changes were triggered in the computer marketplace by the decisions and consequent actions of many skilled and enthusiastic individuals and communities inspired by the visions of do-it-yourself 'home brew' personal computer enthusiasts and campaigners for open information networks, such as Ted Nelson's (1981, 1987 [1972]) Xanadu Project and other concepts that

prefigured many key Web characteristics. This led to the development of new PC and Internet-related markets and the emergence of new market leaders, such as Microsoft and Apple. These developments then affected all the other industries now touched by digital ICTs.

4.2 Influences of digital choices on ICT design and use

Social and technical digital choices about the selection, design, and use of particular ICTs affect outcomes in complex and multidimensional ways. Two important aspects of these developments are highlighted here to help shed light on the social implications of the technology: core ICT innovations and the convergence of different digital technologies, techniques, and strategies.

4.2.1 Core innovations: technological enablers

Core technological elements of digital ICTs that can enable social transformations are summarized in Table 4.1. The major economic driving force behind the explosion in availability and use of digital electronic ICTs has been advances in microelectronics, involving the packing of ever-increasing numbers of integrated circuitry onto a 'chip' of silicon, about the size of a human fingernail.

Microchips are at the heart of all digital ICT equipment, from pocket calculators to supercomputers and increasingly in a vast range of other equipment, such as domestic appliances, consumer goods, and security, medical, and other specialists systems. The rapid, relentless progress made by microelectronics since the 1960s is captured by 'Moore's Law': a popularized verison of microelectronics-pioneer Gordon Moore's observation in the mid-1960s that microprocessor capacity would double about every eighteen months. The actual steady advance in capacities in this direction has allowed for the provision of greater processing speed, more digital storage, more functions, and increased reliability all for less cost. The resultant substantial enhancements in the power and versatility of hardware at decreasing costs has offered the enhanced computing capabilities needed to enable software designers and builders to implement ever larger and more versatile programs to deliver a growing range of applications and services to users.

Table 4.1. Core elements of digital information and communication technologies

Capability	*Examples*
Enabling basic technologies	Electronic components (particularly microelectronics and optoelectronics) and software (e.g. basic operating systems and application programs) that control operations of computer-based systems.
Telecommunications infrastructures	Advances in wired and wireless networking and in applications support (such as through the Internet and Web).
Equipment	ICT-related products (e.g. personal computers, scientific supercomputers, mobile and fixed telephones, televisions, CDs and DVDs, flat screens, digital cameras, television sets) and in 'intelligent' innovations in other goods (e.g. cookers, microwave ovens, controls in vehicles, medical body scanners, biometric security systems).
Content	Digital versions of text, data, administrative records, statistics, graphics, still and moving pictures, voice, and most other communication forms.
User interfaces	How people interact with the technology through combinations of hardware (e.g. keyboard, mouse, touch screen, speaker, microphone) and software (e.g. operating system or Web browser 'point and click', specialist software to understand speech or assist people with sight, hearing, and other disabilities).
Human knowhow	The people who apply their knowhow in using ICTs in their everyday lives (teachers, students, doctors, patients, authors and film makers, audiences, business planners, secretaries, engineers, accountants, etc) and in creating ICTs for others to use (e.g. designers, inventors, programmers, scientists).

More recently, microelectronics has been closely aligned in many ICT developments with optoelectronic innovations, such as high-performance optical fibre telecommunications links and flat-screen computer and television displays. Among electronic ICTs, this has created greater advantages for digital over competing analogue technologies in media as diverse as television, radio, telephony, photography, and music and film recording.

In telecommunications, this is illustrated by the escalation in the amount of information ('bandwidth') that can now be carried by a high-speed digital transmission link, compared both to traditional analogue techniques and earlier digital connections. Bandwidth capacity has been dramatically increased, from about 50,000 bits per second (bps) in a traditional 'narrowband' copper-wire telephone line up to giga (thousands of million) bps on 'broadband' optical fibre and cable connections and even a million bps with telephone wires enhanced by Digital Subscriber Link (DSL) technology. Extra bandwidth also makes possible the delivery through media like cable and satellite of many more television and radio channels than was possible with traditional terrestrial broadcasting using narrowband analogue techniques.

Digitization can be used to enhance traditional media, for instance by 'cleaning up' and better preserving early manuscripts, pictures, music recordings, and film. It can also create entirely new digital forms, as in services offering live online streaming from video 'Webcams' or when viewers can control what they see on television (such as by choosing specific cameras at a sports event or through video-on-demand, where a movie can be watched at the time the viewer wants without waiting for its scheduled broadcast).

The human knowhow that is an intrinsic part of every technology has a special significance with ICTs, beyond the expertise involved in designing, using, and enhancing the technology. This arises because much of the technology's transformative power lies in its ability to be programmed by software to enable the same hardware to do many different things in a manner shaped by and for users. Software is a form of codification of human knowledge, with some types of 'expert' and 'artificial intelligence' (AI) systems explicitly seeking to mimic human reasoning (Weizenbaum 1976) or to extract human reasoning from documents or observations. For example, as already indicated, scientific knowledge based on statistical biometric measurements are now important elements in many security systems at airports

and other sites where strict personal identification is critical. Knowledge is therefore in some senses as much a core capability for ICTs as microelectronics, screens, and other visible hardware technology.

4.2.2 Digital convergence and multimedia explosion

As progress in core ICT capabilities converged towards common technologies and the fusion of scientific knowledge, management strategies, and other techniques, a debate was triggered about whether this would lead to standardization around a narrow range of digital ICT devices, services, and media or an explosion in the range of available specialist options. There is evidence of trends pointing to both outcomes.

The convergence scenario has long been forecast, such as the vision of an integrated 'teleputer' that would replace the telephone, radio, television, and personal computer (Gilder 1994). The many steps taken towards this is exemplified in the growing multimedia capabilities of PCs, PDAs and 3G mobile cellphones. At the same time, there has been a proliferation of ICT devices designed for special purposes, such as medical monitoring equipment, MP3 players, CD and DVD players, and hand-held games stations.

A significant countervailing development to the kind of convergence that packs ever more microchip and software power into integrated multifunctional systems is typified by the 'Grid' (Box 4.1). This is based on the notion of a 'network computer': a simplified user device that draws powerful computing processing, storage, and software capabilities by linking to a network including very large computing resources. There is also likely to be a continuing proliferation of devices combining various ICT components in many variations of the teleputer concept.

An emerging vision of convergence is more closely tied to the Internet (FCC 2004). The Internet is anchored in an open network architecture that uses a standard protocol, or Internet Protocol (IP). It is this set of standards that enables signals to be transmitted in packets from one user to another without being routed by a central switch along a single dedicated electronic circuit, i.e. as a 'packet-switched network'. E-mail, the Web and other familiar Internet services are provided through such IP-enabled packet switched networks. In contrast, traditional telephony uses circuit-switched networks.

Box 4.1. The Grid: A New ICT Utility Delivering Computing Power

The Grid offers on-demand computing that acts in a similar way to plugging an electrical device into an electricity grid because it allows relatively low-cost, stripped-down devices to 'plug' into a shared ICT utility based on massive distributed computing resources that treat all systems attached to it as if they were working within an integrated virtual organization (Foster and Kesselman 2003). This removes much of the need for users to buy and maintain their own complex and costly IT systems as the Grid delivers to the user a wide and powerful range of processing, storage, networking, operating system, word processing, simulation, and other http://www.ibm.com/OnDemandcomputing capabilities.

The Grid emerged from 'Big Science' applications in large scientific laboratories with extensive budgets, government support, top scientific talent, and strong IT support. http://www.rcuk.ac.uk/escience/However, its efficient resource sharing, low maintenance costs, and increased reliability, security, and flexibility make it attractive to a broader range of multimedia content in a wide variety of activities. These include: economic development (by sharing infrastructure, reducing any wasted ICT investment and encouraging the sharing of knowledge and skills); government departments; businesses of all sizes; education at all levels; entertainment (e.g. audio and video streaming); and game playing (e.g. The grid-based Butterfly.net allows a million players to take part in interactive games).

Source: Dutton et al. (2003: Box 3)

Increasingly, more services are capable of being provided over the Internet, such as telephony through voice over Internet Protocol (VoIP) techniques. As the diversity, speed and reliability of these IP-enabled services grows, many experts foresee a convergence of the 'traditional' Internet-based e-mail and Web services with newer voice, data, audio, and video applications of broadband Internet, all of which will be provided to a wide range of devices other than just computers and telephones. This challenges conventional approaches to Internet governance and regulation, since the Internet will be used to provide regulated services to the general public, as well as capabilities for use within governmental and corporate strategies.

Many corporate business strategies have sought mergers and alliances that could exploit the vision of digital ICT convergence of print, television, radio, film, music, telecommunications, and other media. However, early attempts in the 1960s to do this through the marriage of computer and cable-TV

enterprises did not live up to expectations (Dutton, Blumler, and Kraemer 1987). Computers enabled interactive communication over systems like cable networks that could transmit more channels, thereby making room for cultural, minority, and educational content. But the relatively limited technology available at the time created constraints that meant these activities were not popular with audiences. This generated much scepticism about the user appeal and business viability of bringing together separate information and communication technologies and industries.

In the 1990s, a new wave of interest in convergence was triggered by advances in multimedia technologies, such as the Internet and high-performance devices and communication links. But successful technical convergence has not led to automatic success in industrial convergence. Many of the technologies and industries that now make up the ICT marketplace come from a culture, and way of doing business and seeing the world that has emerged from distinct long-term historical routes. These pathways involve their own technologies of production and distribution, business processes, industrial structures, and patterns of regulation (Garnham 1999*b*). Overcoming such differences is a complex management and business challenge, whether or not IP-enabled services are increasingly permitting the technological convergence of different media.

4.3 How technological advances shape reconfiguring access

This subsection examines six key areas where choices about the design, production, and use of ICTs are critical in the reconfiguration of access: cost structures; geography of access; network architecture; the gatekeepers who can open or close communication channels; the relationship between senders and receivers; and user control (Box 4.2).

4.3.1 Changing cost structures

Major social implications of ICTs stem from the technology's contribution to lowering the cost of some products and services substantially, while raising others. Just as the printing press made books affordable to more people, advances in microelectronics have made PCs affordable to the general public and permitted ICTs to become a component in an increasingly wide

Box 4.2. Technological approaches to reconfiguring access

Digital choices about the design and use of ICTs can reconfigure access by:
– changing cost structures;
– redrawing the geography of access;
– redesigning the network architectures;
– changing, by-passing or empowering gatekeepers;
– altering relationships between senders and receivers;
– decreasing or increasing user control.

range of consumer products and services. If you are able to access the Internet you may be able to send e-mail or make telephone calls using VoIP at much cheaper rates than traditional mail and telephony. And the cost of transporting and delivering purely digital products and services, such as online publications and software, has been reduced to the often negligible cost of an Internet link. This facilitates local and global transactions of immense value to you, while also creating pathways for spam and other unwanted digital traffic into your home, office, school or other place of access.

However, costs remain high for activities like producing and promoting digital content, such as for music by a highly-paid artist, a major motion picture, complex software package, or large information database. That is why the music and film industries made such efforts to close down free music downloads, although they could not prevent the substantial and continuing changes in many media costs and distribution approaches that resulted from the introduction of the new medium for accessing multimedia content. This included reductions in the price of music CDs, as was acknowledged by the Universal Music Group when it cut CD prices in September 2003. There has also been rapid growth in copyright-regulated downloading for a fee from online music stores, typically for one song or other unit to enable customers to build their own music collection by creating ('burning') their own CDs. In addition, many users still find ways of obtaining free downloads through peer-to-peer networks.

Some music artists are seeking to use the technology to reconfigure access to take more control over how their works are produced and sold, such as

announcements in 2004 by popular music stars George Michael, who said he would release songs in the future only on the Internet, and Peter Gabriel, who set up the Magnificent Union of Digitally Downloading Artists in 2004 (www.mudda.org). Also in 2004, the Electronic Frontier Foundation (EFF), a non-profit group of lawyers and others interested in digital rights management, proposed a compromise in which the music industry would form a collecting society that offers peer-to-peer music fans the opportunity to share files legally for a regular payment of a few dollars a month (see www.eff.org).

In software, the 'open-source' movement has developed new modes of trade, based on uncopyrighted software that is made available free but under certain 'copyleft' restrictions (Box 4.3). The communitarian origins of this movement is reflected in developments that prioritize social objectives, such as the OpenOffice.org open-source system for word processing and other office applications that is designed for multilingual needs, as required for example in South Africa with its eleven national languages (www.openoffice.org.za).

Box 4.3. Open-source software and copyleft control

The Free Software Foundation pioneered an alternative to the copyright protection of intellectual property through the GNU General Public Licence. This includes the notion of 'copyleft' protection, which requires anyone who redistributes the software, with or without changes, to pass along the freedom to copy and change it further. Copyleft therefore aims to guarantee that every user has freedom, both in terms of not exchanging money to obtain it and in being free to share and change that software. The 'source code' that forms the basis of an open-source software product is put into the public domain uncopyrighted, in the conventional sense of IPR protection.

Copylefting was felt to be necessary to prevent uncooperative people converting the program into proprietary software for which they would hold the copyright. This might create many users, but would block the freedom for subsequent users that the original author had required when making it available free in the first place. It also provides support for programmers to get permission from the organizations in which they work to contribute to software that remains free, although that organization might normally seek to make money from any software developments undertaken by its staff.

Source: Summarized from information at www.gnu.org

The contention over copyright issues indicates how ICTs and new approaches and cultures associated with ICT-enabled developments can seriously threaten cost structures in media industries. On the other hand, large companies with dominant control of telecommunications infrastructures and services, mass media, widely-used software (e.g. the Microsoft Windows operating systems and the Google search engine), or other ICT products and services can design their technology in ways that advantage them in relation to their would-be competitors. For instance, interfaces to popular systems can be designed to be incompatible with those of rivals, or multiple services and products can be wrapped up in integrated packages that cannot be matched by rivals with less financial backing.

Telecommunications is an industry where cost structures are being continually transformed, with technological innovation of comparable significance to competition in driving down costs (Baer 1996). For instance, telephone calls can now be provided free or at low cost because of the dramatic increases in ICT bandwidth volumes. Charges for these lines are set at levels that take account of the delivery of television and other high-volume multimedia, against which the amount of bandwidth used by a telephone call is minimal. This has undermined the economic foundation of telephony-based services that were, until recently, the largest communication industry in every industrial nation.

Non-stop innovation in ICTs means that industries based on newer ICTs can also have their cost structures threatened. For instance, the fast growth since 2001 of Wireless Fidelity (WiFi) technology could challenge established broadband Internet providers (Box 4.4). On a broader economic scale, VoIP could have a strong impact on the economies of developing countries (Box 4.5), as was highlighted in 2000 by a report of the Australian National Bandwidth Inquiry on international charging arrangements for Internet services (see www.noie.gov.au)

4.3.2 Expanding and contracting the geography of access and control

The introduction of the telegraph in the late eighteenth century was a breakthrough in permitting access to information to be independent of human transportation. Since then, ICTs have enabled many more innovations in the

Box 4.4. The WiFi phenomenon

Wireless fidelity (WiFi) is a wireless-based local area network (LAN) that can be used to set up 'hot spot' broadband local access points to national and international Internet infrastructure. WiFi start-up costs are lower and its installation more flexible than other broadband options because it uses unlicensed radio spectrum and relatively low-cost, easily-installed, compact, and low-power equipment. This makes it ideal for use in areas with economic or physical difficulties in establishing a wired infrastructure, such as developing countries and rural and remote areas in developed countries. Although a basic WiFi antenna can operate over a distance of up to only about 300 metres, this coverage can be extended.

WiFi's advantages have enabled an enormous number of 'hotspots' to be established around the world since 2001. They cover an enormous variety of contexts and locations: urban and rural, small local communities and cities, developed and developing countries, homes and classrooms, offices and cafés, remote villages, small islands, farms, college dormitories, coffee bars, airport lounges, trains, etc. (e.g. see www.personaltelco.net and Wireless Internet Institute at http://www.w2i.org). The introduction in 2003 of WiFi-enabled Intel Centrino technology into laptop computers boosted the popularity of this technique.

WiFi reconfigures access in important ways other than its ability to provide cost-effective Internet access to more people in more locations than was possible previously. For instance, its potential for changing your communicative power is highlighted by its wide adoption by a libertarian grassroots movement, similar to that which gave rise to the Internet and PCs, which is committed to developing 'community wireless' capabilities that remain open to all and keep any barriers to access as low as possible (e.g. www.wirelesscommons.org; www.freenetproject.org). WiFi also enables individuals and small groups to become their own Wireless Internet Service Providers (WISPs). WiFi could complement or compete with established wired and wireless telecommunications, thereby changing the rules in the broadband supply game in ways that could reshape parts of the telecommunications industry.

Source: Adapted from Dutton et al. (2003: Box 2)

ease, speed, and costs of gaining access to people, services, information, and technologies wherever they are located. These changes lead to notions of distance, time, and control that have important psychological implications in altering our perception of what 'proximity' or nearness actually means.

This is apparent with the Internet, which supports patterns of reconfiguring access that are distinctly different from the printing press, the telegraph, or the

Box 4.5. International charging arrangements for Internet and telephony

With traditional voice telephony, the country in which the call terminates charges the countries from which international calls originate, normally through a set of bilateral agreements. This has become a significant proportion of the general revenues of developing countries. For Internet use, however, costs are generally borne by ISPs in the developing country, with users paying local rates if they dial into a local ISP. If VoIP becomes so popular that it is used to replace a substantial proportion of international telephone calls to developing countries for business purposes or from emigrants and their families living in developed countries, income to the developing world could be reduced significantly.

On the other hand, the high rates charged on international telephony was one factor allowing the continuation of relatively high local telephony charges in developing countries, often without the extra revenue being used to build up a sustainable, cost-effective local telecommunications market. The rationale for suggesting that developing countries should introduce more competition and reduce telephone pricing is based on the longer-range benefits of increasing the use of telecommunications and computing in ways that foster economic development.

Source: Dutton et al. (2003: 40)

telephone. The Internet enables you to keep in regular contact with people in distant locations anywhere in the world and to have information delivered to you wherever you have a device with appropriate access. That sense of ICTs being in touch with your life wherever you are is heightened with broadband. By putting you online at high interactive speed whenever your PC, 3G cellphone, or other mobile device is switched on, broadband allows immediate and spontaneous 'natural' interaction with a virtual world of people and other resources as if they were actually in physical proximity. Such interaction is being enhanced continuously by a stream of innovations, such as WiFi, that extends local broadband access points into ever more locations.

Changes in control as well as distance and time are also affected by ICTs, as indicated by Innis (1972 [1951]). This can have dramatic implications both for democratic and community processes and for the structure, size, location, and competitiveness of business and industry throughout every sector of the economy. The reconfiguring access perspective reveals how the strategies and choices of users, governments, regulators, and content and service providers

will decide whether these technical capabilities will support greater democratic empowerment or more centralized direction, more competition or greater concentration of industrial and economic control.

For example, the information superhighway and Internet visions were based on an egalitarian vision of anyone getting access to any information, anywhere, at any time. Such visions have indeed led to a reconfiguring of communicative power in many democratic directions. This supported notions that the Internet and other new media would enable more diversity and competition in the provision of services. On the other hand, the management strategies of some corporations see ICT infrastructures as offering efficient and effective centralized administration and control mechanisms for extending the boundaries of their markets across the globe. In the case of the Internet, for example, there is early evidence that the provision of infrastructures and services is becoming more rather than less concentrated (Noam 2003).

4.3.3 Restructuring the architecture of networks

The architecture of a technical network often reflects the social and institutional forces shaping it. An interesting historical case is the resistance to the introduction of the electric telegraph in France in the late eighteenth century because it introduced two-way dialogue into a domain that had been conceived entirely in terms of a 'vertical' one-way monologue, which had been supported by the more technologically-limited visual telegraph (Box 4.6). A centre-to-periphery vertical pattern of power distribution is also seen in mass media where a small group controls one-to-many broadcasting or publishing channels.

The telephone and Internet are based on architectures that allow regular 'horizontal' information flows among individuals and organized groups whenever they want to communicate, which has led them to be seen as potentially more 'democratic' media (Laudon 1977: 16-17). The ease with which the Internet can support relatively simple one-to-one, one-to-many, many-to-one, and many-to-many horizontal networks of communication can be of particular value in the developing world as a complement to, not a replacement of, mass broadcasting media. Peer-to-peer networks where users can share files directly without going through a hierarchy of coordinating and

Box 4.6. Social and political influences on the development of the visual telegraph in France

Frenchman Claude Chappe invented the visual telegraph in the 1790s. It was constructed as a series of towers that radiated from Paris to the rest of France. Initially built in response to military needs, each tower had gates, with high walls and guards to protect those who operated the movable arms used to relay coded messages by line-of-sight. The towers employed illiterate operators to further safeguard the security of messages that were encoded and decoded by specialists located at the end of each line.

The first line of telegraph towers was constructed between Paris and Lille, a financial centre northeast of Paris. By 1844, over 500 towers spread out from Paris to reach 27 cities. In 1856, roughly six years after the electronic telegraph was opened to the French public, the last visual telegraph tower was dismantled.

The longevity of the visual telegraph in France owed much to the way its centralized design reinforced the highly centralized administration of the French state. Not only did central government authorities restrict access to this medium to official uses, but its design enabled the central authorities to communicate easily with the provinces at the same time that it made it difficult for the provinces to communicate among themselves.

Source: Attali and Stourdze (1980)

controlling computers is a further example of the democratic potential of ICT-enabled communication.

Even if Internet use is generally low in a particular country, development and economic officials and experts from government and non-government organizations can still use the Internet to great effect as a means of communicating with one another and sharing information resources across national and geographical boundaries, such as in the provision of health or economic development information. The Internet will not replace radio as a means for reaching the broader public. However, it can enable governmental and NGO staff to improve the information they are able to broadcast because of their increased collaboration and sharing of information with similar staff in other countries and regions. Business and industry in developing countries also need good quality local access to international ICT networks to become players in international marketplaces.

4.3.4 Creating or eliminating gatekeepers

Technological change can also alter the crucial role of those who act as gatekeepers within communication pathways by determining who has access to what kinds of information, from which people, and the relative priority given to different information. In organizations, the secretary was once the prime gatekeeper who screened and prioritized calls for an executive, but this role became less common as e-mail and other forms of electronic communication increased. An illuminating example of the diverse personal, business, and technological factors that contribute to the reconfiguring of access by the elimination of a gatekeeper is provided by the development of the first automatic telephone switch (Box 4.7).

Box 4.7. Diverse factors shaping the Strowger automatic telephone switch

In the late nineteenth century, Almond Strowger was an undertaker in Kansas City. In the course of running his business, he became incensed by the delays, rudeness, and negligence of telephone operators. He became convinced that one operator, the wife of a competing undertaker, was diverting business to her husband by falsely reporting the Strowger's line as being 'busy' when prospective customers rang him up.

His determination to eliminate human operators from the network led him to invent and build the Strowger Automatic Telephone Exchange, which was demonstrated as the first of its kind on November 3, 1892. This enabled a caller to use a finger-wheel dial (later replaced by the push button phone) to make a call without the help of a telephone operator. It had important consequences beyond just gains in the technical efficiency of the service. For instance, whether by accident or design, the anonymity of automatic switching contributed to the privacy and simplicity of a phone call, thereby making it a more appealing service.

Source: Dutton (1999: Box 3.4)

A crucial role is obviously played in the mass media by gatekeepers such as editors, journalists, media owners, television and radio station managers, movie producers and distributors, and film and theatre directors. They decide what is news, who is interviewed, what stories are told, how different points of view are presented, and who and what is shown, heard, and published. ICTs

can radically alter or eliminate these roles. For example, the Internet provides a myriad of news and opinion outlets from both large corporations, old and new smaller enterprises, and individuals or special-interest groups. Digital broadcasting makes possible the provision of a very large number of television and radio channels to cater for a huge range of specialist interests, such as in supporting Queensland University of Technology's Youth Internet Radio Network (YIRN) in its development of facilities for young people in rural areas that help them create and run their own radio stations over the Internet (http://cirac.qut.edu.au/yirn/). Desk-top publishing software allows for high-quality print production at relatively low costs, even for one or a few copies of a publication.

This shift away from a pre-digital era where there was a relative scarcity of communication channels gives audiences more choice in the sources from which they can choose if they have the knowhow and resources to do so. For instance, access to the Internet, satellite TV, DVDs, and video cassettes can provide alternatives to a global electronic culture dominated largely by English-language, western-oriented media. It can also be a means of bypassing national legislation and attempts to censor open communication. If you are visiting, working in, or have emigrated to a culture outside your own, these media can help you to get news, watch films, and listen to music relating to your own local traditions, which could be very different to that of the rest of the society in which you are based at the time. In the 2003 war in Iraq, many people in western countries also found that such access to Arab-based news sources, like the television station Al-Jazeera and personal Web diary of the 'Baghdad blogger' (Pax 2003), were important complements to western media for obtaining more diverse perspectives on the War's context and reaching their own conclusions.

A notable example of how the Internet can be used to bypass traditional media gatekeepers to enhance citizens' direct access to information was provided in 2003 at the UK government's Inquiry led by Lord Hutton into the circumstances surrounding the death of the chemical and biological weapons expert Dr David Kelly. During the course of the Inquiry, documentary evidence was published on a Website (www.the-hutton-inquiry.org.uk) that became the most popular site in the country. This included many e-mails between: ministers and their civil servants and advisors; TV executives, news editors and journalists; and even experts in, and close to, government

intelligence services. Direct public access to such information had previously been unusual in the UK.

However, a proliferation of new communication channels and flood of e-mails and other electronic information flows can become overwhelming. This has re-created the need for information and communication gatekeepers who can be trusted to filter, prioritize, and select information. Some of these will be people, such as personal assistants, deputies, information analysts, and communication experts, who can present you with complex information in accessible ways. An expanding range of automated gatekeepers are also becoming available: Web browsers to help you search for information; spam and other e-mail filters; 'knowbots' that search and filter using AI techniques that can be tailored to learn your particular requirements; graphical presentation software; and specialist Websites and e-newsletters offering summaries and pointers to more details of a product, service, or information.

An awareness of the possible biases introduced by relatively new ICT-based gatekeepers is important in understanding how access is being reconfigured. For instance, a graphical presentation product can impose implicit limitations on the kinds of information that can be used and the options for displaying it. Computer models often embed explicit as well as hidden – even unintentional – biases in their underlying assumptions and therefore in the conclusions we draw from them (Dutton and Kraemer 1985). The experience at a naval command headquarters with a new decision-support system illustrates wider human and organizational implications of changes in information gatekeeping (Box 4.8).

4.3.5 Redistributing power between senders and receivers

Technological changes affect the balance of communicative power between the producers and recipients of communication. For instance, the way automatic switching technology allowed telephone calls to become anonymous shifted power to the person calling, as the receiver would always be inclined to answer a call in case it was important. With answering machines and 'caller identification', where the number of the caller is displayed on the receiving phone, the advantage shifted back to the receiver in terms of power over which calls to answer. However, unwanted spam e-mail

Box 4.8. Organizational implications of an ICT-based decision-support system

During a period when it was not engaged in active conflicts, a naval command headquarters kept ready for war operations by holding daily briefings for the commander, chief of staff, and deputy chiefs in a 'decision room' that included television and large screen projections of a variety of information. Although the chief-of-staff began to feel more frequent meetings would be necessary in a crisis, he recognized it would then be impractical to bring together senior staff more often. A computer-based information system was therefore developed that could provide similar information via online audio-visual presentations to workstations on the desks of the commander, chief-of-staff, and most deputies. This allowed the commander to consult particular deputies as necessary, rather than waiting for daily briefings.

This reconfiguring of access to information was implemented successfully from a technical point of view but fell into disuse over time. One of the key reasons for the eventual removal of the system was its role in reconfiguring the gatekeeping role within the organizational network. Previously, the deputies had known what information was being provided by their staff to the daily decision-room meetings, and could even 'engineer' likely questions from the commander by leaving out certain details. In contrast, the new online system was updated many times a day and was instantaneously accessible from any authorized workstation. As a result, if the deputy had been otherwise occupied recently, the commander might be seeing the latest information before, or at the same time as, the deputy. This left deputies often surprised and embarrassed by the problems revealed.

Gradually, the deputies ordered their departments to withhold input data from the decision system until it had their approval. This restored a strong gatekeeping role to the deputies, but it also lessened the value of the information, for example because it was no longer current. The introduction of the new system also seriously disrupted crucial trust-building in the organization that had been centred on the daily briefings.

Source: Summarized from Baskerville and Land (forthcoming).

is an example of the how the technology can also enhance the power of senders in undesirable ways (see Box 4.9).

Although the Internet was created by a culture promoting openness and freedom of expression, it can also take away anonymity in ways that reconfigure communicative power towards those who wish to monitor and control communication, as with e-mail (Box 4.10).

Box 4.9. The significance of spam

'Spam' is the term given to unsolicited e-mail, equivalent to 'junk' advertising mail sent through the post. Although some spam similarly contains advertising material, it is also a common way in which 'spammers' send more threatening material. For example, spam can include computer viruses that damage the recipient's computer system and data when unintentionally activated by a user, for example by opening a document attached to the e-mail.

Viruses can also generate even more unwanted e-mail by getting the recipient's system to send the original spam message to its own e-mail address list, which can overwhelm a particular Website or the Internet in general if sent in large enough quantities. Much spam contains explicit sexual images or links to sites containing this kind of material. Mass spamming is also used by financial cybercriminals, for instance by setting up a fraudulent Web site (see section 1) or to ask for money for a fictitious but possibly plausible reason such as the need to fund arrangements for the payment from a will after the death of a supposedly distant relative in a foreign country.

Spam filters and firewalls can help to reduce spam, but they might also block wanted mail by mistaking it for spam. The term 'spam' was taken from a song in the British comedy television programme *Monty Python's Flying Circus,* which indicates the kind of anti-establishment cultural roots from which much invention on the Internet is derived, for better and worse.

4.3.6 Controls over content and freedom of information

The proliferation of global electronic links opened by ICTs has added an important new dimension to traditional concerns about who controls (or frees) the content and access to communication and information channels. The reconfiguration of access enabled by these new digital choices challenge fundamental social and political notions of freedom, control, personal responsibility, and shared community values.

You can now use electronic ICTs to 'travel' beyond national boundaries to gain instantaneous access to multimedia sources in almost any country. This is seen as a major advantage by those who believe in open societies with diverse communication and information sources. However, the banning or restriction of traditional printed information or terrestrial broadcast channels could be implemented relatively easily by national governments. As indicated earlier, a number of countries have taken such actions, for instance by filtering

Box 4.10. How technical design choices have affected e-mail uses

E-mail was designed in the 1960s on the basis of an agreed standard that required the 'header' at the start of every e-mail message to identify the person sending it, the recipient, the date sent, and the subject. Much debate focussed on the kinds of information that should be incorporated in an e-mail message, decades before most of the public had any understanding of the coming age of e-mail. Eventually, key decisions were driven by analogies with business memorandums typed on paper. For example, the developers chose to include options for sending 'carbon copies' and 'blind carbon copies' by creating the CC and BCC commands, even when the notion of a carbon copy is absurd in an electronic medium.

This standard also implicitly creates a documented trail, which was also common to business communications. These identifiers created opportunities for abuse, such as by changing an address to appear to be from someone else. Increasing public revelations of private e-mails may cause some shift to undertaking key communication only through face-to-face conversations and other methods that are less likely to be monitored. However, most professionals and managers increasingly understand the need to take precautions against the ways in which e-mail can reconfigure access to communications in ways that go against their interest, in order to take advantage of the substantial benefits to them from using this service.

Internet content, limiting or banning the use of particular browsers, or blocking satellite TV channels (Zittrain and Edelman 2004).

However, enforcing wide and effective access barriers or content censorship on the Internet is much more complex than with traditional media because the sources are spread around the world and may be difficult to identify. Many users have also gained communicative power through their expertise in exploiting the technology to find loopholes through any censorship controls, for example by using special encryption codes to make it difficult to interpret what is contained in a digital message or hacking into computers to reveal protected information deemed by the hacker to be in the public interest.

A sense of loss of control over ICT content can be exacerbated by unrealistic user expectations about the effectiveness of virus checkers, 'firewall' software guards, and other technological protection mechanisms.

When a person's computer system is infected by a virus or there is news of a hacker break-in, it could then seem that all controls are irrelevant. Such an extreme view is not justified as encryption, anti-virus software, and other techniques can do much to lower the risk to a system's security and operational stability. Users can also exercise some control through systems like the 'V-Chip' in televisions to bar films rated as being too violent or 'net nanny' software that can facilitate parental control over the kinds of Websites and content their children are allowed to access from home PCs.

Nevertheless, computer hackers and spammers are motivated to continue to produce new viruses or spamming techniques that are a step ahead of current protection products, and many children have the expertise to bypass any automated controls. Protection can also be provided by legislation that takes account of new technology. This is often effective only if it is part of coordinated global action, such as that involving multinational police initiatives against Websites used by paedophiles. However, coordinated action has been slow in coming for anti-spam legislation beyond a few countries where its effectiveness is problematic. Moreover, some security efforts can undermine valid and welcomed communication and information exchange, for example when a spam filter makes a mistake by discarding an important personal e-mail together with unwanted messages.

Many parents also look towards the providers of content and Internet services for protection against unwanted information and images, while many in the media and Internet communities regard the use of screening devices as undesirable censorship. The ability to program different priorities into filtering and control software, such as blocking pornography or particular political or religious views, again indicates that technical capabilities intertwine with public policy and personal objectives in a diverse ecology of games that reconfigures access to people, services, information, and technologies.

5. Inventing our futures: the social factors shaping outcomes of digital innovation

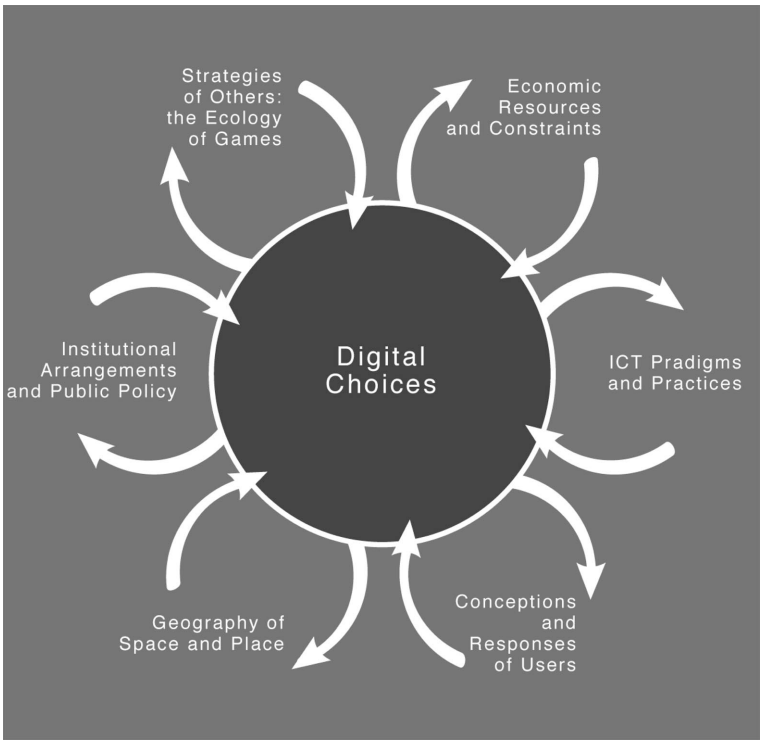
The above discussion explains why outcomes from the reconfiguring of access are unpredictable, although the choices made concerning ICTs and their social implications are not random or unstructured. Patterns of access, such as the distribution of information 'haves' and 'have-nots' across digital divides, are enabled and constrained by the complex social and economic contexts within which relevant actors at all levels make choices. Interactions between outcomes from different contexts also shape these patterns. The main factors facilitating and constraining these digital choices can be categorized roughly along the six dimensions summarized in Figure 5.1 and discussed in the following subsections.

5.1 Economic resources and constraints

The size, wealth, and vitality of nations, companies, and other actors place major constraints on the development and use of ICTs in all arenas of activity. At a personal level, the options for using ICTs to gain more communicative power are far greater if you are a successful ICT-literate professional than a single-parent family with few ICT skills living on a low income. And if you are living in a developing country in a remote village without access to clean water and a school, let alone a telecommunications line, you will have less opportunity than either of these.

Reconfiguring access can also improve or undermine the economic vitality of a nation, business, household, or local community, thereby enhancing or exacerbating socio-economic disparities. For example, the dominant telecommunications provider for Jamaica was able to use its control over the only cable communications link from the island to restrict broadband supply capacity and favour its own vertically integrated ISP while driving others from the market (Dutton et al. 2003: 39–40). A senior official from the Jamaican Office of Utilities Regulation says this placed serious constraints on Jamaica's ability to use broadband to help meet its need for substantial economic development (ibid.).

Figure 5.1. Social factors facilitating and constraining digital choices



Adapted from Dutton (1999: figure 5.1)

5.2 ICT concepts and practices

Ideas, perceptions, theories, and ways of thinking and working associated with ICTs can become the foundation of powerful belief systems or 'paradigms'. These create a way of interpreting reality that is very different from that perceived by people whose thinking is embedded in another paradigm (Dutton 1996). Experience and knowledge about ICTs can influence or even create a paradigm change, for instance in the information society's perception of the overall shift of work from manufacturing to services.

The notion of the 'virtual organization' was one of the ways foreseen by the information society in which innovations in the structuring of organizations

and work would emerge, for example by allowing new patterns in the location of offices, factories, and employees. New approaches have also been explored for engineering business processes within a company, and between a company and its suppliers and customers through ICT-based innovations in e-business and e-commerce online transactions. Similarly, educational policies have been adopted in many countries, local areas, and institutions with the aim of developing virtual education and learning environments that employ the Internet and other ICT-mediated techniques to reconfigure how, when, and where teaching takes place, students learn, administrators manage, librarians work, and so on (Dutton and Loader 2002).

The ways in which ideas like the information society shape views about how the world works and, thereby, influence the decisions of individuals, firms, and governments is a major reason why alternative perspectives on the role of the Internet in society, such as the reconfiguring of access, are more than competing theories. They are also ideas that can shape how actual decisions are taken by all members of society in their different roles.

5.3 Conceptions and responses of users

The views and responses of a wide variety of users, workers, consumers, managers, citizens, audiences, etc. also play an active role in shaping the implications of ICTs, often in very different ways from those expected by simply extrapolating from the perceived potential of the technology. Misconceptions of the user can therefore lead to market failures, as happened with the pre-Internet democratic vision of the 'wired nation' based on interactive ICTs (Dutton 1999: 70-86).

This vision of the wired nation was propelled in the mid-1970s by visionary enthusiasts of interactive ICTs (e.g. Smith 1972). In the US, they associated two-way cable TV and other new media capabilities becoming available at the time with President Lyndon Johnson's agenda for social action, known as the 'Great Society'. This convinced the US Federal Communications Commission to remove regulatory barriers to the development of cable TV, despite risks to the existing broadcasting industry (Dutton, Blumler, and Kraemer 1987). The market failure of interactive cable TV and increasing use of satellite one-way TV undermined the credibility of this vision at that time. However, essential elements of it if not the specific technology advocated then

are now being more closely approached through the Internet and other modern ICTs. This illustrates the danger of failing to take account both of technological realities (not just potential) and the social forces shaping outcomes.

The reconfiguring access approach also underlines that users' roles are not confined to being passive recipients of whatever is targeted at them. Much motivation for the development of PCs, the Internet, WiFi, open-source software, and other technologies has come from users with the skills and motivation to design and build their own systems. The explosive growth in the use of text messaging on mobile cell phones, for example, was driven largely by teenagers who discovered the value of this technique for themselves, although the providers of the systems had originally expected this short message service (SMS) capability would be used primarily for business communication.

The enhanced role of users has been most dramatically illustrated since the turn of the century with the growing discord over Western values and media that has become more visible through the new media, such as in the filtering of content across national borders (Zittrain and Edelman 2003). While the world was long ago pronounced to be a global village, so much communication was one-to-many that Western producers were able to make many false assumptions about the warmth of its reception abroad. People can now more easily talk back to producers in the world of online and interactive communication, as ICTs have reconfigured the relative power of senders and receivers.

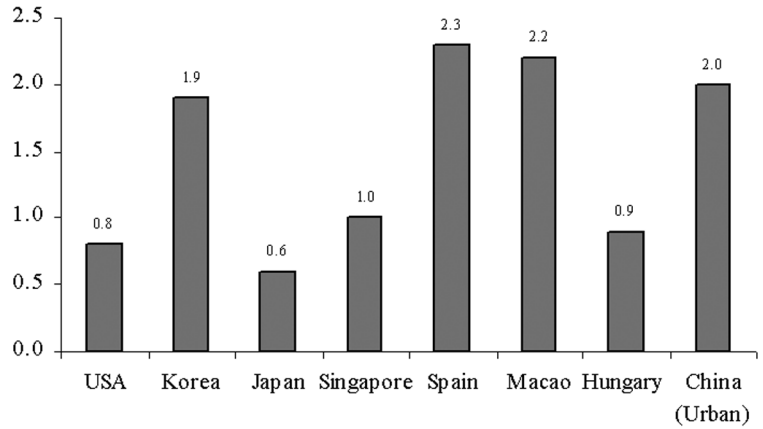
5.4 Time, space, and place

A key reason why the Internet has proved to be such a popular communication medium, even for just sending e-mails, is the relative ease with which it can be used to overcome constraints of time and distance. Although this has led to predictions that spatial and time considerations will therefore become increasingly irrelevant, there is evidence that counteracts such assumptions. For instance, new significance is being given to some locations as a result of ICT deployment, for example by opening up new options for locating call centres, technical support offices, and other services that can be delivered online (Cornford and Gillespie 1999). The Internet has

also not led to a replacement of valued face-to-face meetings or a widespread interest in travelling to meet people.

Users of the Internet can even create 'virtual communities of interest' that encourage people to travel to meet those they first contacted online, with whom they might never have been in touch without access to Internet-enabled interactions. Survey research of the World Internet Project found that users across the globe are likely to make one or more friends online that they will later meet in person (Figure 5.2). When people travel, they can remain in close touch with work, family, and friends through e-mail and other online interactions. At the same time, multimedia ICTs enable many meetings involving participants in multiple locations to take place without travelling, such as through teleconferencing. These varied, sometimes contradictory, possible outcomes again demonstrates the importance of understanding how ICTs reconfigure access in multidimensional and interacting ways, rather than seeing new technological capabilities following a predictable course in providing an alternative means of doing specific tasks.

Figure 5.2. Average number of online Internet friends met in person



Source: http://www.worldinternetproject.net/

Business processes and work opportunities are being reconfigured on a global scale by the ability of the Internet and other networks to assist in the

efficient management of global enterprises and for enabling small local businesses to tap into global markets through e-business links. This can bring significant advantages for many enterprises and their employees, but some local employment opportunities could be reconfigured out of existence if it becomes more desirable for companies to make a rapid switch in the location of a call centre or other e-enabled facility to a different part of the world in order to take advantage of lower wages, costs, or other factors.

5.5 Institutional arrangements and public policy

Much institutional innovation and the formulation and implementation of public policies are tied to social and technical choices. The design of internal organizational structures and processes, as well as interactions between enterprises, can be radically re-engineered by taking account of digital ICT capabilities. Digital choices also strongly affect many areas already highlighted, including institutional arrangements and policies related to ICT developments that affect freedom of information or censorship, telecommunication regulation, IPR, cybercrime, and education. The policies formulated to cover such areas need to be responsive to technological change and its potential for social transformations at all local, national, and international levels.

The changes required in national and international telecommunication regulation exemplify the profound and complex issues raised by ICT innovation. This is indicated by the US Federal Communications Commission (FCC) Notice of Proposed Rule Making (NPRM) issued in March 2004, which aims to gather evidence on which to base a major review of regulations relating to the use of the Internet. In introducing the Notice, the FCC (2004) commented that, as a global network, 'the Internet has transcended historical jurisdictional boundaries'. It noted that customers are beginning to substitute Internet-enabled services for traditional telecommunications, such as the use of VoIP instead of telephone calls through the Public Switched Telephone Network (PSTN) and viewing content over streaming Internet media instead of broadcast or cable platforms.

The way in which VoIP reconfigures access and communicative power compared to traditional telephony illustrates the digital challenge faced by regulatory institutions and public policy makers. The PSTN was designed to

be logically and physically hierarchical, with highly-centralized signalling and switching technology for transmitting two-way voice conversations. This favoured monopoly ownership, either by the state or a dominant private company. In its 2004 Internet NPRM, the FCC (2004) recognizes that much of its regulation of telephony was rooted in seeking to control monopoly ownership. In contrast, VoIP makes use of the Internet's 'flatter' distribution of network intelligence to permit highly dynamic and flexible routing that is not characterized by the same monopoly conditions as telephony.

When VoIP services were beginning to make an impact in the late 1990s, the FCC (1998) decided that they should not be subject to telecommunication regulations when they involved computer-to-computer operations as they should then be considered as a computer application at a similar level to software. It indicated that other forms of VoIP, such as telephone-to-telephone with VoIP in the middle, could look more like a telecommunication service, but recommended that each such case be treated on its particular merits. For example, Pulver.com's Free World Dialup service offers free peer-to-peer Internet-based phone calls between its members, with calls established and managed by the members' devices and transmitted via their existing broadband links. When the FCC initially went out to consultation on a petition from Pulver.com asking for Free World Dialup to be exempt from regulation as a telephone service, the only strong objections came from the FBI and Department of Justice as they were concerned that their telephony surveillance rights might not be applicable to VoIP (Dutton et al. 2003: 34). This which illustrates again how the interplay between different 'games' can influence crucial outcomes from the reconfiguring of access.

Although technical issues like VoIP are a key concern of regulatory authorities around the world as they examine the implications of digital convergence, high priority is also generally given to understanding related changes in the social dimensions traditionally covered by telecommunication rules, such as the provision of a universal telephone service, access for people with disabilities, consumer protection, emergency calls, law enforcement access for authorized 'wiretapping' purposes, and consumer privacy (e.g. FCC 2004). For instance, a Universal Service Obligation (USO) on the monopoly telephone supplier was a prime regulatory mechanism for guarding against a 'tele-divide' and to ensure equitable access to this crucial communication medium.

A USO requires the supplier to provide a telephone service throughout the area it serves, although 100 percent coverage might not usually be achievable. USO subsidies are generally provided to support suppliers in meeting these obligations. This approach fitted well with the hierarchical structure of the PSTN, which essentially delivered just a voice service that could be easily and clearly defined as a minimum obligation. This kind of USO is not directly applicable to the more open, distributed structure of Internet-enabled communication as it offers a wide and diverse range of multimedia services that depend on the availability of links of different bandwidths.

Regulatory authorities around the world are currently exploring new ways of achieving social and economic goals. For example, the provision of an effective and widely-available broadband infrastructure is generally seen as a social and economic necessity, although there is some dispute about the precise definition of a minimum acceptable broadband speed (Dutton et al. 2003). The focus on the digital choices of individual actors in the reconfiguring access framework also indicates that an important universal-service policy option in the more complex environment of Internet-enabled services could look at supporting specific groups of disadvantaged users, such as the low-interest loans for broadband infrastructure to rural areas provided by the US Department of Agriculture, or by subsidizing institutions like schools and libraries to fulfill a public mandate to help close digital divides by widening broadband Internet access and developing the human capacities to use that access successfully.

5.6 Strategies of others: the ecology of games

As explained earlier, the struggle for communicative power using ICTs takes place in a variety of arenas at the same time, with outcomes emerging from interactions among the multiplicity of players in the many different games in each arena. This can be illustrated by the games related to the provision and use of broadband Internet capabilities (Table 5.1).

Table 5.1 Illustrative Games Shaping Outcomes Tied to the Use of the Internet and related ICTs

Game	*Main players*	*Goals and objectives*
Economic development	Governments, public agencies, investors.	Players build ICT infrastructures to attract business, investment, and jobs to localities, nations, and regions.
Developing country	Governments, NGOs, local activists, investors.	Players seek to close social as well as economic divides in developing countries by the appropriate use of suitable ICT infrastructures.
Communitarian	Neighbourhoods, community groups, Internet enthusiasts.	Individuals and groups seek free or low-cost, open access to the Internet, sometimes competing with commercial users or providers.
Telecommunications regulations	Telecommunications firms, regulators, investors, consumers.	Regulators umpire moves of competing firms, taking account of conflicting and complementary goals of players.
Broadband suppliers	Traditional telephone companies using DSL, cable TV firms, wireless and other vendors.	Suppliers compete for shares in a market, where frequently DSL and cable vendors have been the main broadband players winning lines into homes and offices.
New-media publishing	Media giants versus Internet entrepreneurs; media novices versus professionals.	Established and emerging producers of Internet content compete to reach audiences.
Consumer protection	Consumers, consumer groups, suppliers, regulators.	Legislators and regulators respond to competing views of the consumer's interests in ICT provision.
E-games	Pro/anti e-enablement players in government, business, education, etc.	Organizations put their vitality at stake through over/under investment in online infrastructures and applications.
Copyright, digital rights management	Content providers versus consumers and ICT industries; regulators.	Telecommunications firms, media industries, and users compete over interpretations of rights in access to information and services.
Implementation	Users, ICT product and service suppliers, consultants.	Users struggle to implement and maintain ICTs in order to reap the potential benefits.

Source: Dutton et al. (2003: Table 4).

The many players and interests with a stake in games illustrated in Table 5.1 include: local and national governments; broadband policymakers and regulators; telecommunications suppliers offering different technologies and services (DSL, cable, WiFi, satellite, etc.); suppliers of Internet, television, voice, and other services via broadband; community groups and individual citizens living in urban or rural areas, developed or developing countries; business enterprises and their employees and customers who wish to use broadband; commercial multimedia content providers; free-access public content providers; consumers of content; Internet service providers; and many, many more. The behaviour and decisions of all actors affect those of other actors.

For example, some suppliers are seeking to package a mix of television, telephony, and Internet services to attract many individual households to decide to connect to its service. That is how the FastWeb network in Italy achieved one of the highest average revenue-per-user returns among consumer broadband services in Europe in 2003 (Dutton et al. 2003: 20). However, some consumer protection groups could object to this kind of packaging on the grounds that this might give undue power in the long-run to one or a few giant corporations. This occurred in 2003 when two major US consumer groups – the Consumers Union and the Consumers Federation of America – petitioned the Federal Trade Commission and US Justice Department's antitrust division to investigate cable pricing structures that tie together TV and Internet services (see www.consumersunion.org).

In some countries, a multimedia issue like this would involve a number of regulatory games within and between different institutions responsible for different media; in others, just one regulator covers many old and new media, such as the UK Office of Communication (Ofcom) formed in 2003 to cover telecommunication, broadcasting, and print industries. Certain governments have a strong general anti-monopoly agenda with legislative backing, although ICT multimedia convergence makes it harder to define the precise boundaries of ICT and media marketplaces within which one player can be said to be over-dominant. Other countries see these industries as being either part of an economic game that is best left to market forces or, conversely, place them under state control. The goals set for regulators will obviously vary according to the particular political and economic policies being pursued.

Broadband Internet could change the rules of some media games, for instance through the outcomes from the continuing attempts to build new forms of integrated multimedia operations by exploiting technical digital convergence. It can also open up new roles for those who have been communicatively empowered by broadband access, as when media consumers become media producers by setting up Websites offering their own news and discussion forums.

6. Reconfiguring access in major economic, social, and political arenas

In order to further illustrate the reconfiguring of access tied to ICTs, this section focusses on six particularly important arenas: education, development, business, governance, everyday social life, and media industries.

6.1 Education, learning, and knowledge development

ICTs like the Internet can support research and education – the development of knowledge resources – which in turn can support the further development of ICT infrastructures in a virtuous cycle (Castells 2000). Although knowledge is a key resource, the idea of a 'knowledge society' could be misleading for educators, politicians, and other policy makers if they conclude that the technology actually creates knowledge. Instead, policies should recognize the value of ICTs primarily as carriers that can play a vital role in reshaping access to knowledge and expertise. Table 6.1 outlines some ways in which students, teachers, researchers, and others learn and gain knowledge with the support of ICTs, for example via networking, that facilitate student-teacher communication, student-student dialogue, parent-teacher contacts, and collaboration among researchers across space and time.

The extent to which such innovations find productive applications in education and knowledge generation will depend on institutional and policy responses to new ICTs from relevant institutions at all levels. For instance, the vision of a 'virtual' university or classroom based on the use of networked ICTs that eliminate the need for students to be physically present on a campus or in a classroom has been an important influence on e-learning initiatives (Dutton and Loader 2002). The British Open University was one of the pioneers in the 1970s of the underlying 'distance education' capability of a virtual university, initially primarily using television, print, and audio media to complement face-to-face meetings. Newer virtual universities have started with courses centred around the Internet, such as the Jones International University (www.jonesinternational.edu).

However, virtual classrooms remain the exceptions, with most ICT-based products and services being used to explore new approaches to education and learning within traditional educational institutions at all levels (Dutton and

Table 6.1. Interrelated roles ICTs can play in access to learning and education.

ICT role in reconfiguring:	*Examples of activities*
Access to people	– Networking between students, teachers, external experts, parents, and others in the community. – Collaborative research projects. – Institutional networking among administrators.
Access to services	– Packaging and distribution of educational products and services. – Breaking down distinctions between producers and users of educational content. – Facilitating routine transactions, such as Internet access to a course prospectus and online registration.
Access to information	– Searching, screening, and downloading multimedia content. – Drill and practice software with personalized and immediate feedback. – Visualizing and learning-by-doing through interaction with animation and other media
Access to technology	– Learning about ICTs through routine exposure to the technology and its uses. – Using ICTs to improve learning and education. – Providing wired and wireless broadband access in classrooms, offices, on-campus cyber cafés, research laboratories, student dormitories, etc.

Loader 2002; Guttman 2003). There are educational software packages designed to engage students through new forms of collaborative interaction, such as the Kar2ouche system that employs multimedia animation in collaborative role playing to assist learning about Shakespearian plays, operas, history, science, and other school subjects, including citizenship topics like drugs awareness and respect for diversity (www.kar2ouche.com). Many schools also have computer or multimedia laboratories that assist students to become educational content providers as well as consumers, for instance by

creating audio or video recordings with older residents in the community for use in local history lessons. In addition, universities around the world are using institution-wide virtual learning environments (VLEs) to manage and deliver e-learning resources for students and teachers at real universities (e.g. see www.blackboard.com; www.webct.com; http://bodington.org/index.html).

A key factor constraining the introduction of more innovative learning processes is the lack of consensus around the educational approaches that could best exploit the new technological capabilities. Education cultures throughout the world generally involve teaching in the manner that the instructor was taught: typically using a traditional one-to-many teaching paradigm based on 'chalk and talk' class lectures and discussion. This is entrenched in most institutional cultures and assessment and reward processes. Traditional teaching approaches are also often designed into VLEs and other e-learning products. Many are even sold using analogies to what teachers already know, in order to make the system's functionality more understandable.

It is therefore not surprising that e-learning products and services are used primarily to support traditional teaching and learning strategies, as clearly demonstrated in an investigation into the use of a VLE in a US university (Dutton, Cheong, and Park 2004). This case showed that the virtual learning environment was used largely as a replacement for the copy machine and projector, without changing the underlying approach to teaching and learning. A few professors and students used the VLE for more interactive discussion, remote access to the instructor, and virtual study groups. One group of computer-science students even took the initiative to gain access to the system for personal group discussions and research. But these were the exceptions, not the rule.

It takes time for teachers to break old habits and discover for themselves what advantages, if any, a new learning technology brings to their work and the performance of their students. However, students who have grown up with the technology are often more comfortable with using it in novel ways. Moreover, an ecology of digital choices can yield outcomes that reconfigure access in unanticipated ways. For example, in classes where most students have access to their own PCs or laptops, many might be engaged in downloading slides and checking course information on the VLE, searching

related Websites, working on their own papers, instant messaging, and e-mailing their colleagues – all while being more or less attentive to the teacher and classroom discussion. This multi-tasking can put the student in the centre of a many-to-one network, but challenge the teacher running the course, even though some instructors might enjoy and encourage the multiple simultaneous activities, while others feel a loss of control over their students' attention and activities.

A leading international business school brings business executives and managers from around the world to their Switzerland campus where they have state of-the-art meeting rooms and lecture halls (http:www02.imd.ch/). While their lecture hall enables students to access the Internet in a multimedia classroom environment, the instructor can also throw a switch to close access to the outside world. In many respects, this approach recognises the value of being able to control access, giving the teacher relatively more communicative power as a gatekeeper, when and if the teacher believes students need to stop multitasking.

Such ICT-enabled changes to the dynamics of the classroom are redrawing the borders of educational institutions. This could encourage independent learning and/or lead to a widening of knowledge gaps between students who start at different levels of capability, personal efficacy, and motivation in relation to the use of ICTs. These innovations are challenging the role of the teacher in regulating access to course materials inside and outside the classroom. This suggests an urgent need to identify and understand the teaching and learning approaches that are likely to make the most effective use of the new choices made possible by ICTs. For instance, some educationists advocate a policy of using ICT support to enable teachers to move more towards a role of facilitator or coach, rather than lecturer or authority. Others insist that ICTs should be used in ways that complement traditional teaching strategies, such as through lectures, discussions and tutorials. In many respects, this is a debate centred on the role of teachers as gatekeepers who shape access to information and expertise, as well as on the role of students in reconfiguring their access to their instructor(s), course materials, and other learning resources.

6.2 Economic and social development

The availability of appropriate ICT infrastructures and associated human capacities is closely associated with the rate and nature of economic development, including the ability of specific localities, nations, and regions to attract investment, business, and jobs. Some claim that economic development supports the development of ICT infrastructures, such as telecommunications, while others claim ICT infrastructures spur economic development. Most researchers assume that the effects go both ways in a virtuous cycle (Gillespie and Cornford 1996).

For example, the Commission of the European Communities (2001) concluded there is a broad consensus based on statistical evidence that ICTs increase productivity growth rates. The Net Impact Study (www.netimpact-study.com) estimated in mid-2003 that the Internet will account for 0.43 percentage points of the future increase in US productivity growth, and had already contributed cost savings of €9 billion and increased revenues of over €86 billion in Europe. While such causal claims exaggerate the precision and confidence in these estimates, they provide some indication of the order of magnitude of the significant consequences ICT infrastructure can have on the course of economic development.

6.2.1 Resolving the productivity paradox

No technology as complex as ICTs, however versatile and cost-effective it may be, can be guaranteed to bring about a successful economic or social outcome simply by having it or using it. Achieving the objectives of an ICT innovation requires making associated social and organizational innovations, which take longer and require more political will and commitment by individuals and groups than that involved in acquiring new equipment and systems. This was highlighted in the 1980s when many researchers became puzzled because economic growth rates slowed throughout industrialized countries, at a time when the computers that were expected to boost productivity began to be widely used in offices and factories. That became known as the 'productivity paradox' because higher investments in ICTs were not being matched by the expected productivity gains (Freeman 1996*b*).

It took some years before tangible evidence of 'bottom line' business profits gained from ICTs began to emerge. This was partly because microelectronic

and Internet-supported capabilities had improved and matured to a point where they eventually met the performance predictions that had often been prematurely over-sold in the 1970s and 80s, for example in visions of the 'paperless office' and 'peopleless factory of the future' (Dutton 1999). Crucially, the maturing of ICT advances were matched by growth in the personal, social, and organizational capacities needed to understand, manage, use, design, and implement appropriate systems for sustainable progress in productivity, innovation, and creativity. Developing countries need to take account of this common pattern of innovation diffusion with new technologies when considering the social and institutional changes required to realize the full potential from using ICTs to try to close economic and social divides.

Freeman (1996*b*) describes this pattern as the emergence of a 'techno-economic paradigm', such as the new forms of automated factory production lines that characterized the industrial revolution or the more recent emergence of the ICT paradigm of the information society. In the initial gestation period of a new paradigm, the main emphasis is on technical rather than organizational innovation, although the two can never be entirely disassociated. As the technology matures and new key factors become universally and cheaply available, the most significant problems relate to the diffusion of the new paradigm from the leading-edge sectors to the economy as a whole. The emphasis then shifts to organizational and social innovation, although technical change continues to be important even during this phase of structural adaptation and adjustment. When the social-technical mismatch has been overcome and the social and organizational problems largely resolved, institutional factors may move from largely containing and limiting diffusion to becoming forces for encouraging and reinforcing a further wave of technical innovation. A significant level of access to ICTs is therefore essential to any country or enterprise wishing to be viewed as a serious player in the world of business and industry.

6.2.2 Seeking a virtuous economic development cycle

The most productive nations and firms generally continue to invest larger proportions of their resources into ICTs, which brings them advantage through greater levels of productivity. This helps to establish a 'virtuous cycle' in which benefits gained from the technology help to create the human, social, and financial capacities needed to continue progress in the discovery

and exploitation of technological innovation. On the other hand, nations and regions that cannot afford or decide not to pursue greater access to ICT technologies and knowhow can find themselves in a 'vicious cycle' of decline. The desire to move from a vicious to a virtuous cycle has spurred many developing countries, and the NGOs supporting them, to develop and implement policies aimed at using the technology to assist in the creation of sustainable social and economic development (e.g. see Digital Partners 2003; www.developmentgateway.com; www.unicttaskforce.org; http://info.worldbank.org/ict).

Understanding how to invest successfully in ICTs for development requires researchers to move beyond simple correlations between investment and productivity to examine actual mechanisms of successful innovation. Many of these enable the creative building of new levels of imaginative access to people, services, information, or technologies. For instance, a low-tech approach was adopted by the Grameen Village Phone initiative, which provides women in villages in Bangladesh with small amounts of 'micro credit' to earn a living from 'micro enterprises' using mobile phones for 'public call office' services (www.grameen-info.org).

Given the lack of advanced telecommunications infrastructure in most developing countries, projects seeking to bring more advanced capabilities like broadband to these areas are increasingly using wireless networks because they are much easier and less costly to build than wired alternatives (Wireless Internet Institute 2003). The Sustainable Access in Rural India (SARI) initiative, for example, offers wireless ICT-based multimedia kiosks to assist poor villagers in Tamil Nadu to access health, agricultural, and other services, in addition to bringing economic benefits to local kiosk owners and ISPs (www.medialabasia.net). In the Xixua -Xiparin Ecological Reserve in the Brazilian Amazon rainforest, a solar-powered wireless network brings Indians in the area improved access to healthcare, education, and economic opportunities (Wireless Internet Institute 2003: 47-50). Even bicycle-pedalled power has been used for a WiFi wide-area network connecting five remote villages in Laos to the outside world (www.jhai.org).

Wireless networks are of great value in times of emergency or periods of national or regional rebuilding. Wireless broadband links helped Wall Street firms to recover communications rapidly after the September 11 tragedy in

New York City (Noll 2003). After the war in Kosovo in 1999, Internet Project Kosovo (IPKO) launched a wireless broadband network to assist communication among humanitarian agencies and provide ICT training and support to local people (www.ipkoinstitute.org). The Afghanistan Virtual Embassy offered Web-based assistance to the country's economic and diplomatic officials as they re-established relations with other countries after the NATO-led action in the country in 2001 (www.asiafoundation.org). There are also a number of worldwide networks that can assist locally-implemented projects, such as in the provision of healthcare information, advice, and technological knowhow (www.healthinternetwork.net) and to support innovation in African education (www.schoolnetafrica.org).

6.3 Management, business, and organizational change

Managers and business leaders have used technology to enable the transformation of business processes, the workplace, and the geography of the firm using technologies that enable more mobility and flexibility in the organization and location of work. This kind of reconfiguring of access through ICTs is of profound significance to all organizations because it challenges many conventional organizational and business structures and practices. For instance, ICTs question the need to share much information by co-locating people at particular workplaces, or to locate managers close to subordinates to monitor and supervise employees' working practices.

6.3.1 Emergence of the virtual organization

By helping to overcome many constraints of time and distance, ICTs offer managers new choices for the deployment of creative, administrative, management, production, and distribution resources and processes that move away from traditional organizational structures. Many executives have used this ability to free the enterprise from some traditional constraints to re-engineer business processes and organizational responsibilities. This has made possible, for instance, the creation of global corporations that use business processes based on worldwide ICT networks to gather up-to-the-moment information, performance data, sales statistics, customer feed back, and competition analyses as the basis for making timely decisions about the location of employees, factories, offices, and other resources.

One new ICT-enabled organizational form that has offered a fresh vision for business executives is the deployment of electronic networks to support virtual organizations that 'do not need to have all the people, or sometimes any of the people, in one place in order to deliver their service' (Handy 1996: 212). Such a virtual enterprise could integrate business processes encompassing people working for many different groups within and outside the company, increasingly through direct online interactions with suppliers and customers. Boundaries of the organization and the units that comprise them are becoming so permeable that a unit in a firm today could be replaced by an outside contractor from another part of the world tomorrow. On the other hand, the same ICTs have been used to facilitate the growth of large integrated firms.

The now-common notion of a call centre is a phenomenon that grew in the 1990s because of the new organizational choices created by ICTs. These centres use advanced telephony services made possible by computer-controlled exchanges, such as allowing customers to make a local-rate call to a centre however far away it is located. Computer databases and ICT networks that span the globe can also put customer and service information at the fingertips of call-centre agents. The global scope of call centres has created some new criteria for locating employment, for example in areas with appropriate multilingual skills for supporting an international customer base. The centre's ICT infrastructure can enable an agent in a different country to the caller to access a computer to get accurate information of local interest to that caller, such as a telephone number or train time.

The economic development opportunities created by such capabilities have been taken up in India, the Philippines, China, Malaysia, and other developing countries with the necessary skills and relatively low local wage rates that make centres sited in their regions highly competitive with their equivalents in industrialized countries. There has also been a recognition that providing a successful call-centre service requires more than technical skills. Training is therefore given to call-centre staff to help them understand the cultural background and language nuances of the areas from which customers call, in order to avoid misunderstandings. In the long-term, however, much call-centre work could be replaced by the trend to giving customers online access to automated support services via the telephone or Internet, thereby automating call-centre processes in a similar way to which factory automation

replaced human labour. Voice recognition technologies, natural language processing and related artificial intelligence systems are being designed for such purposes.

This indicates why a move to a new organizational form enabled by ICTs requires careful consideration of relevant social and organizational contexts, as these are crucial to harnessing new technical potential to meet overall corporate objectives (see Table 6.2). For instance, internal 'intranets' and inter-organizational networks like the Internet can support a 'networked organization' that enables managers to develop new connections as individuals, generate more communication across, up, and down the organizational hierarchy, and create opportunities for new gatekeepers between the 'online' and 'real' worlds. For many enterprises, the virtual organization can be a valuable approach to reconfiguring access to reach new markets, open new channels to current customers, transform existing products and services, and innovate in entirely new areas.

Amazon.com was one of the first companies to make an impact using a radically new Internet-based retail organizational form when it opened a bookstore on the Web in 1995 that allows anyone who enters it through the Internet to choose from millions of books on its 'virtual shelves'. Since then, many other firms have used e-commerce processes for selling a variety of products and services, either exclusively online or to complement physical 'walk-in' stores. New forms of auction-based pricing have also been developed by online Internet-based enterprises.

Banking and other financial services can now also be undertaken online, for example through an online bank account that allows you to make payments and undertake other account actions directly through the Internet. Broader e-business systems also create ICT-based networks to connect electronically the supply chain between companies and their suppliers, which allows for new kinds of strategic partnerships with certain suppliers and customers. New forms of alliance can be forged with firms in other industries, for example by banks providing automated services in supermarkets and other retailers. The flexibility brought by ICTs also allows firms to move into completely different industries, as with supermarkets offering their own financial and banking services.

Table 6.2. The virtual organization: a cultural, organizational, and technical vision

Organizational innovation	*Possible objectives*
Networking through ICTs	– Change business processes to take advantage of the Internet and other ICT networks. – Substitute electronic media for physical files and face-to-face meetings to encourage more efficient sharing and gathering of information. – Use ICTs to complement face-to-face communication to build cohesion and trust.
Restructuring to a decentralized network of companies	– Employ networks to re-engineer and evolve structures of communication, within and outside the organization. – Emphasize horizontal coordination across functional, divisional, and company boundaries. – Create jobs that span formerly separate functions and locations.
Building a team culture of trust and responsibility	– Devolve authority and initiative. – Encourage workers to operate as trusting and cooperative team players. – Place high value on learning, change, and reorganizing to be responsive, rather than emphasizing rules, procedures, and hierarchy.

Source: Adapted from Dutton (1999: Box 5.1)

Table 6.3 highlights some of new virtual routes for organizing work, business processes, structural units, and interactions with allied organizations. Virtual organizations open strategies for transforming a firm's business processes in a variety of ways, such as by reducing the number of employees ('downsizing'), using external contractors for specific tasks ('outsourcing'), or turning specialist groups within an organization into 'spin off' independent organizations, some of which could then be used to do work for the original firm through a form of outsourcing. Outcomes from such organizational re-engineering depend on how communicative power is reconfigured within the ecology of games in specific intra- and inter-organizational contexts. One result of outsourcing could be to create more flexibility and lower costs, but

Table 6.3. Dimensions of change in organizational forms tied to ICTs

Organizational form	*Operational aims*
– Intra-organizational: vertical control	– Decentralize to less hierarchical control over decisions. – 'Flatten' hierarchies by eliminating middle-management layers. – Reduce proportion of administrative support staff and costs. – Decrease formalization of behaviours and job requirements.
– Intra-organizational: horizontal coordination	– Organize work groups by electronic workflow, not physical location. – Establish 'concurrent engineering': simultaneous design by distributed teams. – Implement production systems such as Just-in-time (JIT) to minimize the need to store components near to production facilities.
– Internal and external resource balancing	– Cut anent staff numbers (downsize), including a reduction in the number of hierarchical layers in the organization structure. – Outsource activities to external contractors or to a 'spin off': a once-internal unit that has become an independent enterprise. – Establish a 'federated' organization by decentralizing within a centrally-coordinated framework.
– Inter-organizational Coordination	– Forge new inter-organizational relationships, such as through e-business links in the supply chain. – Build strategic alliances across industries to share information or networks. – Experiment with new forms of linkage, for example 'coordinating associations' of a number of enterprises.

Source: Adapted from Dutton (1999: Box 5.10)

another could be increased inefficiency and disruptions to working processes if the outsourced skills and capabilities were at the core of the firm's operations.

New virtual structures for managing the changing geography of the firm by creating more autonomous units could lead to greater vigour through local empowerment and entrepreneurship or to anarchic inter-unit rivalry that could lead to different parts of the organization following diverse and often incompatible paths. Virtual organizations are most likely to succeed within what has become known as a 'learning organization' culture that promotes cooperative team work at all organizational levels among individuals and groups who each have a great degree of local autonomy. This approach emphasizes the need for continuous learning and change, as its involves the ongoing creation, disbanding, and recombination of teams in new projects and strategies. Incentive systems based on team performance have been developed to encourage this culture.

6.3.2 New ways of organizing workplaces

Working conditions in some call centres have been criticized for re-creating some of the oppressive working processes and practices that had been typical of much production-line automation. These had been strongly influenced by the American industrial engineer Frederick Winslow Taylor (1911), whose *Principles of Scientific Management* provided a foundation for managers seeking to improve the efficiency of production processes through technological innovation and systematic analysis. This perspective advised managers to break down a production process into its component parts and then allocate the tasks to more specialized workers, which proved to be effective in work allocation along the automobile assembly line pioneered by the Ford Motor Company in the early twentieth century. Detailed 'time and motion' studies of these routinized process were carried out using continuous observation and measurement of how long people take to do specific tasks. This data then formed the statistical basis for determining how certain tasks could be speeded up or eliminated.

A similar emphasis on routinization and measurement remains prevalent in many working environments where advanced ICTs offer capabilities for accurate automated performance and task control, for example where com-

puters guide call-centre agents to follow a 'script' on the screen in responding to customers, as well as automatically recording how long it takes to deal with a customer and how many minutes and seconds the agent is actively working. This has led to staff and trade union dissatisfaction. In some cases, excessive monitoring has been counter-productive for the business. For example, staff at a centre providing a directory enquiry service to UK-based telephone subscribers were paid on the basis of the number of calls they dealt with in a given time. In order to keep their income high by dealing with as many customers as possible, agents began to respond very quickly to caller queries but were actually giving them a wrong number. This is one recent illustration of how professionals, office staff and factory workers have long been adept at circumventing technical fixes to management and workload problems.

One key difference between Taylorism and the approach adopted from the 1980s in business process re-engineering through ICT networks is that scientific management stressed efficiency, while re-engineering methods often place greater emphasis on the responsiveness of an organization to its customers and the quality of the work environment, including local 'empowerment' of staff and managers (Handy 1997).

6.4 Public and political arenas

ICTs are enabling governments to change the ways in which they function, including how they communicate and interact with their citizens, which provides many new opportunities for reconfiguring who gets access to politicians and governments as well as who politicians and governments can reach with their own messages. Citizens are also able to employ ICTs to reconfigure access to individuals and groups to discuss issues, organize campaigns, and seek to influence public policy. The specific objectives of such activities vary greatly, but generally revolve around two main aims. One is the use of ICTs to implement major 'e-government' improvements in the support of administrative services (e.g. budgeting and personnel), decision-making (e.g. using analyses to inform policy-making), and in improving the speed, efficiency, accuracy, and effectiveness of delivering public services, often by emulating techniques that have been well proven in the private sector. The other is to develop 'e-democracy' capacities and infrastructure that employ the technology to bring government closer to citizens and to encourage broader, more active participation in decision making.

6.4.1 E-government: electronic delivery of public services

Institutions of governance have evolved through decades of negotiation and bargaining among conflicting groups and interests, which made them quite resistant to structural and technological reform in many past attempts to modernize government at all levels by making it more 'businesslike'. From the 1950s to the 1970s, the focus of computing and telecommunications in government was on ways to support internal administrative operations through budget, accounting, and other management information systems from which citizens expected to derive indirect benefits (Kraemer, Dutton, and Northrop 1981). These efforts have continued with new database and networking technologies resurrecting early visions of comprehensive management information systems for the organization as a whole. Since the 1980s, however, a growing number of government agencies around the world have placed more emphasis on employing ICTs such as the Web to offer new ways of delivering services electronically, with the aim of achieving improved administrative efficiency, more responsive services, and other benefits, such as when Santa Monica in California initiated an 'electronic city hall' in the late-1980s, called the Public Electronic Network (PEN) (Dutton 1999: 184-85).

Online e-government service initiatives have become common in many countries with an appropriate telecommunications infrastructure, for example in the completion and payment of income and other taxes (Margetts 1998). In other contexts, different kinds of ICT-support are also proving to be of great value. For instance, as part of its long-term programme of reform in government, the south Indian State of Kerala initiated in 1996 the development of a Fast Reliable Instant Effective Network for Disbursement of Services (FRIENDS) in an effort to provide centres offering IT-enabled over-the-counter payments for over 1,000 types of public-sector bills from many different departments, including power utility bills, local property taxes, trader licenses, income tax, vehicle registration, university exam fees, and telephone bills (Madon 2003). Rather than forcing citizens to make payments to separate departments, which can be time consuming for citizens and administratively inefficient, Kerala and many other governments have sought, to paraphrase futurist John Naisbitt, to put citizens in the centre of a network of government services.

Table 6.4. ICT-enabled delivery of public services: potential benefits and threats

Potential benefits	*Potential threats*
Lower administrative costs and management overheads.	Apparent savings in some activities offset by increased inefficiencies elsewhere, including additional costs of implementing and maintaining ICT systems.
Improvements to health, education, welfare and other services through the reallocation of staff and other resources from administrative to 'front-line' activities.	Any savings from ICT-enabled efficiencies seen as primarily cost-cutting initiatives; poorly designed and implemented ICT systems lead service deterioration.
Faster, more accurate responses to, and processing of, citizens' requirements.	Reduction or removal of important face-to-face contacts.
More convenient access to public services from any location, including remote areas, during more times of the day (and night).	Over-centralization of services resulting in less local flexibility to meet specific local requirements.
Multiple public services available from 'one-stop' public service centres, multimedia kiosks, and other ICT-based access points.	More integrated databases and cross-referencing between government departments used for increased unwarranted or illegal government surveillance and control.
Wider and simpler access to all levels and kinds of government information through Web portals, document and form downloading via the internet, etc.	Putting information on the Web is given more priority than improving the quality, range, usefulness, and openness of public information.
Facilitation of government-government and government business interactions.	Government not able to keep up with ICT innovation and investment in the private sector.
Reduction of fraud in public services.	New openings for cybercrime, creating a requirement for new public cyberpolicing.
Enhanced emergency procedures (e.g. for floods and earthquakes) using ICT-based monitoring and coordination control.	Catastrophic failures caused by accidental or deliberately-induced failures of vital ICT capabilities.
Making feasible innovative products and services, such as charging traffic entering cities to reduce congestion and pollution or biometric checks for airport security.	Use of innovative ICTs against the interest of many citizens, such as invasion of privacy and censorship of information and free speech.

Table 6.4 summarizes the kinds of benefits sought from such ICT-enabled government service delivery initiatives around the world. It also highlights how the unpredictability of outcomes from such reconfiguring may actually make processes in some areas less efficient and pose threats to civil liberties. This two-edged potential emphasizes the importance of ensuring public policy anticipates and keeps pace with the trends and options opened by ICT innovation. The trust that is essential to e-government services must also be established, for example by providing assurances about equity in access to the services; the availability of alternatives to electronic access; the privacy and security of personal information and communication; and the maintenance of other civil rights threatened by new electronic capabilities.

6.4.2 E-democracy: reconfiguring participation in political processes

The more extreme visions of a 'point and click' e-democracy based on channelling more political and government activities through ICTs, such as by online voting and electronic welfare payments, is regarded as too high a risk to established political processes by most strands of political opinion in countries with a strong democratic tradition anchored in the representation of citizens by elected and appointed officials. At the same time, ICTs are recognized as having the potential to play an important role in reconfiguring communicative power through the creation of a more politically informed and active public. The power shifts associated with ICTs could therefore follow a number of routes, depending on decisions made at all levels of the political process. These can be characterized by the perspectives in Box 6.1.

As discussed earlier, the Internet, telephone, printing press, and photocopier create the potential for more democratic, horizontal communication among people – what Blumler and Coleman (2001) have called a 'civic commons'. ICTs can also enhance democratic involvement in more vertical communication process, as in the 'tele-democracy' experiments in European cities such as Barcelona and Vienna (Kinder 2003) and e-consultations that seek to provide online information and consultation between a city's authorities and its citizens (Coleman and Gotze 2002). Table 6.5 highlights potential benefits and threats from e-democracy initiatives. Important criteria for evaluating the implications of ICTs on political processes in the long term will be to assess the degree to which the technology enables new sorts of communities, cultures, languages, and opinions to be heard and listened to by more people.

Box 6.1. The politics of ICTs: competing perspectives

- *Democratic technology*. ICTs seen as inherently democratic in ways that will undermine hierarchy and centralized control.
- *Technocratic élite*. View that the increasing centrality of advanced ICTs brings advantages to technical experts ('cybercrats') that will enable them to exercise greater autonomy and control over decisions.
- *Economic élite*. ICTs regarded as being driven by military and industrial needs, with public preferences manipulated by marketing and technical experts accountable to large multinational corporations.
- *Reinforcement*. ICTs seen as malleable resources that are most often controlled by the dominant coalition of interests within an organization or society, reinforcing the prevailing power structure of a political system.

Source: Dutton (1999: Box 7.1)

Technological change in governance could be used to widen citizens' democratic participation, or – if poorly implemented – deepen inequalities in access in ways that further distance the public from government and politicians. In democratic countries concerned about declining trust and confidence in politics and politicians, ICTs could be a reinvigorating force. The placing of fresh communicative power in the hands of more people and special-interest groups contributes to efforts aimed at bolstering human rights and the development of more open societies. For instance, the Bangladesh Human Rights Network promotes the interests of marginalized communities (www.banglarights.net) and the Associación de Cabildos Indóígenas del Norte del Caucia (ACIN) telecentre is run by indigenous Paeces people in Cauca, Columbia to support human rights and the peaceful resolution of disputes in ancestral land (www.inforcauca.org/quilichao). Information is not power, and communication does not solve all problems, but incremental shifts in communicative power are not irrelevant and have had demonstrated impacts on political campaigns and movements around the world.

On the other hand, the same technologies could be used to violate human rights and reinforce anti-democratic forces, as highlighted in Section 1.2.1 (see also Selian 2002). The worldwide mobilization of anti-globalization campaigns to coincide with key economic and environmental meetings of global organizations has illustrated the potential communicative power

Table 6.5. E-democracy: potential benefits and threats

Activity and media used	*Potential benefit*	*Potential threat*
Group discussions via Internet forums and bulletin boards, voter guides, e-mail, instant messaging, blogs, CDs, video, film, PC-produced publications, community broadcasting, and other new media.	Global access to a wider range of viewpoints and experiences to facilitate democratic engagement by enabling access to new information and social networks, often across previous social and geographical divides.	Removes vital face-to-face communication cues; fragments communities; marginalizes and drowns most sources in a flood of information, without respected gatekeepers to filter misleading or extremist views.
Rapid group mobilization via e-mail, mobile cellphones, instant Internet messaging.	Encourages more people to engage in political activities, facilitating horizontal, pluralist citizen-citizen networks.	Encourages the rapid mobilization of anti-democratic forces, or flash campaigns to block policy.
Controls on spam, access to Web sites and other content	Protects children and others who are vulnerable from undesirable content and contacts, such as pornographers, paedophiles or hate groups.	Increased censorship, citizen monitoring, and control by the government, police, and other public and private agencies.
Interactive voting and polling via the Internet, digital TV, text messaging.	Stimulate more informed and active participation in political debates and policy formulation.	Expressions of public opinion biased by unrepresentative e-voters, and an opening for new threats, such as government management of public opinion and fraudulent votes and polls.
Government, public agencies, NGOs and politicians using all ICTs to inform, communicate and consult with the public.	Reinvigorates democratic processes by opening new relationships between citizens and their representatives.	ICT innovation not matched by necessary related policy and legislative innovations to protect and promote freedom of speech and other civil rights.

afforded by ICT networks for better or worse, depending on your political point of view.

6.5 Everyday life in the community and the home

ICTs play a central role in many people's everyday lives, on and off electronic highways. In addition to various old and new communication media, there are numerous 'smart' consumer and household products incorporating much computing power in the form of unseen micro-chip controls, such as mobile cellphone handsets, microwave ovens, heating controls, and automobiles. Many people now naturally tune to the Internet to send e-mail and instant messages to friends to make and change arrangements, book a concert or airline ticket, exchange digital photographs, find answers to a quiz question, and an almost endless array of other social activities. The dynamics of local communities can therefore be strongly influenced by social and technical choices about ICTs that open and close gates to different future pathways in ways that could bring people and communities closer together or isolate individuals and exacerbate divides in communities.

6.5.1 The influence of media and significance of ICT literacy

An early perspective of social research on ICTs evolved after the Second World War from studies of propaganda and the political implications of mass media in influencing public opinion. Many enduring models of media influence emerged from this, such as the role of journalists, publishers, and other media gatekeepers in setting the agenda that shapes which issues are prioritized and whose voices and opinions are heard most widely in public debates. Such media research generally focussed on the contents of messages in the media and their influence on those exposed to them, directly or indirectly. However, McLuhan's (1964) foresight that 'the medium is the message' revealed that the ability of a medium like television to reconfigure access was more significant than whatever message was being conveyed, and that the medium shapes and controls the scale and form of human association and action through this reconfiguration.

These concepts have been applied to new digital media, for example in examining the interactive character of digital TV and online news to

determine whether their interactivity makes them more engaging, and thereby more powerful in shaping attitudes, beliefs, and values. The ICT-inspired profusion of different media and channels is also challenging the very idea of 'mass media' because the one-to-a-few and one-to-one 'narrowcasting' of digital media could erode previous shared experiences based on traditional one-to-many broadcasting and publishing. A growing digital divide could therefore open between those with access to a multitude of new digital media and those who still rely on what might become increasingly impoverished traditional broadcast media.

This kind of role in opening and closing divides within society has a long history. For instance, Johann Gutenburg's invention of the moving-type printing press in the fifteenth century was the trigger for the democratization of printed texts and wider political processes, as the growth in education accelerated the spread of literacy in many countries. However, illiteracy continues to be a major cause of social division and disadvantage as it can result in an inability to read crucial textual information on the Web or understand user interfaces to software applications. This is the case not only in countries with overall low literacy rates, but also within sections of advanced industrialized cities and regions, either through the poor education of some citizens or where there are large minority-language communities, as in Los Angeles, California.

In a similar way, ICT knowhow or proficiency what some called IT or ICT literacy has become a critical capacity because it supports uses of the technology that can enhance a person's communicative power significantly. This has led to a wide range of initiatives across the world offering access to ICT experts, training, information, and technological support. These are being provided in a variety of ICT-based facilities, from cybercafes and telecentres to public libraries and educational institutions (Delgadillo, Gomez, and Stoll 2002; Digital Partners 2003). For example, the ASAFE project offers technology training to underprivileged women and young people in Cameroon (www.asafe.org) and Enable Ireland helps Irish people with special needs to improve their quality of life through technology (www.ednableireland.ie). In the UK, the People's Network of ICT learning centres is based on linking public libraries to the Internet (www.peoplesnetwork.gov.uk).

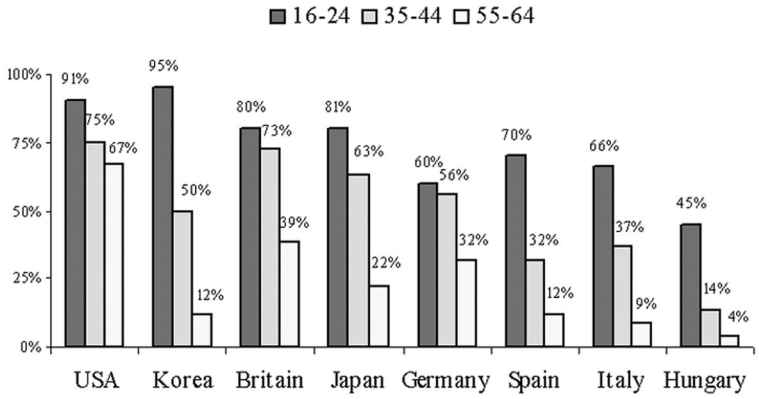
6.5.2 The domestication of ICTs

The household is a complex social, economic, and political arena that illustrates how different contexts affect the use, diffusion, and significance of innovations. Like other technologies, ICTs emerged in public spaces in which their meanings have been initially defined by the designers, engineers, regulators, and others who create the market for new technologies and services. But once the innovations move inside the household, a 'domestication' process occurs as consumers and users seek to gain control over their newly-acquired objects. As Silverstone (1999: 251) explains: 'Domestication involves fitting and fixing the new into the familiar and the secure, moulding their novelty to the needs, desires, and culture of the family or household.'

In this process, consumers try to incorporate new technologies and services into the patterns of their everyday lives in ways that maintain the structure of their lives and their capacity to control that structure. This creates a tension between the transformative potential of the technology and the evolutionary demands of family, household, and society at large. Within households, it also leads to a struggle 'as parents and children, male and female, the computer expert and computer illiterate or semi-literate seek to manage space, time, and technologies without losing position and identity in the complex and uncertain politics of age and gender in the home' (ibid.).

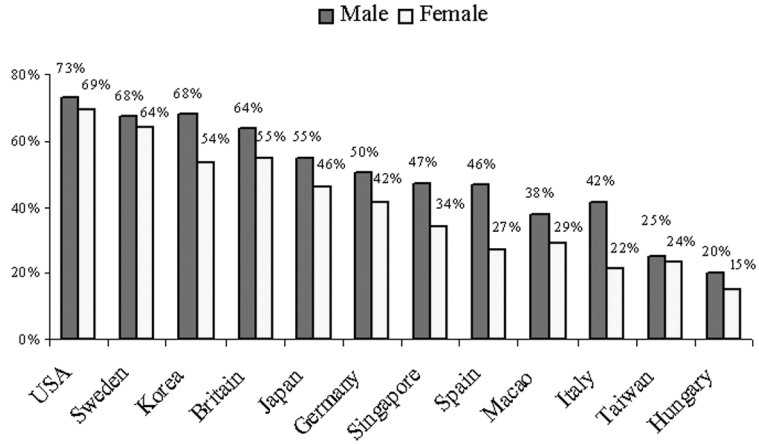
Figures 6.1 and 6.2, together with Figure 1.2 earlier, illustrates that this reflects wider social divides, which many of the initiatives highlighted earlier are seeking to bridge. For example, age is a major factor underpinning access to the Internet across a wide range of countries (Figure 6.1). This cannot be explained by income or economic barriers alone, as it also reflects different cultural attitudes toward technologies. Elder people who do not use the Internet, for example, are among the more distrustful. Elders who have experience using the Internet are among the more trustful, which leads me to argue that the Internet can be viewed as an 'experience technology' (Dutton and Shepherd 2004). Likewise, a digital divide persists with respect to gender, even if this gap seems to be narrowing in wealthier nations (Figure 6.2). As with age, a gender gap is in part a matter of choice, not simply a matter of economic wherewithal, which has pointed researchers to focus more attention on the social dynamics of what my colleagues and I call 'the digital choice'.

Figure 6.1. Internet use by age, circa 2003



Source: World Internet Project, see http://www.worldinternetproject.net/

Figure 6.2. Percent of males and females using the Internet, circa 2003



Source: World Internet Project, see http://www.worldinternetproject.net/

Conventional discussions about the diffusion of ICTs often neglect the degree to which households and the general public are domesticating ICTs by reconfiguring access to serve their own particular values and interests through their everyday choices in consuming ICTs sometimes by design, but often

inadvertently in the pursuit of other values and interests. Negotiating access is becoming increasingly important in many households, for instance in deciding where, when, by who, and for what purposes television is watched or a PC is used. Attempts to regulate access over, and through, ICTs include parental oversight on who their children are contacting via the Internet or mobile cellphone and what information they are accessing, with the assistance of tools like net-nanny software and V-chips in television sets. At more mundane levels, access to the television, video recorder, or DVD remote control and skills in using new digital media devices are matters of everyday domestic interplay and negotiation for many households, with children often being more skilled than their parents.

6.6 Media industries in the era of digital convergence

Reconfiguring access through new media has enabled new sets of content producers to reach new audiences, such as teenagers making Internet radio programmes and activists creating Websites as focal points for environmental or political movements. But it also allows large media conglomerates to consolidate and extend their power bases by gaining control over integrated multimedia services. The outcomes of these 'media games' could have vital effects on society, depending on decisions about how to open or close access to various communication media and channels.

The vision of technological convergence associated with ICTs has strongly influenced multimedia business strategies within media industries, such as the merger in 2000 between the leading Internet service provider and a multimedia news and entertainment giant. Some years before then, in the 1970s, newspaper owners had started to invest profits from print journalism into television, cable, and other media because they believed print journalism might not be a sustainable industry on its own. Some successful enterprises have achieved substantial gains by re-engineering many journalistic practices in multimedia newsrooms which eroded distinctions between separate forms of print, broadcast, cable TV, and online journalism (Shepard 2000).

ICT advances have greatly expanded the number of broadcast, narrowcast, and Internet-based communication services available to households, with broadcast services alone rising from a handful in the 1980s to the hundreds that can be delivered via cable and satellite services. This expansion was

given further impetus by the rapid growth of broadband Internet communication in the early twenty-first century, creating new opportunities for multimedia communication over a growing array of IP-enabled services. This has opened opportunities for gaining competitive advantage by creatively packaging many broadband services.

Although new media are used for local community and public-service purposes, the high investment needed to be an influential player in this arena means that control of the majority of channels lies in the hands of those firms with the economic resources to package and manage many channels across nations and regions. This has enabled these companies to achieve the economies of scale and scope needed to build the financial, creative, and marketing resources to trigger a virtuous cycle of growth and innovation, for instance by expanding the geographical reach of a company's market as well as its share of existing markets.

Mergers and acquisitions have been seen as a method of accelerating the development of such economies of scale. However, 'multimedia', 'convergence', and similar terms disguise important cultural and economic differences between print, film, music, broadcasting, telecommunications, and other traditional media enterprises. These could pose serious potential barriers to media-industry convergence, even if the technologies used are moving towards similar digital formats. Each industry has developed a distinctive approach to content production, distribution, relations with users, cultures of usage, organizational forms, and regulatory regimes. Their evolution has also been shaped by unique histories of cost structures and investments in financial, social, cultural, political, and technological capital based on a particular media-industry model (Garnham 1999*b*). The inertia resulting from these histories can exacerbate the general difficulty of changing organizational cultures, even if the re-engineering is being done by a strong management team.

Digital convergence is often destructive of jobs or old media, as was experienced among print workers in the 1970s and 80s in the move to computerized methods. At the same time, convergence has created new kinds of jobs in a variety of areas. For example, new multimedia have brought some artists into the computing field and attracted some ICT experts into the world of computer-aided design, electronic games development, and desktop pub-

lishing. In the film industry, ICT experts create computer-generated special effects and creative artists are learning how to animate their work on computers. These are examples of trends in ICT convergence towards a fusion of knowledge and industries generating many new alternatives, rather than on a single new converged digital communication medium.

7. Summary: policy for a connected world

This volume has provided many examples to illustrate how ICTs can be designed and used to transform access in the lives of people and the workings of government, business, and other organizations. It has argued that the processes underlying these transformations can be fully understood only by moving beyond the constraints of conceptions that underpin the notion of an information society, such as the primary importance of information as a new resource. And it has proposed the reconfiguring access framework to embrace the full range of personal, social, economic, and technical dimensions that are at stake in the transformations tied to ICTs.

7.1 The reconfiguring access framework

The growing centrality of ICTs to social and economic life is captured by the reconfiguring access perspective, which offers a new way of looking at the role of ICTs in relation to fundamental processes of social transformation. This encompasses and moves forward many ideas encapsulated by previous notions like the information society, knowledge society, and network society since each focussed only on a specific outcome of these processes. Such grand, macro-level social theories can be relatively weak guides to policy and practice, as their sense of historical determinism can lull individuals into accepting that social and technical change are driven by forces to which individuals must adapt.

A focus on reconfiguring access, on the other hand, stresses the importance of both the general overall trends and the real-world contexts in which micro-level choices are made and constrained. This realism can inform policy by helping to focus attention on social issues tied to patterns of adoption and use, such as concerns over equity across socio-economic, political, and geographic divides. It also indicates how the communicative power of individuals, businesses, and whole societies is affected by strategic choices in everyday activities, such as obtaining access to the Internet or a particular package of television channels, as well as in higher-level, longer-term government, business, and media strategies. Of course, decisions taken by the most politically and economically powerful actors on the global stage are likely to have stronger and more immediate impacts than those of individuals in their household. But it should be remembered that the Internet grew to its

current importance to a great extent through the contributions from numerous individuals who believed in the production and use of one-to-one, one-to-many, and other forms of communication other than the one-to-millions mass media.

The reconfiguring access perspective could make a significant change in the way we think about policy and practice relating to the use and design of ICTs because it offers new ways of thinking about personal, corporate, and governmental choices that affect outcomes in small and large ways. For instance, the concept of reconfiguring access avoids the image of individuals processing, storing, and transmitting information that is evoked by the information society. Instead, it is interested in phenomena like the amount of time individuals choose to look at a television, computer, cellphone screen, or person, together with the multiple strategies of ICT and new-media providers that seek to influence your real or virtual presence before particular screens or content.

These and other insights gained from viewing ICT-enabled social transformation from the reconfiguring access perspective have significant policy implications, as summarized in Box 7.1 and in the following subsections.

Box 7.1. Key policy implications of the reconfiguring access framework

- Long-term social transformations and outcomes unfold from unpredictable courses that emerge from, and are shaped by, the decisions of many actors in a complex ecology of games that reconfigures access to people, services, information, and technologies.
- A holistic view should be taken of all relevant social, economic, and technical resources (not just information or knowledge) and all forms of access (electronic as well as physical) when considering how ICTs can help to reconfigure access to meet personal, social, and economic goals.
- As there will be winners and losers from the changes in communicative power resulting from the reconfiguring of access, policy should seek to identify potentially negative as well as positive outcomes and address them using a recognition of how decisions at a micro level can affect macro outcomes as part of social transformation processes.
- The making of strategic decisions and formulation of policy affecting communication and information issues are likely to be most effective if they are treated as issues of reconfiguring electronic and physical access to a range of resources.

Source: Dutton (1999: Box 7.1)

7.2 Unpredictable outcomes from an ecology of games

Outcomes from the design and use of ICTs do not follow a scenario pre-determined by the technology, but flow along unpredictable courses shaped by the results of an ecology of games: a multitude of social and technical choices made by many people in a huge range of interrelated arenas, from the big-business games of global corporations and political power-plays of governments to the household politics involved in domesticating new ICT-enabled products and services. These choices are made by a wide range of actors as they pursue a diversity of goals and objectives other than ICT innovation. They do this in their various roles, such as teacher, consumer, parent, business executive, healthcare professional, call-centre service agent, public administrator, student, government minister, television producer, or musician.

In education, for instance, students typically pursue good marks or friendships. Teachers want to convey information and score well on evaluations. Administrators seek economies of scale to stay within budget. Parents want the best for their children. To some parents, that might mean an experience similar to their own. To others it might entail opportunities for using new ICTs in multimedia wired classrooms. Education policy-makers try to use curriculum guidelines and performance assessments to control, test, and measure progress. Few are interested in innovation *per se*, so their support is most likely to be mobilized if policies and practices aimed at using ICTs to improve educational opportunities clearly address the diverse goals of relevant actors and create opportunities for negotiation between them to try to resolve differences in their perceptions and claims.

A similar understanding of, and respect for, different views and goals is relevant in the arena of national security, as highlighted by response from many governments to the terrorist attacks on the US on 11 September 2001. For example, the US Department of Homeland Security was set up after these attacks to coordinate plans to guard against future threats. These include the use of biometric techniques and other advanced ICT capabilities that can identify individuals, such as in the checks on fingerprints and digital photographs in travel documents of visitors to the country as part of the US-Visits Program. Police and intelligence services around the world have also sought increased powers to intercept data, voice, and other communica-

tion on the Internet in order to enhance their ability to counteract the use of ICTs by terrorists.

Such policies pursue the major goal of a wide set of actors: preventing terrorist attacks by enhancing a nation's security. But other actors focussed on other objectives within the wider ecology of games could strongly disagree with many security measures. For example, pressure from citizens and groups who prioritize the preservation of civil liberties was a key factor in the implementation from the 1980s of data protection laws in many countries aimed primarily at protecting personal information held on computer databases; however, an attempt by the European Union in the early twenty-first century to improve the sharing of criminal and terrorist intelligence information among its member states has been constrained by data protection laws in some states, although there has been general agreement on the principle of gathering greater intelligence against global threats. The future balance of these sometimes conflicting goals and interests of security and civil libertarian values will unfold as the outcome of this ecology of games. However it is resolved, it is focussed on substantially reconfiguring access in a variety of significant ways that will change the relative communication power of different actors.

7.3 Using ICTs to meet social and economic goals

The reconfiguring access approach takes a comprehensive view of the most relevant influences, acknowledging that both electronic and physical access are intertwined and that the technology and the knowledge and expertise intrinsic to it still matters, despite the importance of social and economic contexts in shaping digital choices and outcomes. By illuminating the role of social choice in technological design and innovation, as well as in business, education, government, and all other arenas, this understanding shows why it is not possible to disentangle technological from social and organizational innovation. This is indicated by the way in which the regulation of an apparently technical area like telecommunication is interwoven with crucial social and economic goals (see Section 5.5).

The broad scope of this framework can help to resolve what has seemed to be a dichotomy in debates about the digital divide. ICT enthusiasts often suggest that the introduction of ICTs will automatically and directly improve

wealth, health, and social and personal well-being; others counter that providing access to more doctors, nurses, teachers, books, clean water, sanitation, and other real-world capabilities is more relevant to closing divides than access to ICTs. Thinking broadly about the ecology of choices reconfiguring access shows that this is a false dichotomy. It is possible to embrace the merits of both these views. Access to ICTs can be used strategically to close all other divides and vice versa.

The rethinking of access proposed here illuminates how divides between and within countries, regions, and households can indeed be closed by applying ICTs with the support of appropriate knowledge, skills, and other human capacities. It also points out that the design and use of ICTs can lead to new divides related to access to particular ICT-based knowhow, networks, equipment, and services. In addition, the emphasis on access to physical resources being as important as access through ICTs indicates that a key role of ICTs lies in helping to reconfigure access to non-ICT resources. This demonstrates that false dichotomies are being proposed in debates framed in polarized terms like computers versus books, broadband versus healthcare workers, and e-learning versus teachers. The key issue is not which type of resource should be dominant, but how different resources can complement each other in achieving a balanced approach to social and technical innovation.

Reconfiguring access is not a magical cure that will guarantee a successful outcome from any change involving ICTs. On the contrary, it is a new way of thinking about the social dynamics of ICTs and access that explains why it is difficult to influence outcomes in a chosen direction, let alone determine a particular course with any certainty. However, it does offer a framework within which it is possible to analyse and discuss in a structured way how certain decisions could lead to ICTs opening pathways that are more likely to achieve goals set by people, communities, governments, and businesses, rather than allowing a technological capability to be the dominant force in setting the agenda for change.

7.4 Winners and loses in battles over communicative power

The significance of the reconfiguring of communicative power through the use of ICTs was highlighted by a comment on the way the UK

government's inquiry headed by Lord Hutton had published its evidence on the Web: 'The open process of the inquiry means that all the evidence and the revelations, many of them extraordinary, about the innermost wiring of this government have been available for inspection on the internet by anyone who is interested. Any citizen can be his or her own Lord Hutton' (Rawnsley 2004). This vividly illustrates how the communicative power of individuals can be boosted by enabling you, or anyone else, to be at the heart of social and political networks from which you would otherwise be excluded. But the technology's two-edged impacts also mean that the ICT-enabled reconfiguration of communicative power could reinforce the influence of those who are already politically and economically powerful, or even create new power elites. The outcome will depend on the strategic choices made by people around the world.

Battles over redistributing communicative power will therefore shape important features of the emerging connected world. The unpredictability of the outcomes from such struggles means innovations in ICTs could renew democratic processes in some contexts and stifle debate in others; narrow or widen gaps between the rich and poor; create or destroy jobs; enhance or erode personal privacy. An understanding of the way the communicative power of individuals and groups can be changed for better and worse directs attention to understanding how to overcome barriers that exclude people from vital social networks in which their needs could be better addressed. It also shows that digital divides based on economic development, gender, age, physical disability, language, class, and other factors are economic as well as social issues, for instance in the way the divides can block or constrain access to jobs paying above poverty-level wages for many individuals and social groups or the ability of public agencies and businesses to access an appropriately skilled workforce.

An appreciation of the influential role of the reconfiguring of communicative power at micro and macro levels reveals how even relatively small decisions about whether and how to use the Internet or other ICTs can be a positive step towards achieving targets as far-reaching as UNESCO's four key principles for the World Summit for the Information Society: freedom of expression; equal access to education; universal access to information; and the preservation and promotion of cultural diversity. For instance, communicative power could be reconfigured towards achieving these goals through such

small steps as creating your own Website or online blog diary, setting up or taking a distance learning course at university, using the Internet to exchange views with people across the world, or developing software and Web content in a minority language.

Similarly, small – but potentially cumulative – steps can be taken towards meeting United Nations Millennium Development Goals such as eliminating extreme poverty, combatting serious diseases, achieving universal primary education, and promoting gender equality through initiatives such as the provision of micro-credit for poor women villagers in the Grameen Village Phone project or the online and broadcast delivery of advice to address health, educational, and agricultural problems. Using the Internet and Web to network staff involved in health communication, education, and agricultural initiatives with their counterparts around the world can also build virtual collaborative organizations that are far more powerful and effective than lone individuals within a single agency.

A policy aimed at promoting a democratic political vision could aim to extend the scope of reconfiguring access to empower more individuals to be able to exercise more control over access to their own worlds. This could help to build greater trust in uses of ICTs that seek to reinvigorate community and political debate, better connect politicians with their electorates and citizens with one another, and open up access to information not otherwise available locally or through the mass media. On the other hand, ICTs create new opportunities to bring about the kind of totalitarian state more powerful than that depicted in George Orwell's classic novel *Nineteen Eighty-Four*, in which society is controlled by 'Big Brother' and the 'Thought Police' who monitor and control every aspect of citizens' lives and thoughts using two-way electronic 'telescreens' for the surveillance of citizens and spreading of hate propaganda. Some see echoes of this in a combination of CCTV in public places and much content in the mass media, the Internet, video cassettes, and other channels. A future of networked intelligent sensors combined with electronic tagging of everything from children to cans of produce could underpin an even darker dystopian scenario.

These kinds of contradictory visions illustrate the gap between the hopes and fears, the utopian dreams and dystopian nightmares of the information society. Each vision might influence people to make different choices about

ICTs in their own lives, but they end up largely as deterministic pro- or anti-technology positions that do not inform us adequately about appropriate policies or practices that should be adopted. More often, they create an uncertainty that becomes a prescription for maintaining the status quo. The more complex process of reconfiguring access described here leads to unpredictable futures, rather than a simple choice between following one mapped-out road leading to an open and equitable global village or another route that ends in an Orwellian society of ignorance and perpetual war. It also offers more informed insights to assist policy makers and citizens to make everyday and once-in-a-lifetime decisions.

7.5 Implications for strategic decisions and policy formulation

The reconfiguring access framework does not seek to offer prescriptive advice on conventional policy issues because it acknowledges the unpredictability of final outcomes. In any case, ICTs can be used in such a diverse range of services to the public that no single approach is relevant to all projects. For instance, some e-government systems are large and long-term developments covering many functions, agencies, geographical areas, and types of users, such as those employed for welfare payments and registration of automobile vehicles and drivers; others are small, self-contained, relatively low in risk, and have a limited life span, as in a local government project that sets up a Website to stimulate the take up for a new waste-recycling service.

The use of ICTs in air traffic control, energy supplies, and other safety-critical applications whose failure could threaten the functioning of whole parts of society have vastly different rationales from ICT applications that are peripheral to everyday operations, such as the production of annual government statistics. Public services provided for business users, for example the provision of online access to land records, have very different requirements from those offered to the general public. And systems that collect and maintain personal information, for instance to verify a user's identity for government payments, raise different concerns about privacy to those where anonymity is preserved in some way.

Nevertheless, rethinking access in the way suggested here does reveal new approaches to making strategic decisions about ICTs, whether they are related to the course of a person's career, a community's well-being, business

operations, or the policies and regulations governing national and global communication infrastructures. For instance, if you are involved in planning the future of a library in a university or pharmaceutical company's research laboratory, this perspective could suggest giving more priority to enlarging the role of the library in reconfiguring access to the wider resources of the university or company rather than continuing to focus on seeking efficiencies in the traditional ways of providing the library service. In formulating national, regional, and global communication policies, an awareness of the ecology of games and the principles outlined in this section would broaden the definition of access beyond just physical connections and focus attention on the digital choices of specific actors in specific contexts. This could offer, for example, new avenues for adapting the traditional universal service obligation for telephones, which was appropriate to the needs of monopolistic and single-dimension telephony services, towards achieving meaningful equity in the more dispersed, diverse, and pluralistic world of multimedia digital networks.

An example of an ecology of games in which the scope of a system's reconfiguring access capabilities is a central theme and prime policy goal concerns the governance of the Internet: the rules, procedures, and responsibilities within which all its users operate (e.g. see www.isoc.org). The key Internet values of openness, flexibility, and local empowerment depend on a degree of worldwide coordination in the allocation of Internet resources, such as the 'domain names' used to access a Website (e.g. ending in '.com' for a business or a country code like '.za' for South Africa). The communitarian culture from which the Internet grew is reflected in the non-profit, non-government structures that have evolved to coordinate such governance. In 1998, a new body was set up to achieve this at a global level: the non-profit ICANN that includes participation from technical, business, non-commercial, academic, end-user, and government representatives.

Some national governments and international agencies have begun to seek a reconsideration of Internet governance. In negotiations about possible changes, an understanding of reconfiguring access principles would highlight the importance of avoiding the introduction of imbalances in the ability of Internet users to decide how to reconfigure their own communicative power. Unless this view is given due weight, new controls and procedures could prejudice the right to free expression on the Internet or lead to other

constraints that disrupt its underlying open flow of communication and information. This could impair the Internet's ability to enable the empowerment of individual users, which has been a major reason for the enormous popularity of the Internet and its growing number of users. This is why the debate of Internet governance is important.

In education, many paths to e-learning are being tried, with none providing a sure-win path to higher-quality education. However, there are some broad principles that can be drawn from the reconfiguring access approach which could help to steer educators on a more fruitful course by highlighting the ways in which access to their institutions and its resources can enhance educational outcomes and reach new audiences (Table 7.1). Similar guidelines could be drawn up in different arenas.

7.6 Reconfiguring engagements between civilizations

The new frontier of Internet diffusion is the interconnection of the West with developing nations, particularly the rapidly-developing economies in Asia, the Middle East and Eastern and Central Europe (Castells 2000 [1996]; Rose 2001). The changing patterns of global dissemination and use of ICTs is illustrated by China's rise in 2004 to become the second largest population of Internet users, behind only the USA but with a much greater potential for future growth as only about 6 percent of Chinese households had access to the Internet in 2004 compared to over 70 percent of US households, according to the World Internet Project (www.worldinternetproject.net) and Oxford Internet Surveys (www.oii.ox.ac.uk).

Although the scale of diffusion differs markedly in other developing countries, similar cross-cultural issues are found in many different regions with regard to the opportunities and risks tied to the forging of new electronic links to the West and its differing traditions of participation and governance. This has led to a growing international focus on the global dimensions of the development of information and knowledge societies, as in the WSIS initiative.

Vital global challenges arise from the new and proliferating electronic engagements between political systems, economies, cultures, religions, and lifestyles that were previously less directly and intimately connected. This

Table 7.1. Guiding principles for initiatives using ICTs for education and learning

Policy objective	*Principles for policy development*
Seek to shape outcomes from ICT-enabled innovation towards meeting educational goals.	– Involve the best teachers in the design and development of e-learning approaches and systems – Involve school, college, and university managers and administrators in creating and introducing ICT-based institutional and learning strategies and techniques. – Identify and support the key gatekeepers who can open and close e-learning opportunities.
Use ICTs to make advances in educational standards that exceed established performance levels.	– Choose ICT capabilities suited to particular student, course, and curriculum needs. – Complement rather than replace what currently works well. – Ensure innovative approaches do not detract from core teaching and research objectives.
Understand how to reconfigure access to reach new audiences, while serving existing ones more effectively.	– Establish a strategic package that uses virtual ICT networks to reach out beyond a school's building or university campus. – Be flexible and innovative in the criteria used for admissions to e-learning courses (e.g. be completely open or offer courses for groups who haven't been well catered for previously, such as the disabled or retired people). – Carefully manage alliances with expert agencies and firms in order to build appropriate ICT-related capacities.
Enhance institutional accountability in ways that promote flexible innovations, while resolving potential conflicts.	– Balance local empowerment for learning innovation with the centralized coordination of administration and the setting of assessment and other standards. – Ensure technologically-innovative courses are appropriately accredited by, and to, the responsible institution. – Devise incentive structures appropriate to new e-learning environments, such as those related to copyright issues.

connecting of civilizations in a multiplicity of interactive networks raises an important issue for humankind: the degree to which reconfiguring access through these networks will open or close doors to more global cooperation or to the exacerbation of the 'clash of civilizations' seen by Huntington (1996). The reconfiguring access framework can help policy makers to analyse and understand these complex, intertwining global forces.

7.7 Reconfiguring access: a compass to help navigate uncertain futures

The growing profusion of ICTs could be a social and economic gold mine. But the technology's two-edged nature means it could also become a minefield that does great harm to many people and societies. Individuals in all settings, whether in a household or a global media firm, need a mental map and compass that will guide them in making social and technical choices in the information age. An understanding of reconfiguring access and the range of social and technical choices shaping these social transformations could reorient the way people think about ICTs, thereby changing decisions and societal outcomes in constructive ways. Then, rather than drifting further into the twenty-first century thinking our futures are being determined by technical advances in ICTs or by the strategies of governments or global corporations, you would be aware of ways in which you can consider and negotiate how you can enhance your own communicative power through the reconfiguring of access to yourself and the world.

References

Ackoff, R. (1969), 'Management Misinformation Systems', *Management Science*, 14(4): 147-57.

Ananthaswamy, A. (2004), 'Can We Ever Trust E-Voting?', *New Scientist*, 14 February, 6-7.

Annan, K. (2003), 'Break the Technology Barrier', *International Herald Tribune*, 9 December.

Attali, J. and Stourdze, Y. (1980), 'The Birth of the Telephone and Economic Crisis: The Slow Death of Monologue in French Society', in de Sola Pool (2000): 97-111.

Avgerou. C. and Rovere, R. L. L. (eds.), (2003), *Information Systems and the Economics of Innovation* (Cheltenham, UK: Edward Elgar).

Avgerou, C., Ciborra, C., and Land, F. (forthcoming), *The Social Study of Information and Communication Technologies* (Oxford: Oxford University Press).

Baer, W. S. (1996), 'Telecommunication Infrastructure Competition: The Costs of Delay', in Dutton (1996): 353-70.

Baskerville, R. and Land, F. (forthcoming), in Avgerou, Ciborra, and Land (forthcoming).

Beaver, P. (2003), 'Cyberwarfare', in WSIS (2003*b*): 33.

Bell, D. (1999 [1973]), The Coming of Post-Industrial Society: A Venture in Social Forecasting (New York: Basic Books).

Berners-Lee, T. (1999), with Fischetti, M., Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web (San Francisco: HarperCollins).

Blumler, J. G. (1992), Television and the Public Interest: Vulnerable Values in West European Broadcasting (London: Sage).

Blumler, J. G. and Coleman, S. (2001), *Realising Democracy Online: A Civic Commons in Cyberspace*, IPPR/Citizens Online

Castells, M. (2000 [1996]), The Rise of the Network Society: The Information Age: Economy, Society and Culture, Volume 1 (Oxford: Blackwell Publishers).

Castells, M. and Himanen, P. (2002), *The Information Society and the Welfare State: The Finnish Model* (Oxford: Oxford University Press).

Castles, S. (2000), 'Development, Social Transformation and Globalisation'. Paper given at Social Transformation Studies Workshop, Wollongong, Australia: Centre for Asia Pacific Studies, University of Wollongong, 23-25 June. www.theglobalsite.ac.uk/press/012castles.htm

Chen, W. and Wellman, B. (2004), 'Charting Digital Divides', in Dutton et al. (2004): forthcoming.

Chittenden, M. (2004), 'Hi-tech Cash Machine Gang Steals Millions', *The Sunday Times*, 14 March, 14.

Coleman, S. and Gotze, J. (2002), Bowling Together: Online Public Engagement *in Policy Deliberation* (London: Hansard Society).

Commission of the European Communities (2001), *The Impact of the e-Economy on European Enterprises: Economic Analysis and Policy Implications* (Brussels: Commission of the European Communities).

Comstock, G., Chaffee, S., Katzman, N., McCombs, M., and Roberts, D. (1978), *Television and Human Behavior* (New York: Columbia University Press).

Cornford, J. and Gillespie, A. (1999), 'The Geography of Network Access', in Dutton (1999): 255–56.

Crichton, M. (2002), *Prey* (London: HarperCollins Publishers).

Danziger, J. N., Dutton, W. H., Kling, R., and Kraemer, K. L. (1982), *Computers and Politics* (New York: Columbia University Press).

David, P. A. and Spence, M. (2003), 'Towards Institutional Infrastructures for E-Science', *OII Research Report No. 2* (Oxford: Oxford Internet Institute).

Delgadillo, K., Gomez, R., and Stoll, K. (2002), Community Telecentres for Development: Lessons from Community Telecentres in Latin America and the Caribbean (Ottawa: International Development Research Centre).

Denning, D. E. and Lin, H. S. (1994) (eds.), *Rights and Responsibilities of Participants in Networked Communications* (Washington, DC: National Academy Press).

de Sola Pool, I. (1980) (ed.), *The Social Impact of the Telephone* (Cambridge, MA: MIT Press).

de Sola Pool, I. (1983), *Technologies of Freedom* (Cambridge, MA: Harvard University Press).

Digital Partners (2003), *Partners in Potential* (Seattle, WA: Microsoft Corporation).

Dutton, W. H. (1992), 'The Ecology of Games Shaping Telecommunications Policy', *Communication Theory*, 2: 303-28.

Dutton (1996) (ed.), Information and Communication Technologies - Visions and Realities, Oxford: Oxford University Press.

Dutton, W. H. (1999), Society on the Line: Information Politics in the Digital Age (Oxford: Oxford University Press).

Dutton, W. H. and Loader, B. D. (2002) (eds.), *Digital Academe: New Media and Institutions in Higher Education and Learning* (London: Taylor and Francis/Routledge).

Dutton, W. H. and Kraemer, K. L. (1985), *Modelling as Negotiating* (Norwood, NJ: Ablex).

Dutton, W. H. and Shepherd, A. (2004), 'Trust in the Internet: The Social Dynamics of an Experience Technology'. Paper prepared for the Foresight Directorate of the Office of Science and Technology (Oxford: Oxford Internet Institute).

Dutton, W., Blumler, J., and Kraemer, K. (1987) (eds.), *Wired Cities* (Boston: G. K. Hall).

Dutton, W. H., Cheong, P. H., and Park, N. (2004), 'The Social Shaping of a Virtual Learning Environment: The Case of a University-wide Course Management System', *Electronic Journal of E-Learning*, 1(2): March. www.ejel.org

Dutton, W. H., Gillett, S. E., McKnight, L. W., and Peltu, M. (2003), 'Broadband Internet: The Power to Reconfigure Access', *Forum Discussion Paper No. 1* (Oxford: Oxford Internet Institute).

Dutton, W. H., Gillett, S. E., McKnight, L. W. and Peltu, M. (2004), 'Bridging Broadband Internet Divides: Reconfiguring Access to Enhance Communicative Power', *Journal of Information Technology*, 19(1): 29-39

Dutton, W. H., Kahin, B., O'Callaghan, R., and Wyckoff, A. W. (2004) (eds.), *Transforming Enterprise* (Cambridge, MA: MIT Press).

Eisenstadt, E. L. (1980), 'The Emergence of Print Culture in the West', *Journal of Communications*, 30/1: 99-106.

Ellul, J. (1964), *The Technological Society* (New York: Vintage Books).

FCC (1998), Federal Communications Commission, *Federal-State Joint Board on Universal Service (Stevens Report to Congress),* CC Docket No. 96045, 13 FCC Rcd 11501 (Washington DC: Federal Communications Commission).

FCC (2004), Federal Communications Commission, *Notice of Proposed Rule Making,* FCC 04-28 (Washington DC: Federal Communications Commission). http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-28A1.pdf

Foster, I. and Kesselman, C. (1998) (eds.), *The Grid: Blueprint for a New Computing Infrastructure* (San Francisco: Morgan Kaufmann).

Freeman, C. (1996*a*), 'The Two-edged Nature of Technical Change: Employment and Unemployment', in Dutton (1996): 19-36.

Freeman, C. (1996*b*), 'The Factory of the Future and the Productivity Paradox', in Dutton (1996): 123-41.

Frith, M. (2004), 'Four Million CCTV Cameras Watch Public', *The Independent*, 12 January.

Galperin, H. (2004), *New Television, Old Politics* (Cambridge, UK: Cambridge University Press).

Garnham, N. (1999*a*), 'Information Politics: The Study of Communicative Power', in Dutton (1999): 77-8.

Garnham, N. (1999*b*), 'Barriers to Convergence', in Dutton (1999): 73-5.

Gilder, G. (1994), *Life After Television: The Coming Transformation of Media and American Life* (New York: W. W. Norton).

Gillespie, A., and Cornford, J. (1996), 'Telecommunication Infrastructures and Regional Development', in Dutton (1996): 335-51.

Guttman, C. (2003), Education in and for the Information Society (Paris: UNESCO).

Handy, C. (1996), Beyond Certainty: The Changing World of Organizations (Boston: Harvard Business School Press).

Handy, C. (1997), The Hungry Spirit: Beyond Capitalism - A Quest for Purpose in the Modern World (New York: Hutchinson).

Huntington, S. P. (1993), 'The Clash of Civilizations?', Foreign Affairs, Summer.

Huntington, S. P. (1996), The Clash of Civilizations and the Remaking of World Order (New York: Touchstone).

Innis, H. A. (1972 [1951]), Empire and Communications (Toronto: University of Toronto Press).

ITU (2003), International Telecommunication Union, World Telecommunication Development Report: Access Indicators for the Information Society. Executive Summary (Geneva: ITU), December.

Katz, J. E. and Rice, R. E. (2002), Social Consequences of the Internet (Cambridge, MA: MIT Press).

Kinder, T. (2003), 'Tele-democracy in Europe', in WSIS (2003b): 56-7.

Kohno, T., Stubblefield, A., Rubin, A. D., and Wallach, D. S. (2004), 'Analysis of an Electronic Voting System', IEE Symposium on Security and Privacy (Piscataway, NJ: IEEE Computer Society Press). www.cse.ucsd.edu/users/tkohno/papers/eVoting/vote.pdf

Kraemer, K. L., Dutton, W. H., and Northrop, A. (1981), The Management of Information Systems (New York: Columbia University Press).

Laudon, K. L. (1977), Communications Technology and Democratic Participation (New York: Praeger).

Lessig, L. (2002), The Future of Ideas (New York: Vintage Books).

MacKenzie, D. and Wajcman, J. (1985) (eds.), The Social Shaping of Technology: How the Refrigerator Got Its Hum (Milton Keynes: Open University Press).

Madon, S. (2003), 'IT Diffusion for Public Service Delivery: Looking for Plausible Theoretical Approaches', in Avgerou and La Rovere (2003), 71-85.

Margetts, H. (1998), Information Technology in Government: Britain and America (London: Routledge).

Matsuura, K. (2003a), 'Address by Mr. K. Matsuura, Director-General of UNESCO' (DG/2003/175), Round Table on Science, the Information Society and the Millennium Development Goals during the World Summit on the Information Society' (Geneva: UNESCO) 11 December. http://unesdoc.unesco.org/images/0013/001330/133015e.pdf

Matsuura, K. (2003b), 'Address by Mr K. Matsuura, Director-General of UNESCO on the Occasion of the Briefing Session with Permanent Dele-

gates on the World Summit on the Information Society (DG/2003/161)' (Geneva: UNESCO, 21 November).
http://unesdoc.unesco.org/images/0013/001326/132646m.pdf

McLuhan, M. (1964), Understanding Media: The Extension of Man (London: Routledge).

Mesthene, E. G. (2000), 'The Role of Technology in Society', in Teich (2000): 61-70.

Miles, I. and Robins, K. (1992), 'Making Sense of Information', in Robins (1992): 1-26.

Nelson, T. H. (1981), Literary Machines (Sausilito, CA: Mindful Press).

Nelson, T. H. (1987 [1974]), Computer Lib/Dream Machines (Redmond, WA: Microsoft Books)

Noam, E. (2003), 'The Internet: Still Wide Open and Competitive?', OII Issue Brief No. 1 (Oxford: Oxford Internet Institute, University of Oxford). See: http://www.oii.ox.ac.uk/resources/

Noll, M. (2003), Crisis Communications: Lessons from September 11 (New York: Rowman & Littlefield Publishers).

Pax, S. (2003), "'I Became the Profane Pervert Arab Blogger'", The Guardian, 9 September, 2–3 (G2 Section).

Rawnsley, A. (2004), 'A Messy Draw', The Observer, 1 February, 29.

Robins, K.(1992) (ed.), Understanding Information: Business Technology and Geography (London: Belhaven).

Rose, R. (2001), 'Digital Divide or Digital Diffusion?', Transition Newsletter (Washington, DC: The World Bank).
www.worldbank.org/transitionnewsletter/julaugsep02/pgs33-35.htm

Selian, A. N. (2002), ICTs in Support of Human Rights, Democracy and Good Governance (Geneva: International Telecommunication Union), August. www.itu.int

Selvin, J. (2000), The Internet and Society (Oxford: Blackwell).

Shepard, A. (2000), 'Tribune's Big Deal', American Journalism Review, May.

Silverstone, R. (1999), Domesticating ICTs, in Dutton (2003): 251-2.

Smith, R. L. (1972), The Wired Nation: Cable TV - The Electronic Communications Highway (New York: Harper & Row).

Taylor, F. W. (1911), Principles of Scientific Management (New York: Harper).

Teich, A. H. (2000), Technology and the Future (Boston: Bedford/St. Martin's Press).

UNESCO (2003), UNESCO Institute for Statistics, Montreal, Measuring and Monitoring the Information and Knowledge Societies: A Statistical Challenge (Paris: UNESCO).

Weizenbaum, J. (1976), Computer Power and Human Reason (San Francisco: W. H. Freeman & Company).

Williams. R. (1999), 'The Social Shaping of Technology', in Dutton (1999): 41-3.

Winner, L. (1977), Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought (Cambridge, MA: MIT Press).

Winner, L. (1986), The Whale and the Reactor (Chicago: University of Chicago Press).

Winston, B. (1998), Media Technology and Society: A History (London: Routledge).

Wireless Internet Institute (2003), The Wireless Internet Opportunity for Developing Countries (Boston: Wireless Internet Institute).

Woolgar, S. (2002) (ed.), Virtual Society? Technology, Cyberbole, Reality (Oxford: Oxford University Press).

WSIS (2003a), World Summit on the Information Society, Plan of Action (Paris: UNESCO and Geneva ITU).

WSIS (2003b), WSIS 2003: World Summit on the information Society, Connecting the World (London: Agenda Publishing).

Zittrain, J. and Edelman, B. (2004), 'Documentation of Internet Filtering Worldwide'. http://cyber.law.harvard.edu/filtering.

Appendix 1: Glossary

3G mobile technology: 'Third generation' multimedia technology for mobile cellphones with the potential for transmissions at speeds in the lower end of the broadband range offering video, Internet access, and other advanced communication capabilities in addition to basic telephony and texting.

Analogue: A way of representing information or numbers by a continuously changing physical entity, such as the electromagnetic waves used in traditional telephony and audiovisual broadcast television; often contrasted with discrete numerical representations of digital technologies.

Artificial intelligence: The use of computer-based theories and techniques to represent expert human knowledge and carry out intellectual, communication, and physical interactions that simulate behavioural characteristics of humans and other animals.

Asynchronous telecommunications: Using different speeds for sending and receiving information through the same telecommunications link.

Bandwidth: Indication of the amount of information a telecommunications channel can carry, usually measured in bits per second (bps).

Biometrics: The science of measuring and studying physical human properties such as fingerprints, facial features, and eye characteristics.

Bit: Binary digit (0 or 1) used to represent information in digital technologies.

Broadband: High-performance telecommunications connection that is always on (i.e. does not require dial-up as for a telephone), enabling users to access and interact with other people and a variety of multimedia information, services, and technologies via Internet, Web, cable, and other capabilities.

Burn: The act of writing data, music, or other information to a CD.

Call centre: A centre where service agents respond to telephone calls with the support of computer-based information systems containing customer, product, and service information.

Caller identification (Call-ID): Display on the receiving device showing the caller's name or telephone or fax number.

Cellphone: Mobile telephone that uses a cellular network within which cells covering small geographical areas are interlinked to provide coverage over wide areas, including international calls.

Chat room: A virtual space on the Internet where online users can enter and exchange comments, typically focussed on a particular topic.

Communicative power: The relative social power that comes from the ability to control access to and the design, production, use, and governance of communication media.

Cyber: Widely used as a prefix to indicate the centrality of ICTs to an activity, such as 'cyberspace' or 'cybercrime'.

Cybercafe: Café that offers customers access to the Internet; also known as Internet cafés.

Cybercrime: Criminal acts, such as fraud, committed using the Internet and other computer-based systems.

Cyberspace: A way of referring to the online world encompassed by the use of the Internet and other ICT networks.

Cyberwarfare: The use of ICT-based systems and weapons in warfare as a form of attack (e.g. computing-enabled 'smart bombs' or damaging an opponent's information and communication systems using ICT capabilities) or defence (e.g. by using ICT intelligence databases and surveillance techniques).

Desktop publishing. Using a personal computer or workstation to produce high-quality documents, including colour printing, photographs, and graphics.

Digital Rights Management: Copyright and Intellectual Property Rights issues within a digital ICT context.

Digital Subscriber Line (DSL): Asynchronous DSL (ADSL) and other technologies that enables traditional copper-wire telephony lines to be used for broadband

Domain name: A unique identifier of a resource on the Internet, most commonly used for naming and accessing a Website and pages within it, such as http://www.oii.ox.ac.uk for the Oxford Internet Institute Website

E-business: Use of electronic links to undertake transactions between business enterprises, such as that connecting a company and its supply chain.

E-commerce: Use of electronic links for sales transactions between a customer and provider of a product or service, for example by online shopping for goods in a supermarket or booking a seat on an aeroplane.

E-learning: Use of ICTs, including specially designed software and systems, for educational instruction and administration, including online distance learning.

Ethernet: A widely-used standard for fast local area networks.

E-voting: Use of computer-based electronic voting machines or the Internet to cast and count votes in democratic elections.

Firewall: A system designed to prevent unauthorized access to or from a private ICT-based network.

Games station: Device used for playing computer-based electronic games.

Giga: 1 billion

Grid: A distributed computing system that uses broadband to share very large computing resources among mass audiences, individuals, and large and small organisations and groups.

Hacker: Originally identified a computer enthusiast who enjoys programming and the inner technical aspects of computer systems, but now often used for individuals who gain unauthorized access to computer systems for the purpose of stealing and corrupting data, perhaps through writing and sending a computer virus.

Hotspot: Location where a WiFi wireless broadband link is accessible.

Internet: A network of computer networks around the world based on standards and protocols that enable computers in different networks to communicate with each other.

Laptop: A personal computer powered by a battery or mains electricity that can be carried like a slim briefcase (including a fold-down screen) and used to access the Internet via a wired or wireless connection.

Local area network: ICT network covering a relatively small local area, such as a house, school, office, coffee bar, farm, or neighbourhood.

Micro chip: A thin slice of silicon, smaller than a thumbnail, containing large numbers of integrated circuits used for processing and storing information in computers.

Narrowband: Telecommunication transmission speeds, such as that used in traditional telephony, that are much slower than broadband.

Narrowcasting: Broadcasting to a relatively narrow targeted audience, in contrast to the one-to-millions broadcasting and publishing of mass-media.

Net nanny: Software designed to enable parents to prevent children from accessing certain Websites and chat rooms.

Network computer: A simplified user device that can draw great computing power and software capabilities from a very large computing utility, such as the Grid.

Offline: Originally indicated work at a computer while it is not connected to a network, but has been also increasingly used as a general term for activities that do not involve ICTs.

Online: Being connected to the Internet or other communication network in a way that enables direct interaction between a user and other people who are online or with various online information, services, products, and technologies.

Optical fibre: High-speed broadband telecommunications medium that transmits data as pulses of light down hair-thin glass fibres.

Palmtop: A device small and light enough to be held in the hand offering, in a variety of combinations specific to each device, capabilities such as that of an Internet-access computer and calculator, digital camera, game station, and electronic diary, address book, and notepad.

Paradigm: A major framework or set of assumptions that guides thoughts and some actions around a particular process, such as a scientific method.

Peer-to-peer: A network in which all personal computers or workstations connected to it are of equal status and can connect directly to each other, without having to go through a hierarchical control structure.

Personal digital assistant: Palmtop computer that includes the characteristics of a personal organizer, such as an electronic diary and notepad, telephone, fax, and Internet link.

Search engine: Software, such as Google, that uses keywords specified by the user to find relevant information on the Web.

Short message service: Mobile cellphone service allowing the sending of short text messages between phones.

Spam: Unsolicited e-mail, or 'electronic junk mail', which could contain material that harms, offends, or irritates the recipient, such as a computer virus, automatic link to a Website containing pornography, or unwanted advertisements for a variety of products and services.

Spin-off enterprise: A once-internal organizational unit that has become an independent enterprise.

Streaming: Continuous audio-visual downloading of TV news, radio programmes, or live online events.

Telecentre: A centre offering training and support in ICT skills and the use of the technology, often with funding from government or NGO sources to assist target specific disadvantaged groups or regions.

Tele-density: Percentage of the population with access to a telephone.

Terrestrial broadcasting: Traditional radio and television broadcasting from land-based transmitters.

Texting: Use of a mobile cellphone to send text messages.

Third generation: See 3G mobile technology.

Virtual: General term for activities linked by ICTs, such as a virtual organization in which many individuals, groups, and firms in different locations collaborate through the Internet and other ICT facilities as if they were a single organization at one site.

Virus: A software program typically sent by e-mail and designed to infiltrate, take control of, or damage the recipient's computer system, including spreading the virus quickly around the world by using the recipient's e-mail software to send out further e-mails carrying the virus.

Web: The World Wide Web containing multimedia information in a vast number of computer-based Websites around the world that can be accessed via the Internet through a simple user interface.

Webcam: A digital video camera that can be connected directly to Websites.

Website: One of the computer-based repositories of information and other digital resources that can be searched and accessed through the Web.

WiFi: Local wireless area network based on Ethernet 802.11 standards.

Worm: A form of virus sent in e-mails.

Appendix 2: Abbreviations and acronyms

3G	Third generation
ADSL	Asynchronous DSL
AI	Artificial Intelligence
BPR	Business Process Re-engineering
bps	Bits per second
CCTV	Closed Circuit TV
CD	Compact Disc
DRE	Direct Recording Electronic voting machines
DRM	Digital Rights Management
DSL	Digital Subscriber Line
DVD	Digital Versatile (or Video) Disc
G	Giga
GSM	Global System for Mobile communications
ICANN	Internet Corporation for Assigned Names and Numbers
ICT	Information and Communication Technology
IP	Internet Protocol (works with higher level TCP)
IPR	Intellectual Property Rights
IS	Information System
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunication Union
JIT	Just In Time (production-line process)
K	1,000 (or 1024 in some digital contexts)
LAN	Local Area Network
M	Million
MDG	Millennium Development Goals (of United Nations)

NGO	Non-Government Organization
NC	Network Computer
OECD	Organization for Economic Cooperation and Development
P2P	Peer-to-Peer
PC	Personal Computer
PDA	Personal Digital Assistant
PSTN	Public Switched Telephone Network
TCP	Transmission Control Protocol (works with Internet Protocol)
SMS	Short Message Service
UNDP	United Nations Development Programme
USO	Universal Service Obligation
VoIP	Voice-over-Internet Protocol
VSAT	Very Small Aperture Terminal (for satellite communications)
WAN	Wide Area Network
WiFi	Wireless Fidelity
WISP	Wireless Internet Service Provider
WLAN	Wireless LAN
WSIS	World Summit on the Information Society
WTO	World Trade Organization

Composé par JOUVE, 11, bd de Sébastopol, 75001 PARIS
N° 360739U. Dépôt légal : Décembre 2004