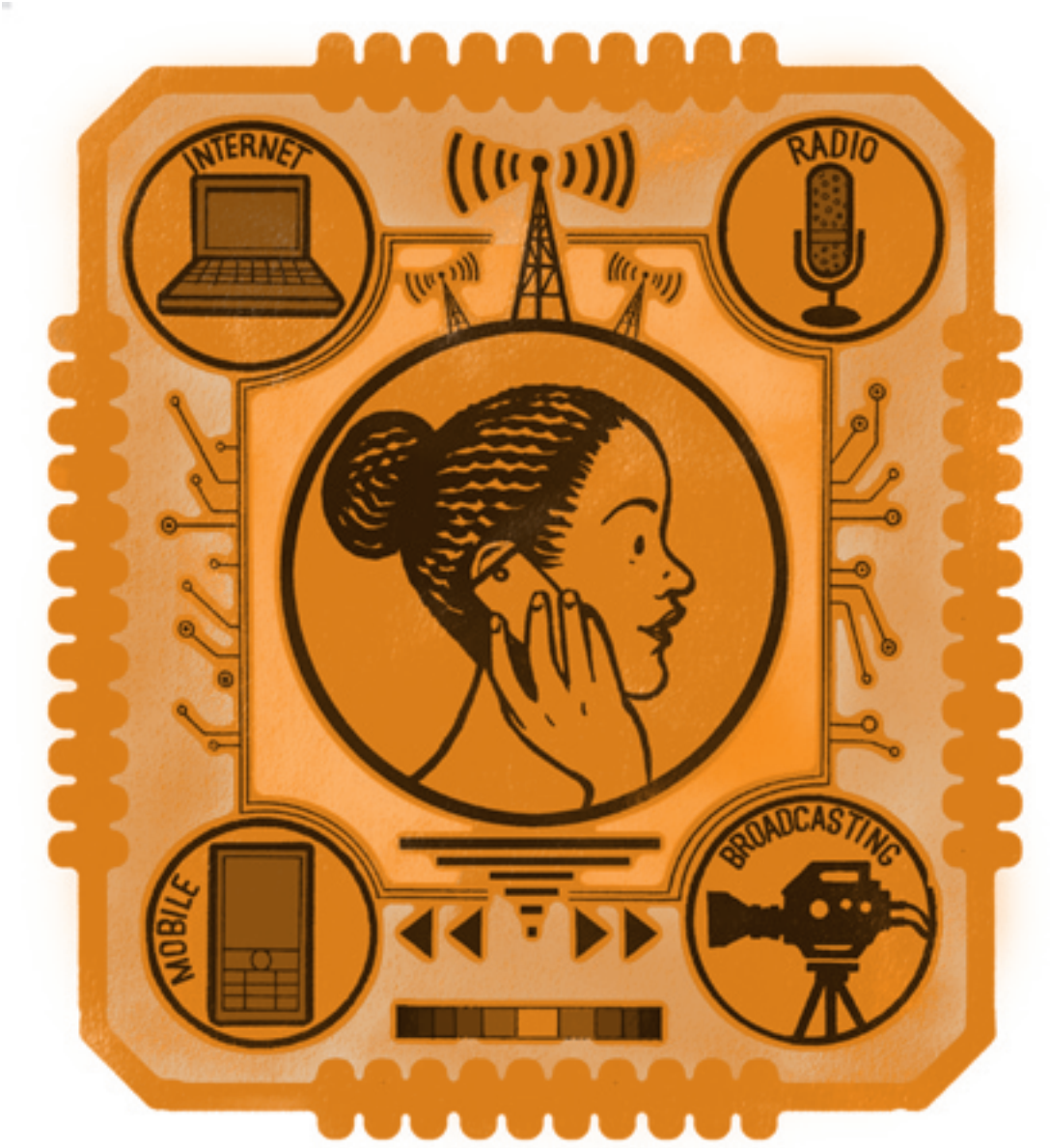
The APC ICT Policy Handbook



APC
THE ASSOCIATION FOR PROGRESIVE COMMUNICATIONS

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With contributions from
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The Association for Progressive Communications - www.apc.org

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About this handbook

Ask a typical citizen – of any country – about ICT policy and the reply will probably be something like "What's that?" or "Who cares?" Getting involved in information and communications technology (ICT) policy making has not been a priority for many people, even those who are generally active in other areas of public policy. Much of it seems remote from our daily experience, and technically complex. Yet new communications media are becoming so important that we cannot continue to ignore them.

ICTs, and the products and services that make use of them, play an increasingly important part in all our lives. Since the mid-1990s, all countries have seen major changes in the way that information and communications services are delivered – the proliferation of new radio and television channels, the creation of mass markets for mobile telephony, and the establishment of the internet as a new resource for knowledge and information are three major developments which have affected every nation. These new information and communications resources offer new opportunities for citizens and civil society, but also pose new challenges, particularly in areas such as access, privacy and security.

The structure of the ICT industry has been transformed during the same period, nationally and internationally, as a result of new technologies and changes in the relationship between governments and businesses. Many information and communications services have moved from the control of the state into the private sector, with monopolies replaced by competitive markets. The emergence of the internet as a major force has raised new issues of governance and of the relationship between the citizen and the state, changing old and raising new issues of human rights. The role of ICTs within development has been championed by many – not least within the World Summit on the Information Society that was held in 2003 and 2005 – but is still questioned by some.

Policy frameworks for handling information and communications issues in the pre-digital world have not always been sufficient to deal with these new challenges. Many need to be redesigned for a digital age, and this raises further challenges and opportunities for civil society and other organisations seeking to engage with them.

There has been a great deal of discussion of these issues during the last decade. This handbook aims to take the mystery out of ICT policy and make it easier to understand. In particular, it aims to build the capacity of those who want to understand more about the issues surrounding policy on ICT development and regulation, to grasp the policy process, and to become more involved in it as informed participants. It should therefore be of interest to a wide range of people: members of civil society groups, researchers, activists, technical specialists who are becoming more interested in the policy and regulatory aspects of their work, journalists looking for background information, government officials and other stakeholders. It is not a technical handbook, although it tries to explain in straightforward language some of the technical background knowledge that is necessary in order to be able to discuss and debate ICT policy issues.

The main text of the handbook has been written by experts in the field, in order to establish a basic understanding of the issues. This can be used by readers as a platform for further investigation and for consideration of their own perspectives. Each chapter seeks to give an objective account of existing issues, rather than presenting any specific point of view. Where issues are controversial, the different viewpoints involved have been explained so that the reader has a clear view of the issues in dispute. Examples are also given of recent events or debates, which readers can explore further if so inclined. Suggestions as to where readers can find out more about ICT policy can also be located in the bibliography and list of organisations active in the field which are in appendices.

The text is divided into sections as follows:

- Section 1 introduces the main themes within ICT policy debate.
- Four sections look at the technical, market, policy and regulatory issues affecting the four main types of ICT with which the handbook is concerned:
  - Section 2: Computing and information technology
  - Section 3: Broadcasting
  - Section 4: Telecommunications
  - Section 5: The internet.
- Section 6 is concerned with the relationship between ICTs and social, economic and development policy.
- Section 7 is concerned with rights issues.
- An appendix identifies further resources which readers may find useful.

This is the second edition of the APC ICT Policy Handbook. The first edition has been used extensively by APC members and other civil society organisations since it was published in 2003, and has been widely praised. Like most things in the ICT world, however, it has fallen out of date in the short period of time since then. There

have been many new developments over the past five years – in technology, in networks, in markets, in services, in access. Since the first edition of the handbook was written, for example, the proportion of people subscribing to mobile phone networks in many African countries has risen from under 5% to over 25%; two sessions of the World Summit on the Information Society have taken place, and the Internet Governance Forum has emerged as a new locus for debate on internet issues; and new wireless technologies have emerged which have the potential to deliver services in new ways to more people in more locations than was imagined even five years ago.

Rather than simply revising the original handbook, therefore, the opportunity has been taken to produce an entirely new text for this second edition. This new text has been edited by David Souter, and written by him with contributions from Peter da Costa, Avri Doria, Lisa Horner, Gus Hosein, Heike Jensen, Mike Jensen, Achal Prabhala and Dmitri Vitaliev. The principal author is indicated for each chapter. Each has drawn on her/his extensive experience and previous writings on the themes and subjects covered.

The handbook project has been overseen for APC by Natasha Primo, with the support of Karen Banks, Willie Currie and Anriette Esterhuysen. APC would also like to take this opportunity of recognising, once more, the late Chris Nicol for his work in bringing the first edition to fruition.

Contributors to the main text

David Souter acted as editor for the handbook and is the principal author of many of the chapters. David leads *ict* Development Associates, which brings together independent experts in information, communications and development issues. He is also a visiting professor in communications management at the University of Strathclyde and a visiting senior fellow in the Department of Media and Communications at the London School of Economics. From 1995 to 2003, he was chief executive of the Commonwealth Telecommunications Organisation. His work with APC includes authorship of the major study *Whose Summit? Whose Information Society?*, about the World Summit on the Information Society.

Peter da Costa is a communications and development specialist who has worked extensively in Africa as well as internationally over the last nineteen years. He has worked as regional director (Africa) for Inter Press Service and as senior communication advisor to the head of the United Nations Economic Commission for Africa, where he led efforts to build and strengthen communications for development partnerships and capacity.

Avri Doria is an adjunct professor at Luleå University of Technology and the coordinating researcher for an EC FP7 project on Networking for Communications Challenged Communities. She also works as a part-time consultant to the secretariat of the Internet Governance Forum, and was at time of writing serving as chair of ICANN's GNSO Council.

Lisa Horner is head of research and policy at Global Partners & Associates, a social purpose company working to build democratic institutions and promote human rights. She coordinates the Ford Foundation-funded Freedom of Expression Project, which is examining and addressing the impact of digital communications on human rights.

Gus Hosein is an academic, advocate, and consultant. He is a visiting senior fellow in the Department of Management at the London School of Economics and Political Science, where he lectures and researches on technology policy; a senior fellow with Privacy International in London, where he coordinates international research and campaigns on civil liberties; and a visiting scholar at the American Civil Liberties Union, which he advises on international technology and liberty issues.

Heike Jensen is a postdoctoral researcher affiliated with the Department of Gender Studies of Humboldt University in Berlin, Germany, where she focuses on gender and feminist theory, media and ICT politics, women's movements and globalisation.

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Achal Prabhala is a researcher and writer now based in Bangalore, India. Between 2004 and 2006, he coordinated a campaign for Access to Learning Materials in Southern Africa, as part of a collective of consumer organisations and university groups. He has worked with the Alternative Law Forum on a proposed overhaul of the Indian Copyright Act, and with the Lawyers' Collective HIV/AIDS Unite on patents and access to medicines in India. He is a research advisor to the African Copyright and Access to Knowledge project at the LINK Centre, University of the Witwatersrand.

Dmitri Vitaliev works in the human rights and independent media sector, with an emphasis on digital security and privacy. He has led and participated in consulting and training missions to over 30 countries. He is the author of the manual *Digital Security and Privacy for Human Rights Defenders*, a leading member of the NGO-in-a-Box Security Edition project, and a regular contributor to technology publications. He currently manages eQuality Consulting, which provides expert support and digital solutions for civil society organisations. ■

Section 1

Main themes

Chapter 1
WHY ICTs AND ICT POLICIES MATTER

Lead author ***David Souter***

Information and communications are integral to human society. In all past societies (and some still today) information retrieval and presentation – the recording of received wisdom and history, the transmission of knowledge and experience – have been primarily performed through speech and in cultural forms such as drama, painting, song and dance. The introduction of writing added to the opportunities available for communication, giving it more permanence and allowing it to take place more easily over distances and between generations. The invention of the printing press permitted communication on a mass scale, through newspapers and magazines. More recent technological innovations – including broadcasting, telephony and the internet – have increased further the reach and speed of communications, culminating (for the present) with digital technology. The spread and range of information and communications media and opportunities continue to grow, and it is far from easy to predict what will be the next major innovation.

- This handbook is principally concerned with the most recent generation of new information and communications technologies. These can be divided into four main categories:
- Computing and information technology, which have become pervasive in government and business worldwide and are also widely used by those citizens that can afford them to process data, organise lives and save on time and effort.
- Broadcasting, including radio and television, which offers news, information, entertainment and (sometimes) education through both terrestrial and satellite networks.
- Telecommunications, including telephony and data communications, which are delivered through fixed and wireless networks, within and between countries, and whose footprint has become geographically pervasive in the past ten years through the spread of mobile telephony.
- The internet and internet-enabled services, which have opened up new opportunities for communication and sharing experience and knowledge worldwide – and posed new challenges to government and business – but which remain at present poorly distributed between rich and poor.

These new ICTs have become central to contemporary societies, particularly in the industrial world. They reach into many areas of activity where their presence may not be immediately recognised. Whether you are talking on the phone, watching the news or football on television, sending an email, using a library, going to the bank or driving a car, today, you are likely – one way or another – to be using ICTs.

These new ICTs do not exist in isolation from one another. Most of them share the same basic technical language, many of them share the same equipment and networks, some deliver the same content to terminal devices capable of handling material from many different sources. International telephone calls, for example, increasingly make use of packet-based "Internet Protocol" networks; people throughout the world listen to radio programmes on their computers; music is downloaded and photographs and video are shared through mobile telephones. Media and communications industries are experiencing both diversification (in the range of services that can be provided) and convergence (in the platforms that provide them).

This convergence happens not only at a technological level, but also in the business models that are applied by industry. Where once the information and communications sector was dominated by national broadcasters and telephone companies, much of it is dominated today by multinational multimedia enterprises which take advantage of the potential to combine different networks, platforms and services to reach customers in many countries. A large internet service provider may well be linked to a telecommunications infrastructure provider, which is itself part of a business grouping other parts of which are involved in software or content production or in broadcasting. The company that broadcasts your favourite TV programme may, in another guise, also be the company that allows you to access the internet, or provides your internet service provider with its connection to the internet as a whole. Alongside the globalisation of multimedia businesses, however, new ICTs have also enabled the establishment of thousands of new small businesses serving the niche requirements of particular groups of users.

A wide range of new business models – and new relationships between government, business and the consumer – have developed in this rapidly changing environment.

Music purchasing in industrial countries, for example, has moved substantially from physical products (CDs) to virtual sales (downloads), with knock-on effects on production, marketing and distribution. Many other physical goods – such as books – are now ordered online, revitalising the "mail order" sector at the expense of high street retailers. The internet has enabled individuals to become retailers (through websites such as eBay), and has radically changed business models and regulatory challenges for products and services which have previously been hard for customers to buy (including gambling, prescription drugs and pornography). Software is often developed by a team of programmers who work in different countries, but who collaborate via the internet. Citizens in many countries now file their taxes, apply for driving licences, obtain certificates and interact with other government departments online.

Networks are, of course, fundamental to all of this. While some ICT networks, like television, allow communications to flow mostly in one direction, others, like telephony and the internet, facilitate interactive communications, enabling governments, businesses and citizens to talk with – rather than at – one another. The sociologist Manuel Castells is one of many commentators who has placed emphasis on networking, as well as technology, in understanding the social and economic changes that are associated with ICTs. He envisages a "network society" in which "the entire planet is organised around telecommunicated networks of computers at the heart of information systems and communication processes." In such a society, he argues, "the availability and use of information and communication technologies are a prerequisite for economic and social development…. They are the functional equivalent of electricity in the industrial era."[1]

Of course, ICT networks – like those for electricity and clean water – can only benefit directly those who have access to them, or to services that make use of them. The optimism which is often expressed about ICTs needs to be tempered with reference to their availability; their potential to transform lives and social interaction considered in the light of technical access and social inclusion. In all societies, the marginalised, powerless and poor are likely to have less access to ICTs, to be less able to afford their use, and to have less of the other resources (such as literacy) which are required to make effective use of them than are the rich, more educated and powerful. The relationships between access and use and between poverty and empowerment are complex, and the subject of a good deal of debate within the development community. It is important to distinguish between what ICTs "can" do in ideal circumstances and what is actually happening or likely to happen in the real circumstances of people's lives, particularly those who are socially, economically or politically disadvantaged. The question of access is at the centre of much debate about ICTs and social justice.

ICT policy

The Oxford English Dictionary has defined "policy" as "a course of action, adopted and pursued by a government, party, ruler, statesman, etc.; any course of action adopted as advantageous or expedient."[2] The online encyclopaedia Wikipedia is a little broader in its definition: "A policy," it says, "is a deliberate plan of action to guide decisions and achieve rational outcome(s). The term may apply to government, private sector organisations and groups, and individuals." It adds that "Policy differs from rules or law. While law can compel or prohibit behaviours…, policy merely guides actions toward those that are most likely to achieve a desired outcome."[3]

ICT policy covers information and communications technologies, networks, services, markets and the relationships between the different actors involved in these – from the operators of submarine cable systems to the users of telecentres. It may be national or international in scope. Each level may have its own decision-making bodies, sometimes taking different (and even contradictory) decisions about how ICTs will develop within the same territory. Because ICTs draw together areas of technology, business and policy that have previously been distinct, policy towards different ICTs is often based around different traditions and assumptions. This is particularly so when it comes to regulation. The ethos of broadcasting regulation, which is based around content and ownership, is very different from that of telecommunications regulation, which is based around technology and interconnectivity.

While ICT policy is primarily concerned with the ICT sector itself and the services it provides, the increasing importance and diversity of ICTs mean that it also intersects more and more with other areas of public policy. The ability of internet users to make use of material sourced from the internet, for example, has implications for public policies on issues ranging from intellectual property (most obviously) to the maintenance of educational standards (which have been undermined by plagiarism and downloaded "model answers"). The availability of complex databases capable of drawing together information on individuals from many sources raises new issues of privacy and security. The use of telephones and the internet

1 Manuel Castells *Information Technology, Globalization and Social Development* (Geneva: UNRISD, 1999)

2 Quoted at open.org.kh/ictpolicy/about_ICTPolicy

3 Wikipedia "Policy" accessed 24 October 2009 en.wikipedia.org/wiki/Policy

by organised crime, including the advent of spam, "419 scams"[4] and other crime specifically enabled by the internet, needs to be addressed in legislation and policy dealing with justice and policing as well as with information and communications themselves. Interfaces like these between ICTs and other areas of public policy have proved difficult for many governments, businesses and civil society organisations to handle.

The most important interfaces of this kind for APC are those between ICT policy, rights and civil liberties; and between ICT policy, access and development. The increasing pervasiveness of ICTs within society changes the relationship between the citizen and the state in many ways. ICTs facilitate both individual empowerment (by extending access to information and the opportunity to organise) and state power (by extending the government's ability to oversee and manage citizens' behaviour). ICTs also enable businesses to gather more information about their customers than was previously possible.

ICTs are often said to empower those with access to them, and to disempower those without. Both individual empowerment and state power can act to the advantage and disadvantage of citizens in general or particular groups of citizens, and the social and political context in which ICTs become available is likely to be important. This gives rise to complex issues concerning rights and civil liberties. For example, surveillance cameras have proved successful in reducing street crime and increasing personal security in public places in some countries, but many citizens are also concerned about the risk that governments will use them to monitor individual behaviour, particularly political protest.

The relationship between ICTs and development is also complex. One major issue, on which APC has focused much attention, is access. Access policy concerns the availability to everyone within society – irrespective of geography or wealth – of infrastructure and access points that enable them to make use of ICTs and the information which ICTs like the internet can make available. Access to telephony has grown exceptionally fast in developing countries during the past ten years – the spread of mobile phones has been faster, probably, than that of any other technology in history – but it has not been matched by the same rate of growth in access to the internet.

4 Advance-fee frauds, named after a clause in the Nigerian criminal code.

Involvement in ICT policy

Although policies are (in most cases) formally decided by governments and intergovernmental organisations, other stakeholders also make input into the policy process and influence its outcomes. The privatisation of broadcasting and telecommunications, for example, has given much greater influence to the private sector than was previously the case. Private companies now have considerable influence over the ways in which technology develops, and international organisations like the International Telecommunication Union (ITU) have recognised this by granting them more participation in decision-making processes. The interface between the private sector and government (policy makers and regulators) is critical in determining the deployment of networks and services, and the pace and quality of service that they make available to consumers.

Civil society organisations have also been taking a more active role in ICT policy issues, although they have achieved less access to national and international decision-making processes than the private sector. Civil society has been active in a number of areas, but particularly those – such as information and consumer rights and social and economic development – where new ICTs affect the opportunities and empowerment of citizens.

Why should citizens and civil society organisations become involved in ICT policy making? The simplest answer is that ICTs have become of central importance in our societies, and are becoming more important every year in areas which civil society organisations find important. Without instantaneous global telecommunications, world financial markets and trading systems would not exist as they do today, for example. Competition between companies depends on global communications, as does the production of new ideas and research, whether at universities, private institutes or company laboratories. They change the behaviour of citizens and communities, enabling people to maintain far greater contact with friends and family at remote distances, access new economic opportunities, and gain information which was previously inaccessible to them. ICTs also facilitate international collaboration, in areas ranging from police action against international crime to campaigns on issues like land mines and human rights.

ICTs may not have "caused" these changes which are taking place within societies, but they have facilitated them, and have become fundamental to the functioning of an increasingly global society and economy. If civil society organisations wish to participate in policy making concerning these broad issues, then they also need to engage with the communications environment that is now central to them.

Civil society involvement in ICT policy has included what civil society organisations (CSOs) have seen as both "positive" and "negative" dimensions of the "ICT revolution"

– the opportunities which ICTs create for citizen engagement and action, and for enhanced prosperity, on the one hand; and the threats of increased surveillance and state control, on the other. They have found it easier to engage with policy on the internet, which has not historically been led by governments and intergovernmental organisations, than with policy on broadcasting and telecommunications, where governments have historically been much more in charge. Civil society engagement has been helped by debates during the World Summit on the Information Society (2003-2005) on the value of "multi-stakeholder" decision making, which aims to establish civil society and private sector participation alongside that of governments and intergovernmental agencies.

ICTs also offer opportunities to civil society organisations to work in different ways:

- To spread their own and others' information more widely and creatively, to millions of people instantly, irrespective of distance.
- To create new forms of organisation and coordination, new structures and new modes of engagement.
- To foster new forms of experience sharing and coordination among the disempowered and disadvantaged.

Many civil society organisations have been using ICTs in innovative ways for several years: from publishing on the Web to coordinating activities through email "lists". Some now also exploit the potential of Web 2.0 services such as social networking sites. APC is one of a number of organisations that works globally, as a digitally empowered network, rather than in traditional office spaces. While these forms of organisation will not suit every civil society organisation, they increase the range of ways in which civil society can work and affect the lives of those it represents.

Above all, however, civil society organisations should be engaged in ICT policy issues because the way ICTs develop will have an enormous impact on future possibilities of working for social justice and sustainable development. If they do not take an active part in ICT policy making, they will have less say in how their societies develop and how the future unfolds. To play that active part, however, civil society organisations need to be well informed: to understand the technology, markets and policy issues involved and to articulate credible policy positions which can win wider support within a multi-stakeholder decision-making environment. This handbook is designed to help to build that understanding and credibility. ■

Chapter 2
INFORMATION AND COMMUNICATIONS: AN OVERVIEW

Lead author ***David Souter***

Information and communications are fundamental to the way societies work. Our ability to choose what to do and how to do it most effectively depends on the information we have gained, from our own experience and from others communicating their experiences and knowledge to us – back to the very first moments of our lives. Our capacity to achieve much of what we want to do depends on us working and communicating with others: to agree common objectives, to issue and receive instructions, to learn and to share what we have learnt, to express our aspirations and concerns. Societies – from the smallest villages to the largest nation-states – are held together by shared information and communication between all who take part in them: governments, businesses, civil society groups and individual citizens.

The information and communications capabilities required for all of this are inherent in all of us. Throughout our lives, we make use of a number of basic information and communication skills – skills such as observation, memory, analysis, speech and our capacity to influence the behaviour of others. ICTs do not change these basic skills but add new capabilities to them, as illustrated in Table 2.1.[1]

ICTs, in short, make it possible for us to collect, store, analyse and share more information, more quickly and more accurately than we can do on our own. This is what makes them such empowering tools. But they do this by adding to our existing information and communications resources, rather than replacing those which we already have.

- Research in many communities shows that face-to-face communications are still preferred by most people for many purposes, particularly those most directly and immediately affecting their lives. Established information sources such as trusted intermediaries (teachers, health workers, community leaders, priests, astrologers, extension workers, successful peers, etc.) continue to play a crucial role in transmitting knowledge and in shaping public opinion even when new technologies have become widespread.
- Traditional information and communications media, such as storytelling, village meetings, music and song, socialising, and physical movement within and between communities, also remain important when new ICTs become available – though they may change form, for example, with radio and television drama adopting some of the roles which were previously played by community performance. Established media such as newspapers and broadcast radio remain important, too, complementing and being complemented by the internet and television. They may even be revitalised by competition from new media.

Table 2.1: **Communication skills and ICT applications**

Communication skills	**ICT applications**
Observation	Data monitoring and collation; applications including remote sensing, global positioning by satellite (GPS), etc.
Memory	Data storage; applications such as databases
Thought/analysis	Data manipulation; applications such as spreadsheets
Research	Databases; digital libraries; the World Wide Web
Calculation	The original functions of the "computer"; data manipulation; applications such as spreadsheets
Organisation	Management information systems and other "information technology" applications
Speech and writing	Communications ICTs, including telephony, email, etc.
Influence	Mass communications ICTs, including broadcasting and the internet

1 This table draws on work by David Souter and James Deane for the United Nations Development Programme and by David Souter, Jacqueline Davies and Ellen Helsper for Plan International.

When thinking about ICTs, therefore, it is important not to see them in isolation, but to recognise where and how they fit into the wider range of information and communications channels and resources which people use to meet their information and communications needs in their particular societies.

Much of the debate about the role of ICTs focuses on identifying ways in which they can add most to the quantity and quality of information that is available, and in which they can extend the range and effectiveness of communications opportunities. Networks are particularly important in this context. This is not just a matter of the technical networks that deliver postal, telecommunications or broadcasting services, but also of the social networks that people rely on for much of the news, entertainment, advice, information and cooperation that underpin their lives and livelihoods. ICTs can do much to enhance and extend informal (e.g. social) as well as formal (e.g. professional or educational) networking.

Information, knowledge and public debate

The terms "information" and "knowledge" are sometimes used interchangeably, but are in fact distinct. Information is the raw material for knowledge – the individual facts in isolation, perhaps – while knowledge reflects the accumulation of information and experience in ways that enable individuals and communities to improve their performance, productivity or quality of life. Information is necessary for knowledge, but does not necessarily lead to it.

It is, obviously, usual to know more or less about something than other people – to be "better informed" or "less well informed" than they are. More (or more comprehensive) information may enable people to make better judgements about things, but does not necessarily do so. People may interpret information poorly, while too much information may cloud the picture rather than clarifying it. For decision-making purposes, what people usually want is sufficient information to make a sound judgement of what will work for them, with a high probability of being "right" – and the knowledge or experience to make that judgement well.

Information and knowledge are also subject to interpretation. Presented with the same facts, different people will reach different conclusions – based, for example, on their own circumstances or on views that they already hold. Individual facts alone may be unequivocal but, as soon as many facts are brought together, the scope for interpretation increases exponentially. Everyone can agree that the Archduke Franz Ferdinand was shot in Sarajevo in June 1914, for example, but there are very many interpretations of the causes of the First World War. Differing views about the facts – different information, different interpretations of that information, different background knowledge and experience, different perceptions of the world – underpin how we think about social, economic and political issues and provide the substance of political debate and policy choice.

Nevertheless, information is often empowering in itself. People use information and knowledge to make decisions which are appropriate for their needs, and to manage their relationships with others in the communities in which they live. As well as enabling people to make the right decisions and to fulfil their potential, information often enables people to gain advantage over their fellow citizens. Those in authority have always known the power of information to help them maintain dominance (though democratic governments seek to do so through popular consent and are therefore more likely to share information with their citizens). The role of information in maintaining and in challenging power is as important at family and village level as in nation-states and international relations. It is another area in which many people believe that new ICTs can alter the way in which things work – either in favour of those with power or those without.

Communications

Information held by an individual empowers only that individual. Information that is shared with others empowers the wider community within which it is shared. It is communications that enable sharing of information to take place, both within communities and over generations. Most importantly, communications enable the different information that is held by different individuals and different communities to be drawn together, building greater understanding and knowledge. To understand the role and potential of ICTs today, it is worth reflecting on the past development of communications.

Human beings have, of course, communicated since before the beginning of recorded history. From earliest times, people conveyed messages to one another through sound/speech and through non-verbal means (gestures, body language, etc.). Other species also use sound and body language. Human communications, however, have been distinguished since very early times by language (which probably first developed around 50,000 years ago), artistic expression (the first rock paintings date back at least 30,000 years) and writing (which first emerged 7,000 or 8,000 years ago). Speech and writing remain the fundamental building blocks of human communications, and the power of new ICTs lies to a very large degree in the capacity which they have to facilitate and expand the range of their expression.

Also from the earliest times, speech and writing have been used to share information and build knowledge within communities. As already noted, knowledge can be shared in many ways other than direct speech. Most communities have used music, narrative, history and myth, for example, to share understanding of the world

in which they live. Over time, these forms of knowledge sharing have been mediated through a growing range of technologies – from paint to print, and more recently through broadcasting and the internet. The variety of means of expression enabled by technology continues to grow: the extensive use of social networking websites is one of the latest manifestations.

These communications technologies – particularly printing, broadcasting, telecommunications and the internet – have had three profound impacts on peoples' and societies' ability to share knowledge:

- They have made information more permanent, enabling it to be conveyed more easily between generations.
- They have made it much easier to convey information over a distance.
- They have facilitated the creation of mass markets for information and communications, in which very large numbers of people in different locations can participate.

Of course, the impact of these changes has taken place over a period of time: several centuries in the case of printing, a little under a hundred years in that of broadcasting, around a quarter of a century for the internet. They have all been more available to certain people – and to certain social groups – at different times in their development, and have gradually widened their reach into the mass of populations.

Of the technologies described here:

- Some (printing and the internet) require additional skills for use (in particular, literacy).
- Some require dedicated equipment (broadcasting, telecommunications and the internet).
- All require expenditure (on newspapers/magazines/books or on equipment).

To gain access to the information resources which are available through ICTs, people therefore need to have access to necessary skills, equipment (both networks and terminals such as radios and telephones) and the money to pay for them. In addition, the interpretation of information in many cases also requires further skills (for example, research and analytical skills) and knowledge – which are gained primarily through education and experience. As a result, the information and knowledge made accessible by technologies (including writing and printing) have historically been more available to the rich and better educated, and very often more available to men, than they have been to the rest of society. The "digital divide" discussed in Chapter 5 of this handbook builds on a longstanding "information/knowledge divide" within societies.

The impact of new communications opportunities

There has been an underlying difference of perception in debate about the impact of ICTs on society during the past ten years or so. This difference lies between those who emphasise continuities between past information and communications resources and new ICTs, and those who emphasise discontinuities. The former view the impact of new ICTs as, essentially, evolutionary – enabling people and organisations to do things more efficiently and effectively than they could previously but not inherently changing the nature of society. The latter view their impact as, essentially, revolutionary and transformational – making society different from what it has been before. The latter sometimes compare what they describe as an "Information Revolution" or "Knowledge Revolution" with the Agricultural Revolution of early human history and the Industrial Revolution of the 18th and 19th centuries.

Which of these views turns out to reflect better the impact of new ICTs on today's world is something we cannot tell at present. ICTs are certainly changing many aspects of many societies very rapidly, but whether or not this impact is transformational will depend on whether those changes in turn result in further and more fundamental shifts in the way people behave and society works. It is always difficult to predict the likely long-term impact of new forces in society like this, but many are increasingly convinced that ICTs do have genuinely transformational potential.

"Information society" and "knowledge society" or "knowledge economy" are terms which are quite often used in this context, although sometimes with different underlying meanings. The online encyclopaedia Wikipedia defines these terms as follows:

> An **information society** is a society in which the creation, distribution, diffusion, use, integration and manipulation of information is a significant economic, political, and cultural activity. The **knowledge economy** is its economic counterpart whereby wealth is created through the economic exploitation of understanding.[2]

Both terms imply a major lasting shift in the way society works – from one based around the production and exchange of goods to one based around the production and exchange of information and services. Both have been widely considered to be desirable or "progressive" developments, and the United Nations has even held two world summits to promote the information society (see Chapter 29). A good deal of discussion around them also focuses on their relationship with globalisation, i.e. the international integration of societies and economies. This integration is facilitated by the capacity of new ICTs to render distance irrelevant in the transfer of information and many other services. ■

2 Wikipedia "Information society" accessed 24 October 2009 en.wikipedia.org/wiki/Information_society

Chapter 3
INFORMATION AND COMMUNICATIONS TECHNOLOGIES

Lead author ***David Souter***

Defining ICTs

ICTs are information and communications technologies, and the products and services which make use of them.

Most people who are interested in ICTs have a fairly clear idea of what they themselves mean when they use the term – but different people's clear ideas can differ quite substantially from one another. Some people use a very wide definition of ICTs, including broadcasting and even print technology, while others restrict it to what are sometimes called "digital technologies". Digital technologies are those which make use of the binary language of ones and zeros which is understood by computers, by contrast with "analogue technologies" which rely on fluctuations in wave forms (see Chapter 8). They include computing and information technology, modern telecommunications and the internet, and the latest types of broadcasting. Some writers have an even tighter definition, using the term ICTs to refer almost exclusively to the internet and services driven by it such as e-business and those applications encompassed in the term e-government.

It is important to be clear, when reading any commentary on ICTs, just what the writer has in mind. This handbook uses a broad definition of ICTs, summarising them as "electronic means of capturing, processing, storing and distributing information" – electronic means, that is, of fulfilling or supporting the human information and communications activities described in the table in Chapter 2: observing, thinking and calculating, recording, memorising, talking, writing, etc. With ICTs, people can do these things more efficiently, more accurately and more quickly than they can by relying on their own mental abilities. As a result, they can also achieve things which cannot be achieved by human intelligence alone.

This definition includes analogue and digital technologies, and so includes broadcast radio and television as well as "new ICTs" like mobile phones, computing and the internet. However, it does not include printing and print publications.

Types of ICTs

ICTs, as they have been defined here, fall into four main categories:

- **Computing and information technology**, which are mostly concerned with the use of electronic intelligence to analyse information and manage processes.
- **Broadcasting**, including radio and television, which is mostly concerned with communicating the same information simultaneously to a large number of people.
- **Telecommunications**, including both telephony and business-to-business data communications, which is mostly concerned with communicating one-to-one messages between people and computers on an interactive basis.
- **The internet**, which networks computerised information sources over telecommunications infrastructure, and allows both undifferentiated information and one-to-one messages to be transmitted interactively between all connected computers and their users.

The technical, market and policy issues concerning these specific ICTs are described in Chapters 8 to 21 of this handbook. Chapter 8 looks at computing and information technology issues, Chapters 9 to 12 at broadcasting, Chapters 13 to 17 at telecommunications and Chapters 18 to 21 at the internet. This chapter provides an overall summary of ICT technologies as a whole.

Historical development

The use of electronics to capture, process, store and distribute information began in the 1830s with the introduction of the telegraph, which used code (usually Morse code)[1] to send text over wired networks. The first transatlantic telegraph became operational in 1866 and a global network was in place by around 1870. The International Telegraph (now Telecommunication) Union was established in 1865 to oversee international telegraphy.

The telephone, which first allowed sound (and therefore speech) to be transmitted over wires, was invented in the 1870s and in commercial use by the end of the 19th century. Its use became widespread in the United States and Canada quite quickly (40% of US homes had telephones by 1930), but it remained a luxury item in other industrial countries until the 1970s and did not reach large markets in developing countries until the 1990s.

Telephone networks can use radio waves (or wireless technology) as well as wired infrastructure to transmit

1 Morse code uses sequences of dots and dashes in place of letters and numbers.

messages, both locally and over longer distances. Communications satellites began to compete with oceanic cables for international telecoms traffic in the 1960s. Since the early 1980s, cellular wireless networks have transformed domestic telephony by providing infrastructure for the mobile phone, which provides telephone service to an individual wherever s/he may be rather than to a specific location. Mobile phone networks now have more subscribers than fixed phone networks in almost every country.

Telecommunications networks can also deliver data (i.e. information in electronic form) as well as voice communications. Data communications have been important to government and business for many years. Most individuals in industrial countries have also become familiar with some devices that make use of data communications such as bank ATMs (automated teller machines), credit card transaction terminals and fax machines. The ability of telephone networks to deliver data is at the root of the development of the internet.

Broadcasting developed separately from telecommunications, using different technologies and networks, although in recent years these have begun to converge significantly with those of telecoms. Radio began to be used as a broadcast medium during the first quarter of the 20th century. In the latter half of the century, portable transistor radios helped to make broadcast radio the most widely available of all ICTs – and the most common source of news, information and entertainment – particularly in lower-income developing countries. The later 20th century also saw the widespread development and use of television, displacing radio as the primary source of news and entertainment in industrial countries and, latterly, an increasing number of developing countries. The advent of digital broadcasting in the last decade or so has facilitated the delivery of broadcast content through other media, including the internet, and enabled a variety of new broadcasting models to evolve. Liberalisation of broadcasting and the development of community radio have been important in many countries.[2]

Computing, in the broad sense that we understand it today, dates back to the invention of digital electronics in the 1930s. Early computers were very large, expensive and limited in their capabilities. The 1980s, however, saw the beginning of a transition from centralised computing, managed by organisations, to distributed computing based around individual personal computers or PCs, firstly in the workplace and then increasingly at home. The development of graphical user interfaces, such as Microsoft Windows, did much to make computers user-friendly, and they can today be found in a majority of households in many industrial countries. The capability of computers continues to increase rapidly year on year.

2 For more on the history of broadcasting, see Chapter 9.

The internet draws together the capabilities of the computer (to store information) and the telecommunications network (to disseminate it widely). It works by linking computers (and, now, also other terminal devices), enabling them to access and share each others' data. Its origins lie in a United States defence project called ARPANET which began in 1969. The wider potential of the internet was realised successively by computer specialists and the academic community, by business and by individual users. Tremendous growth in internet use followed the introduction of the World Wide Web in the 1990s, and the number of internet users reached around 22% of the world population by the end of 2008.

Although the internet makes use of telecommunications infrastructure, it does so in a different way from traditional telephone networks – disassembling data into small "packets" which travel independently to their destination, where they are reassembled, rather than requiring a single dedicated channel to be open continuously between those who are communicating. This IP ("Internet Protocol") technology is now displacing traditional telecommunications transmission.

The last two decades have seen a good deal of convergence between these historically distinct types of ICT. This has been driven in particular by the move from analogue to digital technologies. Although (wave-based) analogue technology is still widely used in broadcasting, other ICTs now rely predominantly on the same binary digital language of ones and zeros which drives computing – and broadcasting itself is also increasingly becoming digital. This convergence has had major repercussions for the organisation and regulation of ICT businesses which are discussed in later chapters of this handbook.

ICTs have become increasingly important, playing an increasing part in the lives of more and more people in the 170 years or so since the invention of the telegraph. Their increased role has been driven by their obvious utility and by rapidly falling costs, which have resulted from very rapid technological development. During the last quarter of the 20th century, most business and government functions in industrial countries and in larger business sectors of developing countries have been computerised, and ownership of televisions, telephones and computers has spread widely in all countries. By 2002, the ICT sector accounted for 6.6% of global GDP, about twice its contribution 25 years earlier, and ICT use continues to grow rapidly.

Networks, platforms, services and terminal equipment

An important distinction can be drawn when thinking about ICTs between different stages in the provision of communications to end-users. There are five main technical terms and stages involved.

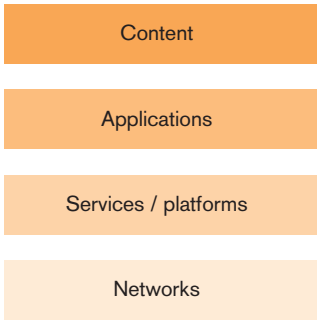
- Networks are essentially delivery channels. They provide the infrastructure which enables communication to occur. All networks involve some physical infrastructure, but actual transmission over a distance may use radio waves rather than (or as well as) physical wire or cable. In recent years, telecommunications has increasingly moved from fixed (wired) to radio (wireless) infrastructure, while broadcasting has increasingly moved the other way, from wireless to cable networks.
- Platforms are the systems and standards which have been developed, either in competition or agreement, to make use of networks in order to deliver services to users. Different platforms have different characteristics which are more or less valuable to different users and in different circumstances. Examples of such platforms include short wave radio, high-definition television, and the GSM and CDMA variants of wireless telephony. In the past, they have often been specific to particular networks, but this has become less so as digital has replaced analogue equipment.
- Services provide the framework for the "communication events" which take place over networks – for example, the television channels (which deliver programmes), the telephone services (such as conventional voice telephony, fax service or voicemail) and internet services (such as the World Wide Web, audio download and "voice over internet" telephony).
- Applications are specific forms of service provision. The term is used both in a generic sense (such as "soap opera", "phone-in programme" or "word processing") and to identify specific instances or programmes offered by particular service providers or application vendors (such as "Big Brother", "Microsoft Word" or "Google"). In the past, services and applications have often been specific to particular networks and platforms, but multi-network services and cross-platform applications are more common in the digital age.
- Terminal devices are the equipment which is required to send and receive communications. These include radio and television receivers, fixed and mobile telephone handsets, and the modems, routers and computers used to gain access to the internet. Many of these are now also becoming capable of working with diverse platforms, services and applications.

In addition, within computing, there is an important distinction to be made between operating systems (such as Apple Macintosh, Linux, Microsoft Windows), which are comparable to platforms; and applications, using the term either generically (word processing, spreadsheet, database) or in reference to proprietary products (such as Microsoft Word, Excel and Access) and their open source counterparts.

Although most discussion of ICTs now emphasises "communications" which require networks, it should be remembered that not all ICTs are connected to networks or indeed have network capability. Many people around the world still use personal computers without connecting to the internet. Stand-alone systems of this kind also have utility and in some cases offer a level of security that cannot be guaranteed within a network environment.

One framework which has proved useful for thinking about the interaction between the ICT sector and end-users is based around four distinct layers of ICT provision. There are a number of ways of identifying these layers, but one of the most obvious is illustrated in Figure 3.1. ("Platform", in this context, refers to the different network architecture and hardware devices on which applications and content may be delivered.)

Figure 3.1: **Layers of ICT provision**



Each layer within this framework has different economic characteristics and market circumstances (see Chapter 4). All four are crucial to determining the value which ICTs offer to end-users, and the interaction between them is particularly important in this context. Networks without applications and content, for example, are of little value to consumers. This framework therefore provides a helpful basis for thinking about some of the issues covered elsewhere in this handbook.

How ICTs are used

Much of the literature about ICTs, particularly that concerned with development policy and applications, considers the role and impact of ICTs together, as a group of new technologies. This is especially true of assessments that emphasise the potential which ICTs are seen to hold for social and economic transformation, or which seek to take an overview of their impact on countries and communities.

While this approach is useful and important, it is also important to recognise the differences between the ways in which people use different types of information and communications services and devices. In practice, different ICTs have historically had different basic characteristics

Table 3.1: **Characteristics of media types**

	Primary information or communication mode	Primary users	Prevalence among the poor	Principal uses
Print media	One-to-many communication	Individual citizens (newspapers); collective institutions such as schools and businesses (books)	Limited by prevailing levels of literacy, content control (newspapers) and scarce distribution (books)	Information and entertainment
Computing and information technology	Administration and information management	Organisations, including government and business	The poor make use of services but do not usually own or implement them	Administration and service delivery
Broadcasting	One-to-many communication	Individual citizens	Radio – very extensive Television – substantial and rapidly growing in Asia and Latin America; limited in rural areas in Africa	Entertainment and information
Telecoms	Voice telephony – one-to-one communication Data communications – one-to-one and one-to-many communication	Voice telephony – individual citizens and organisations Data communications – business and government	Ownership of telephone devices – limited but growing rapidly Usage of telephony – high, including public facilities and entrepreneurial resale	Social networking Information and administration
The internet	Email – one-to-one communication World Wide Web – one-to-many communication Social networking – many-to-many communication	At present, government, business and educated elites in most countries; most citizens in industrial countries	High in industrial countries; limited in middle-income countries and urban areas; very limited in Africa and in many rural areas	Email – social networking and administration World Wide Web – entertainment, information and commerce Social networking – social networking

and been used by different people for different purposes. Broadcasting, for example, has been and is still used primarily to obtain entertainment and general information. (It is also used by some governments to control information, by companies to promote products and services, etc.). Telephony is used primarily for interpersonal communications between individuals, whether for private or business purposes. Many data communications, computing and information technology applications, however, are primarily used by organisations to enhance their internal management or service delivery. Use of the internet includes characteristics of all three of these other types of ICTs, meeting a wide range of different needs for those who can afford the necessary equipment and usage cost.

Many of the differences observed here result from the different degrees of interactivity which different technologies can offer. For example, broadcasting primarily delivers messages from one source to many recipients, while telephony is primarily concerned with one-to-one communications. Table 3.1 summarises some of the main characteristics of these different types of ICTs and compares them with traditional print media.[3]

Convergence, as described above, means that it is now increasingly possible for people to use different technology types (networks, platforms, services, terminal devices) to gain information or to communicate in ways for which they would previously have used other technology types. This has led to substantial changes in both technological and business models for communications services, which are discussed in Chapter 15. However, the differences between the usage characteristics of different types of ICTs remain substantial, and profoundly affect their value for specific purposes – for example, for service delivery, provision of information, and advocacy work. People will continue to use different ICT services and devices for different purposes, and those who work with them increasingly recognise the need to consider the diversity of ICTs as well as the overall impact of the ICT sector.

As well as opening up new opportunities, the rapid development of ICT technologies has made markets for information and communications products and services less stable and required major revisions in the plans of information and communications providers. These issues are discussed in Chapter 4. ■

3 This table draws on earlier work by David Souter for the United Nations Development Programme and others.

Chapter 4
INFORMATION AND COMMUNICATIONS MARKETS

Lead author ***David Souter***

Information and communications facilities and services are supplied within a number of different markets. Some of these markets are closely linked, while others are converging with one another; but different ICT products and services are still often provided to consumers by different businesses in different market frameworks which have different rules and regulations.

It is important, when looking at any information or communications market, to be clear about the different players involved and the relationships between them. Three types of relationship are important in most ICT markets, as follows:

- Those between government (policy makers and regulators) and participating businesses.
- Those between businesses which participate within the market, whether as competitors or as parts of the same supply chain (or sometimes both).
- Those between businesses and consumers.

Because of the complexity of the ICT sector, these relationships are often also very complex. It is impossible to give a comprehensive survey of information and communications markets in the space available within this handbook, but this chapter tries to describe some of the more important issues about market structure which are likely to concern civil society organisations.

Types of market

There are a number of different ways of categorising ICT markets. The simplest is to distinguish between them according to the *service* which is delivered to end-users – such as telephony, broadcasting, internet access or consumer terminal equipment. As mentioned in Chapter 3, although convergence is blurring the boundaries between these different service markets, most people still distinguish quite clearly between them in their daily lives.

Another useful starting point is to distinguish between markets on the basis of the *nature* of what is being traded. This is perhaps a little less straightforward, but four categories or types of product or service that is made available can be readily identified: infrastructure, services, equipment and applications, and content. These categories are closely related to the layers illustrated by Figure 3.1 in Chapter 3.

Infrastructure markets are concerned with the supply of network capacity, and so with the availability of the communications "facilities" which are needed to deliver services and content.

Infrastructure providers own networks – which may be broadcasting networks or telecommunications networks, national or international in extent, based on wired or wireless technology or a combination of both. Different types of network have historically been used for different service and content markets but there is growing convergence and interchangeability between them. Most infrastructure provision is capital intensive and infrastructure markets tend to be highly concentrated. Many have been monopolies, and some still are.

The main customers of infrastructure markets are service providers (broadcasting channels, telecoms and internet service providers, suppliers of value-added services such as ATMs, etc.), and infrastructure markets are therefore largely wholesale markets in which end-users are not directly involved. However, some large end-users (multinational companies, banks, etc.) also buy network capacity directly from infrastructure owners. In addition, many infrastructure owners (particularly telephone companies) also act as service providers and so engage in competition in service markets with other service providers who are customers of their wholesale infrastructure business. This raises regulatory problems which are discussed in Chapter 16.

Service markets are concerned with the supply of information and communications services to end-users – for example, the provision of cable television channels, voice telephony or internet access to individual citizens, businesses and other organisations. In addition to these major services, recent years have seen a proliferation of niche or "value-added" services which are of interest to particular user groups.

Where infrastructure markets are essentially wholesale, service markets are essentially retail in character. Provision of services requires much less capital investment than provision of networks, and so there are usually many more service providers than infrastructure providers (unless the service provision market has been restricted by regulation). As noted above, particularly in telecommunications markets, network operators often also act as service providers, in competition with companies that do not own networks. (Most mobile telephone networks are

at present made up solely of companies which are both network operators and service providers, but some also have "virtual" mobile operators, i.e. companies which retail service to end-users using infrastructure capacity bought from network operators).

Equipment and applications markets are concerned with the supply of the physical and non-physical goods – the hardware and the software – which enable networks and services to work. There are many different equipment markets, but, for present purposes, they can be divided into two main groups: those for equipment and applications which enable networks to work, which are primarily of interest to network operators and service providers, and those for equipment and applications which enable services to be accessed by end-users.

Network equipment markets are dominated by a small number of very large international companies which manufacture and deploy telephone exchanges, optic fibre cable, etc. Because of the very high capital costs involved in many aspects of network procurement, the technical choices made can have a substantial and lasting impact on the subsequent deployment of services to end-users.

The markets for some consumer equipment products – such as televisions, mobile phones and "office suite" software – have also become highly concentrated, although there is usually more diversity in these. Manufacturers rarely sell directly to end-users (except in the case of specialist equipment bought by major companies). Most terminal equipment (such as televisions and computers) is bought by end-users in retail markets, but service providers have become involved, alongside conventional retailers, in the supply of some consumer equipment. This is especially the case with mobile phones.

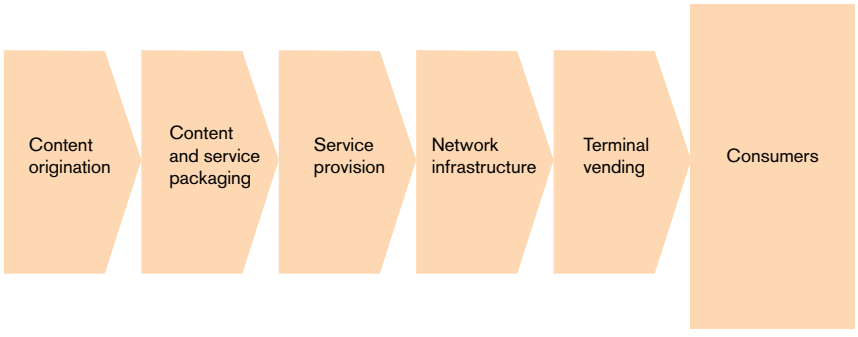
Content markets are concerned with the information which is supplied through communications media. A number of different stages can be identified in the transmission of content to end-users, including content origination (writers, filmmakers, musicians); production (publishing houses, recording studios); and packaging and delivery (television channels, websites, search engines). Content markets also involve competition across different platforms: today, for example, news can be obtained from newspapers, radio, television and the internet. As well as competing against each other, therefore, different radio and television channels are also competing against other media channels which can deliver the same or closely similar content to end-users.

Content markets are most important, for present purposes, in broadcasting and the internet. They are less important in telecommunications, where the principal area of competition for end-users is that between service providers.

This four-part categorisation is still, of course, a relatively simple one. All of these markets – whether for infrastructure, services, content or equipment – can be divided into subsidiary markets. In many cases, these subsidiary markets are geographical in character: national markets for telephony, for example, or regional markets between competing local radio stations. In others, they mesh with one another to provide broadly equivalent services with different capabilities – for example, those for mainstream "terrestrial" and cable or satellite television, those for fixed and mobile telephony, and for second and third generation mobile telephony. In such markets, different products and services may complement or substitute for one another, and which it is they do may well vary over time as well as between communities.

The categorisation above is helpful, however, in distinguishing between different stages in the delivery of information and communications services to consumers. Where most ICTs are concerned, most consumers, in practice, need to be located in areas where suitable networks have been deployed, to have the opportunity to buy services and equipment, and to have available to them content which is sufficiently meaningful or attractive to make it worth the purchase. This can be represented diagrammatically as in Figure 4.1.

Figure 4.1: **An ICT supply chain**



Many of the problems which consumers have in making use of ICTs result from failures occurring at particular points within this chain of supply – most obviously, of course, when networks themselves are not available within their geographic area. Factors which contribute to such market failures are discussed later in this chapter. Firstly, however, it is useful to consider the different categories of consumer served by communications markets, and to summarise the structural changes which have taken place in these markets in recent years.

Categorising consumers

Without consumers there would be no information and communications markets. Successful businesses pay a great deal of attention to market research, which seeks to elicit consumer opinion and help predict consumer behaviour. Policy makers and regulators in some countries now also pay significant attention to consumer consultation. One, the former British regulator Oftel, put them squarely at the centre of its mandate, summarising its key goal as being to secure for the consumer "the best possible deal in terms of quality, choice and value for money."[1]

In many countries, however, civil society organisations struggle hard to make consumer voices heard. One particular challenge in communications markets is the diversity of consumer views resulting from the different purposes for which people and organisations make use of different services. Take the market for voice and data telecommunications, for example. The following main customer groups can be identified within this market:

- Government departments (historically by far the largest users of fixed voice telephony in developing countries)
- High-volume high-intensity business users of telecommunications (such as banks, which require high levels of reliability and security)
- Telecoms-dependent business users (such as internet service providers, telecentres and call centres)
- Multinational businesses (which require high standards of international communications)
- Small businesses (such as local shops, manufacturers, etc.)
- Residential subscribers
- Mobile subscribers (who may be in urban or rural areas, contract or prepaid subscribers)
- Non-subscribers (i.e. those who rely on public access facilities rather than owning their own telephone handsets).

1 www.ofcom.org.uk/static/archive/oftel/publications/consumer/data1200.htm

Each of these consumer groups is likely to have its own distinct priorities and to respond in different ways to the services provided and the decisions taken by businesses and regulators. Businesses in communications markets are likely to focus on different market segments, basing their decisions on the likelihood of achieving a profitable market share which can be sustained and/or built on for the future. In some cases, this will mean concentration on higher-value customers such as businesses. However, recent years have also seen significant attention paid to the commercial potential of aggregating demand amongst the poor, in what the economist C. K. Prahalad calls "bottom of the pyramid" markets (see Chapter 17).

Sector restructuring

There have been three broad trends affecting the nature of information and communications markets in the last twenty years: sector restructuring, diversification and convergence.

Until the last quarter of the 20th century, electronic communications markets – broadcasting and telephony – were dominated in most countries by national governments. In very many countries, broadcasting was monopolised by state-owned broadcasters or heavily controlled by government. In most countries, telecommunications was provided by state-owned monopolies, just like (and often alongside) postal services. Most countries, however, had a more liberal attitude to the ownership and delivery of print (as opposed to broadcast) content.

This situation has changed dramatically since 1975.

- There has been extensive liberalisation of broadcasting, in many countries, including the emergence of commercial and community stations with both national and local coverage.
- There has been extensive liberalisation and privatisation of telecommunications businesses, with almost all new businesses being established in private sector, liberalised markets.
- The internet has come to play a major part in information and communications markets with little significant government involvement.

Diversification

These changes, and new technological developments, have diversified the sources of information and channels of communication which are available in almost every country. In particular:

- Listeners and viewers now have a much wider range of broadcast channels available to them. Greater diversity in entertainment has increased the attractiveness of radio and TV ownership. The end of state monopoly has also diversified the perspectives of news programmes.

- Telephone users have much more choice of service provider and, in particular, can now choose between fixed and mobile network modes. In practice, this has seen a transition from fixed to mobile networks as the primary mode of telephony for most users in most countries.
- The internet has provided access to a far wider range of information and entertainment resources than was previously available, including the opportunity for end-users to bypass content restrictions imposed by their governments (through political censorship or public interest regulation).

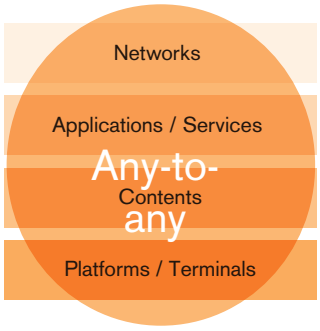
Convergence

Technological convergence has also enabled the convergence of businesses which had previously operated in separate communications markets. New technology makes it much easier, and more commercially viable, for companies to combine activities in broadcasting, telecommunications, the internet and other information and communications markets.

The convergence between different ICT markets has enabled policy makers as well as businesses to rethink the way in which communications markets might be expected to develop. In particular, some regulators have sought to make markets technology- and service-neutral, allowing businesses to make use of whatever technology is available to provide whatever services they can, so long as they do not behave in an anti-competitive way. As a result, the linear pattern of communications services based on specific communications types, which was illustrated earlier in this chapter, is beginning to be replaced by a much more flexible "any-to-any" pattern which might be illustrated by Figure 4.2.

This new understanding of the communications market is increasingly being adopted by businesses and regulators, and has been welcomed by APC. It is seen most clearly in the European Union's current Regulatory Framework for Electronic Communications,[2] one of whose key principles is technology neutrality, but it is increasingly evident too in other regulatory regimes.

Figure 4.2: **The new European regulatory framework**



Market failure

In most contexts, markets arise naturally for products and services. Where there is significant demand, a number of suppliers will offer to provide the products and services in question. In most circumstances, there will be sufficient suppliers to enable effective competition on price, quality and variety of service. This in turn should result in the most economically efficient allocation of goods and services. (It should be noted that economic efficiency does not necessarily imply social equity: the two may coincide, and many mainstream economists would argue that they often or usually do so; other economists, however, disagree and see the two concepts as unrelated or, in some cases, as inimical.)

Although markets arise naturally in most instances, there are cases where they do not arise, or where they do not lead to sufficient competition to produce efficient competitive outcomes. These circumstances are known as "market failure". Two types of market failure are quite often seen in communications markets:

- The first of these is when the capital costs of investment required to enter a market are so high that investment costs can only be recouped by one supplier. This situation is known as "natural monopoly". It has been a particular problem in the deployment of networks, especially in rural areas and areas of low demand.
- The second is when a particular point within the supply chain – sometimes called a "bottleneck" – remains monopolistic even though other parts of the supply chain are competitive. This has been a particular problem in the provision of the "local loop" for telecommunications, i.e. the final connection between the telephone network and the individual subscriber's premises, and in international gateways.

"Public goods"

In some cases, market failure arises from what are called the "public goods" characteristics of particular markets. In economic terms, public goods are those which can be described as "non-rival" (i.e. where consumption by one person does not prevent subsequent – or even simultaneous – consumption by another) and "non-excludable" (i.e. where it is not possible to prevent people who have not paid for them from making use of them). This economic

2 ec.europa.eu/information_society/topics/telecoms/regulatory/new_rf/index_en.htm

sense of the term is distinct from the political term "the public good", though the two are sometimes confused.

Some information and communications markets have significant "public goods" characteristics. For example, the fact that one person watches a television programme has no effect on the opportunity for another person in the neighbourhood to watch that same programme. Knowledge is sometimes described as a "global public good", because its use by one person does not prevent its use by another and because access to it can be non-excludable (although in practice it is usually constrained by factors such as access costs and language skills).

APC is among those organisations which have argued that the internet, which provides access to knowledge, should be regarded as a public good; and so, by extension, should the availability of high-quality networks which can be used to access it effectively.

Market issues

Issues concerned with the ways in which particular information and communications markets work are described in greater detail in later chapters of this handbook. However, there are three broad issues which it is useful to remember when thinking about communications markets in general.

The first of these concerns what are known as "**network externalities**".

Some communications markets – particularly telecommunications and postal services – are highly interactive. Network externalities derive from the fact that the utility of a telephone line (or similar access point for interactive communications) increases when a new subscriber joins by the increase in the number of connections that can be made between subscribers rather than by the number of subscribers themselves. A telephone network with two subscribers has one possible connection, for example, while a network with two subscribers has three possible connections, a network with four subscribers has six possible connections, and so forth.

In interactive markets like this, therefore, the gain of each new customer should be measured in terms of the number of connections which are now available rather than the number of customers. This is particularly important when customer numbers are low, and suggests that there will be a "tipping point", when participation in the market comes to be seen as "common", after which the number of customers or subscribers will accelerate sharply. Broadcasting markets, which are not interactive, grow more incrementally and are likely to experience fewer sudden bursts of growth.

The second issue concerns **interconnection**. The supply chains of communications markets are long and require a number of different business inputs before they can deliver services to end-users. To be of sufficient quality, these different parts of the supply chain – networks, services, equipment – need to "interoperate", i.e. to interact technically, with high reliability. If at all possible, from the end-user's point of view, the whole supply chain should appear "seamless" (a favourite word within the industry).

Interconnection becomes even more complicated when markets become competitive, because many supply chains now involve competing as well as complementary networks and service providers. For example, a telephone call may originate on facilities owned by network A and terminate on those of network B, using infrastructure en route which is owned by networks C and D as well as A and B. Interconnection here requires not just technical interoperability but also complex and reliable accounting, and a significant degree of cooperation between competitors. In practice, in competitive telecoms markets, interconnection charges mean that network and service providers' main customers are often the other network and service providers with which they are in competition.

The third issue concerns **vertical and horizontal integration**. Historic monopoly communications businesses had a high degree of vertical integration, i.e. they owned networks, provided services that ran over those networks, and often also supplied terminal equipment to consumers. As a result, they were able to cross-subsidise different parts of the supply chain in order to achieve their business goals. Most telecommunications operators, for example, subsidised customer access charges (connection charges and subscriptions) by making high profit margins on international traffic.

Cross-subsidies of this kind are not sustainable in a competitive market. However, vertically integrated companies have found other ways of leveraging their integration in order to gain competitive advantage. One example of this is "bundling", i.e. offering customers packages of services which their competitors are not able to offer in the same way. (The bundling of broadcasting, telephony and internet on a single broadband connection is known as "triple play".)

Convergence has enabled businesses to go beyond their historic boundaries in combining markets in this way – integrating horizontally across service provision boundaries as well as vertically within the supply chain. Many companies, for example, now combine elements of telecommunications, internet services, broadcasting and even content production. These developments pose further challenges for regulation which are discussed in later chapters of this handbook. ■

Chapter 5
INFORMATION AND COMMUNICATIONS RIGHTS

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Introduction

The term "information and communications rights" refers to the broad range of legal and moral entitlements and responsibilities that people have relating to communications. Many of these are included in the group of rights known as "universal human rights" and are protected under international law, including for example the right to freedom of expression. Others are political and consumer rights, such as the right of access to public information and rights over personal data. These often stem from universal human rights but are protected only in national and regional law.

Within the international human rights framework, communications rights are considered to be extremely important as they underpin many other rights and social goods. For example, within democratic political systems, communications rights enable people to hold their elected representatives to account, both through direct communications with those representatives and by providing means for them to express their needs and opinions in public.

Communications rights are closely related to ICTs and ICT policy in two main ways:

- Firstly, by changing the ways in which people communicate with one another, ICTs present new challenges and opportunities for communications rights. For example, the internet can help to realise the right to freedom of expression more fully by making it easier for individuals to communicate with one another in private and public domains. However, it also presents challenges for those seeking to protect the right to privacy as it supports new ways in which the monitoring of private conversations can be undertaken by third parties (governments and others). By influencing the development and use of ICTs, policy can either indirectly affect rights or specifically seek to promote them – for example, by giving people access to technologies that enable them to access public information, participate more directly in government, or encrypt their personal conversations.

- Secondly, the human rights framework can be used to help address ICT policy issues, as it provides guidance from other rights experience on how to balance different – and potentially competing – rights and responsibilities. For example, the framework can be used to help policy makers determine where the line should be drawn between security measures that are necessary to protect public safety, and those that impinge on freedom of expression and privacy.

This chapter explores the relationship between ICTs and communications rights. It begins with a brief overview of the history and definition of information and communications rights. It then describes the challenges and opportunities available for protecting and advancing rights in the age of ICTs. Finally, it examines the position of rights within current ICT policy debates and looks at the question of whether the existing rights system is adequate for advancing and protecting communications rights in the information age. These discussions provide the foundations for a more in-depth examination of specific information and communications rights issues which can be found in Chapters 30 to 33 of this handbook.

Historical development of the concept of rights

The idea that human beings possess certain rights and responsibilities as individuals or as members of a community can be traced back to early philosophical and religious texts. It is sometimes assumed that rights principles stem from Western traditions, building on ancient Greek and Roman philosophy and, more recently, the Reformation and Enlightenment. However, similar principles can also be found in Buddhism, Confucianism, Islam and Hinduism.[1]

The notion that people (or at least citizens) have rights *in relation to their rulers* was apparent in a number of ancient cultures, notably those of Greece and Rome. In later European culture, it became enshrined in law for the first time in the Magna Carta of 13th century England, an agreement forced upon the English monarch by his aristocracy, which included principles such as *habeas corpus* (which legislates against unlawful detention). This was further developed in England by the 1689 Bill of Rights which established the sovereignty of the English parliament – although this was essentially a political settlement between the monarchy and parliament, and granted only limited rights protections to individual citizens. The idea

1 For further discussion, see Amartya Sen *Human Rights and Asian Values* (Sixteenth Annual Morgenthau Memorial Lecture on Ethics and Foreign Policy, 1997) 206.252.132.104/media/254_sen.pdf

that all humans hold natural, inalienable rights entered into national laws in the 18th century, drawing on the political and legal struggles of religious dissenters in a number of European countries during the 16th and 17th centuries and then on Enlightenment period philosophy. The American Declaration of Independence (1776) and the French Declaration of the Rights of Man and of the Citizen (1789) were the first constitutional texts to reflect this thinking.

The concept of universal human rights gained international acceptance in 1948 with the approval of the Universal Declaration of Human Rights (UDHR) by the United Nations General Assembly. This agreement was spurred by the authoritarianism and atrocities that had been committed by European dictatorships during the 1930s and the Second World War. World leaders – which, at that time, meant mostly European and North American political leaders – vowed that injustice and violence on the scale of the first half of the 20th century should not be allowed to recur, and the definition and protection of universal rights were seen as key means of preventing their recurrence. The Universal Declaration itself is non-binding, but it was translated into two binding treaties which were agreed in 1966: the International Covenant on Civil and Political Rights (ICCPR) and the International Covenant on Economic, Social and Cultural Rights (ICESCR). Together, these three agreements make up the International Bill of Rights (IBR) and form the foundations of the international human rights system. States that have ratified the two rights covenants are legally bound to enforce them under international law.

The international human rights system can be pictured as consisting of three overlapping tiers of national, regional and global regimes. The IBR forms the basis of the global regime. It has been interpreted at the regional level by a number of regional bodies: for example, the Council of Europe adopted the European Convention on Human Rights in 1950; the Organisation of American States agreed the American Convention on Human Rights in 1969; the African Union adopted the African Charter of Human Rights and Peoples' Rights in 1981; the League of Arab States adopted the Arab Charter on Human Rights in 1994. The obligations enshrined in these agreements are in turn codified in national law in many countries. Codification in law does not, however, mean that the principles contained in agreements are necessarily respected in practice.

Information and communications rights in the international human rights system

Communications rights are given a high degree of importance within the International Bill of Rights and regional rights agreements, reflecting the underpinning role that they are felt to play in supporting democratic rights-based societies.

The right that refers most directly to communications is the right to freedom of expression. This is protected by Article 19 of the UDHR and ICCPR; by Article 13 of the American Convention; by Article 9 of the African Charter (elaborated by a specific declaration agreed in October 2002); and by Article 11 of the European Convention. Article 19 of the UDHR states that:

> Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.[2]

Many legal scholars argue that freedom of expression here refers not only to the "negative" right to be free from censorship, but also includes "positive" dimensions of seeking, receiving and imparting information. The international rights agreements also imply that simply refraining from censorship is not enough and that states have obligations to take whatever steps are necessary to ensure that people can enjoy free expression in this fuller sense, for example, by providing them with the means to communicate.[3]

The term "protecting rights" is used to refer to the protection of minimum rights standards. This usually constitutes protection of "negative" aspects of rights, in this example by governments refraining from direct interference in communications. The term "expanding rights" is used to refer to ways of interpreting rights that include their positive dimensions. For example, in the case of free expression, this might involve giving people access to public information, ensuring that everyone has the means to communicate in the public domain, and ensuring that people have access to diverse and pluralistic media.

Because of its positive dimensions, the right to freedom of expression can be thought of as a foundation right within the rights framework because, without it, other rights contained in the IBR cannot be upheld. For example, without freedom of expression, the civil right to participate in government is severely constrained, and the economic right to freedom from hunger is less likely to be realised. The economist Amartya Sen has argued that there has never been a famine in a country with a free press and regular elections.[4]

While some commentators argue that all information and communications rights stem from freedom of expression,[5] a range of other freedoms and responsibilities that affect

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2 www.un.org/Overview/rights.html

3 Article 2 of the ICCPR obliges states to "adopt such legislative or other measures as may be necessary to give effect to the rights recognised by the Covenant." A similar obligation is contained in the preamble of the UDHR.

4 See, for example, Amartya Sen *Poverty and Famines: An Essay on Entitlement and Deprivation* (Oxford: Oxford University Press, 1993)

5 For further discussion see Article 19 *Note on the Draft Declaration on the Right to Communicate* (2003) www.article19.org/pdfs/analysis/hamelink-declaration-the-right-to-communicate.pdf

communications in private and public spheres are included under the umbrella of information and communications rights. A number of rights within the IBR fall within this category. For example, communications rights in the Universal Declaration include the following:

- Article 10: Everyone is entitled in full equality to a fair and public hearing by an independent and impartial tribunal...
- Article 12: No one shall be subjected to arbitrary interference with his privacy, family, home, or correspondence, nor to attacks on his honour and reputation...
- Article 18: Everyone has the right to freedom of thought, conscience and religion...
- Article 19: Everyone has the right to freedom of opinion and expression...
- Article 20: Everyone has the right to freedom of peaceful assembly and association...
- Article 21: Everyone has the right to take part in the government of his country...
- Article 26: Everyone has the right to education...
- Article 27: Everyone has the right freely to participate in the cultural life of the community ... and to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author.

Interpreting information and communications rights

Determining how these rights translate into law and how to apply them in everyday life is a complex and evolving process. Human rights standards can change as a result of scientific progress, research findings and changes in social and moral attitudes, and this has resulted in gradual changes in understanding of the multi-layered international human rights system. Many human rights contained in the IBR have been further developed through legally binding international conventions and treaties, as well as by "soft law" declarations and guidelines (i.e. non-binding ways of regulating behaviour including social norms). These embellishments elaborate on the meaning of particular rights in relation to other rights and to specific groups within society. For example, the International Convention on the Elimination of All Forms of Racial Discrimination (1969) emphasises the universality of human rights, whilst the UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expressions (2005) explores and expands on Article 27 of the UDHR.

A similar process of interpreting and applying human rights standards occurs at regional and national levels. Of particular note where information and communications rights are concerned is the emerging acceptance of access to public information as a citizen right, reflected in an increase in the number of countries with "right to information" laws from 13 in 1990 to 75 in 2008. This is a significant development, enshrining the positive dimensions of freedom of expression in national law.

While a substantial body of case law has developed – particularly from regional human rights courts – which sets standards and precedents for the interpretation of human rights, it should be stressed that there is no universal agreement between countries about what human rights mean in practice. Interpretation is highly issue- and context-specific. For example, freedom of expression is interpreted very differently in the United States than in many other jurisdictions across the world, because of the very strong protection which it enjoys through the First Amendment to the US Constitution. As a result, restrictions on free expression to guard against activities that would violate other rights – such as legislation controlling "hate speech" – are less likely to be deemed acceptable under US law than under European law.

Some commentators argue that such diversity of interpretation undermines the notion that human rights are universal, but others argue that providing space for context-specific interpretation like this adds to their strength and relevance.[6]

While rights are subject to interpretation, it should be noted that international law does provide some guidance on how they should be interpreted, particularly where rights are restricted or balanced in order to give specific rights greater or lesser significance than others that may be in conflict with them. When deciding whether a human right should be limited in a specific circumstance, decision makers are expected by international law to ensure that the proposed limitation passes a strict three-part test: the restriction must have a legitimate aim; be construed narrowly and prescribed in a clear law; and be proportionate and necessary in a democratic society.[7] The concepts of transparency and proportionality, coupled with case law and legal precedents, are important in ensuring that interpretations of human rights do not erode the basic standards set down in the Universal Declaration.

Alongside governmental and legal bodies, non-governmental organisations and social movements play a significant role in interpreting and translating rights. For example, civil society movements have pressed governments in a number of countries to pass laws granting rights to access public information. One example of resulting international agreement in this area is the UN Economic Commission for Europe's Aarhus Convention, which

6 For further discussion see Andrew Clapham *A Very Short Introduction to Human Rights* (Oxford: Oxford University Press, 2006)

7 Legitimate interests recognised in international law that might require restrictions on communication rights include the protection of the rights and reputations of others, national security, public order, public health and public morals.

establishes information and participation rights in decision making that has substantial environmental impact.

At the time of writing (mid-2008), the A2K (access to knowledge) movement was pressing for an international treaty that would commit signatories to advancing open access to knowledge that serves the public interest, particularly in intellectual property legislation. The A2K movement has focused its lobbying activity on the World Intellectual Property Organisation (WIPO), but also engages with other policy forums such as the Internet Governance Forum (IGF). Other groups at the IGF were working to determine the role that rights may play in internet governance. These included a number of multi-stakeholder "dynamic coalitions" which focused on specific thematic issues – such as a Dynamic Coalition on Internet Rights and Principles, which sought to interpret how to apply and enforce existing human rights in the rapidly changing internet-based communications environment.

In summary, when considering information rights, it is important to recognise that the human rights system is not static but evolving, with the fundamental human rights laid out in the IBR being interpreted and translated to apply to different contexts, including new contexts such as those established by new ICTs. The remaining sections of this chapter examine how the development and proliferation of ICTs are affecting human rights, and how the human rights system is responding. While ICTs have implications for a wide range of established rights and freedoms, the focus here is on information and communications rights.[8]

Information and communications rights and ICTs

Chapter 2 of this handbook describes how people's perceptions of the effects that modern ICTs have had on society can be divided into two broad categories: those which emphasise continuity between modern ICTs and older modes of communication such as television and newspapers; and those which emphasise discontinuities, seeing the changes that have taken place as revolutionary or transformative. These different perceptions are discernable, too, in people's views about the implications that ICTs have for information and communications rights.

- At one end of the spectrum, some argue that ICTs are emancipating, shifting the balance of power away from governments and other powerful groups in society towards the citizen, and so enabling more opportunities to protect and advance human rights.
- Along the spectrum, others argue that ICTs do not affect opportunities to enforce and expand rights.
  - Some of these believe that the impact of ICTs on society is such that new rights directly applicable to ICTs and new communications practices need to be defined and protected.
  - Others think that the existing rights system is adequate for protecting fundamental rights, despite the fact that the tools we use for communication have changed, or are wary of reopening debates about established rights lest these be diminished as a result.
- Finally, some argue that the long-term impact of modern ICTs is likely to shift the balance of power between citizen and state in favour of the state, rather than empowering the citizen. (This was also a prevalent view of new technology in the dystopian fiction and cinema of the 20th century).

The debates between these different perspectives are explored further below.

Do ICTs present new opportunities for protecting and advancing information and communications rights?

In the early stages of the development of modern ICTs, particularly the internet, many of those involved in their design thought that they not only presented new opportunities for advancing individual rights and freedoms but represented opportunities for citizens to act outside or to reject conventional government (whether democratic or authoritarian). The US libertarian John Perry Barlow and the Electronic Frontier Foundation (with which he is associated) became the best-known exponents of the argument that the internet should be a government-free space, in which individuals may do what they like without political or legal constraints (or indeed those of rights frameworks like the UDHR) – notably in Barlow's 1996 "Declaration of the Independence of Cyberspace".

As the internet has become public property, and played an increasingly important role in many aspects of social, economic, political and cultural life, the idea that it can or should be exempt from laws governing other aspects of social organisation has become both difficult to sustain and marginal in thinking about internet governance. Citizens and governments alike have been concerned to ensure that the internet is not used as a means to bypass legal constraints on, for example, pornography, incitement to racial hatred and fraud. The ongoing debate about the relationship between the internet and mainstream governance is discussed in Chapters 20 and 21.

At the opposite extreme from Barlow's libertarianism, some governments have sought to control access to information over the internet and to monitor the internet use of individuals and organisations. In such cases, power over internet resources can be used to reduce the internet's

8 For discussion of the impact of ICTs on a broader range of human rights, see Rikke F. Jørgensen, ed. *Human Rights in the Global Information Society* (Cambridge: MIT Press, 2006)

potential for stimulating public debate, and to suppress the expression and organisation of political dissent. A further set of challenges arises because of the increasing sophistication of mechanisms to survey, filter and censor online communication. Filtering techniques are being used by some governments (and some internet businesses) to limit communication that is deemed to be undesirable, be it for security, commercial, political or cultural reasons.[9]

In many societies, meanwhile, both democratic and authoritarian, citizens have made use of new means of expression opened up by the internet, including blogs, social networking sites and "citizen journalism". Like fax and mobile telephony, these new forms of expression have been used for political and campaigning purposes – including both campaigns to support democracy and human rights and those inimical to them. These new forms of expression raise a number of governance questions which are discussed in Section 5 of this handbook.

As the internet has become more important in society, it has also become increasingly clear that ICTs cannot be divorced from the wider social, economic, political and cultural contexts in which they are developed and used. They are increasingly seen as tools for communication which can be used for different purposes by different people, rather than necessarily exerting a specific influence in a particular social direction.

It can be useful, in this context, to frame the relationship between ICTs and human rights as one of challenges and opportunities. If we take freedom of expression as a core communications right, we can discern ways in which the internet is opening up more opportunities for people to seek, receive and impart information across frontiers. For example, the internet gives people new opportunities to communicate in the public domain through websites and blogs, bypassing traditional information gatekeepers such as the mainstream media. However, many internet users continue to visit the same trusted news brands online that they use offline.[10] The opportunity to access different voices (or different types of cultural input) does not necessarily change behaviour. Much depends on the trust which people have in existing sources of information (and the development of trust in new altenatives), and on their political and cultural preferences. Readers of the *Wall Street Journal* are unlikely to switch to the *National Enquirer* (or vice versa); evangelical Christians and enthusiasts for Mozart are unlikely to seek enlightenment or entertainment, respectively, from Islamist websites or hip-hop stations. The development of modern ICTs does not fundamentally change the impact of such behavioural preferences.

9 See the Open Net Initiative for surveys of internet filtering across the world: www.opennet.net

10 Chris Paterson *News Agency Dominance in International News on the Internet* (Centre for International Communications Research: Papers in International and Global Communication No 01/06, 2006)

Do new rights need to be defined as new ICTs emerge?

As discussed above, the definition and elaboration of rights and their application to new and emerging circumstances is a complex, evolving process. In the field of communications, debates over how best to define rights have long been contentious, and have only intensified with the emergence of modern ICTs. Some people argue that, as the communications landscape has changed considerably since the Universal Declaration was agreed in 1948, new communications rights need to be defined and protected in laws that are better suited to the current environment. Others feel that this is unnecessary, because existing rights cover the principles involved, or fear that opening discussion on the definition of rights today may lead to their dilution rather than extension.

Much of this debate has focused around whether a new "right to communicate" should be enshrined in international law. Proponents of the idea argue that the right to freedom of expression as it is currently defined does not guarantee people's right to be heard in society. People can voice their opinions and express their needs, but those in power are under no obligation to listen. In many cases, it is argued, the most widely available media are owned by powerful groups, limiting the extent to which individual citizens – particularly those in poor and minority groups – can use them as tools for communicating their views. At a time of increasing globalisation, these divides in communicative power occur at both national and international levels.

Proponents of a new right to communicate also argue that the human rights framework has been developed to prevent national governments from undermining the rights and freedoms of citizens, and that it is therefore inadequate to provide protection against rights infringements by non-state actors (from private companies to criminal conspiracies), particularly where these operate across national borders.

Disagreements about these issues were significant during the debates about a "New World Information and Communication Order" (NWICO) during the 1970s (see Chapter 10). They have continued since, though changing in nature as a result of changes in technology and in the characteristics of national and international media. They were influential, for example, during the establishment of the Communication Rights in the Information Society (CRIS) campaign in 2001, a broad coalition of civil society organisations which aimed to promote the right to communicate at the first meeting of the World Summit on the Information Society (WSIS) in 2003.

However, not all civil society groups engaged in the WSIS process agreed that this was the best or most strategic way to ensure that rights were included on the WSIS agenda – either because of the association of the "right to communicate", in many people's minds, with the ideologically charged NWICO debates of the 1970s, or

because they felt that the concept was not adequately rooted in the existing international human rights framework. For example, the NGO Article 19, which focuses on freedom of expression, used case law to argue that positive dimensions of freedom of expression – including the right to diverse and pluralistic media and equitable access to the means of communication – were already adequately supported by existing or emerging international law. By contrast, it argued, many laws that were proposed under the banner of the right to communicate threatened to erode existing human rights standards.[11]

By the end of the first phase of WSIS in 2003, there was broad agreement amongst civil society organisations engaged with the issue that advocacy for communications rights did not necessarily require the establishment of new legal standards. Indeed, a number saw this as a strategic way of highlighting inadequate enforcement of existing legal standards. Civil society groups also generally agreed that "communications rights" was a useful umbrella term encompassing the range of rights relevant to communications in modern society, including their positive dimensions.[12]

The debate over whether new communications rights need to be defined in the information age is by no means resolved, and is itself part of the continuing evolution of the human rights framework which is described above. However, there seemed by the time of writing (mid-2008) to be growing consensus amongst civil society groups that there was a need to focus on applying and enforcing the fundamental rights and freedoms that are protected in international law within the information society. It has yet to be seen whether this requires or will lead to new rights being enshrined in international law.

Information and communications rights in the ICT policy arena

During the WSIS process, human rights advocates sought to ensure the inclusion of texts supporting the view that rights should underpin governance of the information society. A number of governments contested the inclusion of rights language in the WSIS outcome documents. As a result, the formal declarations and strategy documents produced by the summit did not go as far as many rights advocates hoped, but they did reaffirm international commitment to human rights as guiding principles in the information society. For example, the WSIS Geneva Declaration of Principles begins by stating that:

> We… declare our common desire and commitment to build a people-centred, inclusive and development-oriented Information Society… respecting fully and upholding the Universal Declaration of Human Rights.[13]

The Tunis Agenda, which emerged during the second phase of WSIS, likewise states that:

> We reaffirm our commitment to the freedom to seek, receive, impart and use information, in particular, for the creation, accumulation and dissemination of knowledge…. We affirm that measures undertaken to ensure Internet stability and security… must protect and respect the provisions for privacy and freedom of expression as contained in the relevant parts of the Universal Declaration of Human Rights and the Geneva Declaration of Principles.[14]

Despite these formal commitments to protecting and upholding rights, very little has been done since WSIS to translate them into actual ICT policy. The issue of rights remains on the agenda in the Internet Governance Forum (IGF) process, but has become less visible than during the WSIS process. Some suggest that this is due to lower levels of organisation amongst human rights advocates involved in the IGF as compared with WSIS, and to the more technical nature of many of the discussions there. A number of multi-stakeholder "dynamic coalitions" have formed within the IGF framework around rights issues, including coalitions on privacy, freedom of expression and access to knowledge. However, these are generally under-resourced, lack representation from different stakeholder groups, and have no formal means of influencing the direction of IGF debates. Despite this, a general commitment to multi-stakeholder participation, coupled with the fluid and relatively open nature of the IGF, has provided rights advocates with the opportunity to engage in international ICT policy processes at the Forum.

Alongside the IGF, information and communications rights are under discussion in a number of other multilateral and bilateral policy spheres. For example, bilateral trade agreements and multilateral negotiations at the World Trade Organisation affect national regulation of communications service providers and producers of media and communications content. This can impact on the degree of access that people have to communications platforms that can be used to exercise freedom of expression, and the extent to which people can participate in the cultural life of their communities through the media. Agreements made at the World Intellectual Property Organisation have significant impact on intellectual property laws (see Chapter 33). Policies concerning internet filtering for political or social reasons have implications for the right to freedom of expression, whilst data collection, manipulation and monitoring by governments and companies using ICTs have implications for the right

11 For further discussion see Article 19 *Note on the Draft Declaration on the Right to Communicate.*

12 Article 19 (ibid); William Drake and Rikke F. Jørgensen "Introduction" in Jørgensen, ed. *Human Rights in the Global Information Society*; Seán Ó Siochrú *Assessing Communication Rights*: *A handbook* (London: CRIS Campaign, 2005)

13 Geneva Declaration of Principles, Article 1 www.itu.int/wsis/docs/geneva/official/dop.html

14 Tunis Agenda for the Information Society, Article 42 www.itu.int/wsis/docs2/tunis/off/6rev1.html

to privacy. This list of the implications that ICT policy has for communications rights is by no means exhaustive.[15]

Protecting and expanding information and communications rights in the age of ICTs

The evolution of ICTs and associated policy processes is clearly affecting human rights, in some instances undermining established rights standards, and in others presenting new challenges and opportunities to realise and expand rights. The question of how rights can be protected and opportunities taken to expand them is therefore an important issue for rights advocates. This final section of the chapter briefly examines official national and international mechanisms and instruments in this context, as well as ongoing efforts to update and build new instruments to ensure they can meet the new challenges of the information age.

At the international level, the UN Human Rights Committee, composed of independent experts, is responsible for monitoring compliance with the International Covenant on Civil and Political Rights (ICCPR), and obliges states to submit regular reports detailing how they are upholding the rights contained in the covenant. If states have signed up to the First Optional Protocol of the ICCPR, individual citizens are allowed to take their complaints about alleged rights abuses in their country directly to the Office of the UN High Commissioner for Human Rights. Similarly, the UN Committee on Economic, Social and Cultural Rights is responsible for monitoring compliance with the International Covenant on Economic, Social and Cultural Rights (ICESCR), though it is unable to receive complaints from individuals.

Many national governments have enshrined international human rights standards in national law. For example, in 1998 the UK Parliament passed a Human Rights Act to bring national standards into conformity with those contained in the European Convention of Human Rights. UK citizens can take their grievances to their national courts and, if they remain unresolved, to the European court.

In addition to mechanisms such as these, the United Nations and some regional bodies have appointed special rapporteurs who are responsible for monitoring and reporting on human rights themes or on specific country contexts. Their recommendations are not legally binding, but carry moral weight and provide a means of focusing attention on certain issues. Indeed, some commentators argue that the real strength of the international human rights system lies in the moral weight that it carries: formally or informally drawing attention to rights contraventions can have a significant impact in raising awareness and instigating legislative or behaviour change.[16] The "universal periodic review" system introduced by the UN Human Rights Council during the first decade of the 21st century is designed to further this effect by generating regular reports on UN member states' compliance with human rights commitments.

Many human rights advocates maintain that the way the international human rights system operates is not adequate to meet new challenges and opportunities such as those that arise as communications environments evolve. For example, some have called for the UN Human Rights Council and the Special Rapporteur on Freedom of Expression to engage better with the Internet Governance Forum.[17] Others believe that new institutions and mechanisms are required to ensure that ICT policy complies with human rights. For example, the WSIS civil society human rights caucus has called for the establishment of an independent commission of experts to monitor policy and ensure compliance with rights.[18] At the intergovernmental level, UNESCO is working to develop a code of ethics for the information society.

Amongst civil society organisations, initiatives like the APC Internet Rights Charter, the multi-stakeholder Principles on Freedom of Expression and Privacy project and the Ford Foundation-sponsored Freedom of Expression Project Policy Principles seek to apply the international human rights framework to salient issues that have arisen with the proliferation of ICTs.[19] Many groups working on ICT and development also follow a rights-based approach to ICT policy, in which communications technologies are seen as enabling tools supporting individual freedom, self-determination and the ability to participate in society. They therefore argue that guaranteeing universal access to ICTs should be seen as a key rights objective.

Information and communications rights are currently on the international ICT policy agenda, and civil society advocacy has played a significant part in putting them there. However, addressing the human rights challenges and opportunities that emerge from evolving ICT use tends to occur on an ad hoc basis. Civil society activists, ICT policy makers and the human rights community have a significant amount of work to do if they are to ensure that these challenges are addressed in a more coordinated and effective way. ■

15 A more detailed account can be found in Jørgensen, ed. *Human Rights in the Global Information Society.*

16 Clapham *A Very Short Introduction to Human Rights*

17 Wolfgang Benedek "Internet Governance and Human Rights" in *Internet Governance and the Information Society* eds. Wolfgang Benedek, Veronika Bauer and Matthias Kettemann (Utrecht: Eleven International Publishing, 2008)

18 Drake and Jorgensen, *Human Rights in the Global Information Society*

19 See rights.apc.org/charter.shtml and www.freedomofexpression.org.uk
These and other initiatives which are working to establish principles for networked communications and ICTs are mapped in Kate Wilkinson *Developing principles for a public interest communications environment* (Freedom of Expression Project and Global Partners & Associates, 2008) www.freedomofexpression.org.uk/resources/mapping+existing+agreements+and+principles

Chapter 6
THE "DIGITAL DIVIDE"

Lead author ***David Souter***

The concept of the "digital divide" has been widely used over the past ten years to describe the gap which has arisen between those that make use of ICTs and those that do not – whether the comparison is made between countries or between individual citizens. It is easy to demonstrate the existence of a digital divide, but more difficult to assess whether (and where) it is growing or diminishing, and whether it is qualitatively different from similar divides in other development sectors.

Development divides

Development divides exist in almost every area of social, economic and development policy, within and between countries, and are based on wealth. Rich people are able to afford better health care and better education than poor people. Rich countries, too, tend to have better health and educational provision than poor countries, and so to have higher rates of literacy, lower rates of infant mortality, etc.

Although wealth/income is the primary determinant in most development divides, these are also affected by the status of different groups within society, i.e. by issues of equality. In many societies, for example, development divides can be found between men and women as well as between rich and poor. Ethnic minorities are often disadvantaged in comparison with majority groups (although sometimes - as in apartheid-era South Africa - the opposite is true). In India, there are visible development divides between caste groups. In most cases, development divides result partly from distinctions of wealth/income and partly from other issues of equality.

These development divides are not isolated one from another, but have a cumulative effect. Those who are better educated are likely to use their knowledge, for example, to improve standards of health and hygiene or to limit family size; those who are healthy are more likely to attend school, to be in work, to have better housing; and so forth.

People at the bottom of the wealth distribution in any country are also likely to suffer more from other forms of deprivation than their peers. The United Nations has therefore defined "absolute poverty" not just in financial terms but as "severe deprivation of basic human needs [...] It depends not only on income, but also access to services," including food, safe drinking water, sanitation, health, shelter and education.[1]

At a global level, the cumulative effect of development divides is well illustrated by the United Nations Development Programme (UNDP)'s Human Development Index (HDI). The HDI combines indices of life expectancy, education (adult literacy and child school enrolment) and average income (GDP per capita) to create a composite index which UNDP believes reflects overall development levels. The map in Figure 6.1,[2] derived from its 2007 *Human Development Report*, shows the outcome of this index, with dark green representing those countries with high HDI ratings and dark red those with the lowest figures. In the period from 1975 to 2005, HDI figures for sub-Saharan Africa improved more slowly than those for other world regions, suggesting that the development divide between Africa and the rest of the world increased over that period as a whole (although the trend in Africa during the first decade of the 21st century has been more positive).

Another useful measure for international comparisons is the Gini coefficient, which measures statistical dispersion. In the development community, this is most used to measure the distribution of income or wealth, i.e. the extent to which income and wealth are concentrated in certain groups.

Within countries, attention is paid to a defined poverty threshold or "poverty line", which represents the minimum level of income thought necessary in a particular society to achieve an adequate standard of living. Poverty lines vary from country to country, but international agencies have sought to use common thresholds to enable international comparison, for example, the number of people "living on less than a dollar a day". (These are difficult to measure, not least because of differences in purchasing power and seasonal fluctuations in incomes of the poor.)

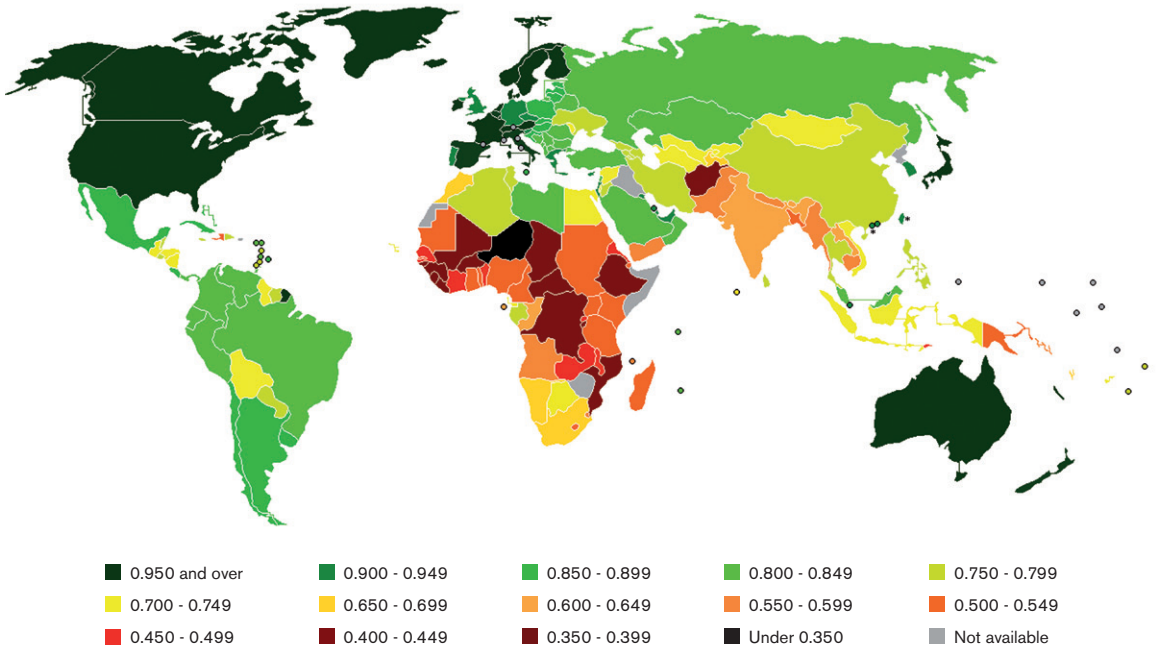
Digital divides

Digital divides do not differ fundamentally from other development divides. The rich are more likely to own telephones, televisions and computers than the poor, just as they are more likely to own books, cars and refrigerators, or to have access to safe drinking water, well-equipped

1 Definition taken from World Social Development Summit, 1995.

2 Sourced from Wikipedia "Human Development Index" accessed 24 October 2009 en.wikipedia.org/wiki/Human_Development_Index#Examples

Figure 6.1: **The Human Development Index, 2007**



schools and medical advice. Rich countries have much higher average levels of ownership of telephones, televisions and computers than poor countries, just as they have higher average levels of ownership of cars and labour-saving devices. All of these divides fundamentally reflect differences in wealth and income.

The availability of networks plays a significant part in digital as well as other development divides (for example, those for water and electricity). Resources that depend on network infrastructure – such as terrestrial broadcasting, fixed or mobile telephony and internet – will only be available to people living in areas where the required infrastructures have been deployed, irrespective of how rich or poor they themselves might be. There are therefore often significant digital divides between urban and rural areas, as well as between different social and economic groups.

Measuring digital divides

One measure commonly used to compare countries' digital capabilities is the number of devices of a particular type per hundred people (or per hundred households), sometimes known as the "penetration rate". In the case of telephony, this measure is known as "teledensity".

Measures such as teledensity need to be treated with some caution:

- Firstly, they measure *ownership* of devices rather than use of devices or access to services. Most adults who cannot afford their own telephones make use of public telephone services (such as payphones or people reselling airtime on mobile phones from kiosks or on the streets). In many lower-income countries, a majority of adults currently gain access in this way, but their usage is not included in teledensity statistics. Similarly, for example, most people in such countries make use of public transport, and therefore of the roads, without owning motor cars.
- Secondly, measures of this kind are subject to exogenous (i.e. external) variables. The most obvious of these is household size. Usually, a household will have only one fixed line telephone or television. Average household size varies substantially from country to country, from around two people per household to more than seven. A country with a high average household size can have quite a low teledensity figure even though almost everyone has access to a phone at home.

Measuring "digital opportunity"

Nevertheless, these measures are useful in getting an overall picture of "digital divides" at international level.

Throughout the world as a whole, broadcast radio is the most widely distributed ICT device/service. Accurate figures for radio ownership are difficult to establish, since radio devices are readily available and relatively cheap. It is clear, however, that the majority of households worldwide have access to some form of broadcasting, either radio or television. Increasing adoption of television is having a significant effect on the availability of news and entertainment resources in many countries.

Data for computing, telecommunications and internet access are included in publications from the International Telecommunication Union and other sources. However, these data are not entirely reliable, partly because of different and unreliable reporting systems.

The data for telecommunications are also complicated by the shift in technology which has taken place in recent years from fixed to mobile phones. There are two statistical factors involved in this. While fixed networks have been pervasive in industrial countries, they have remained sparsely available in developing countries; it is mobile, not fixed, networks that have therefore met previously unmet demand in rural areas. Mobile telephones are also more likely to be treated as individual possessions than as household goods.

The Digital Opportunity Index

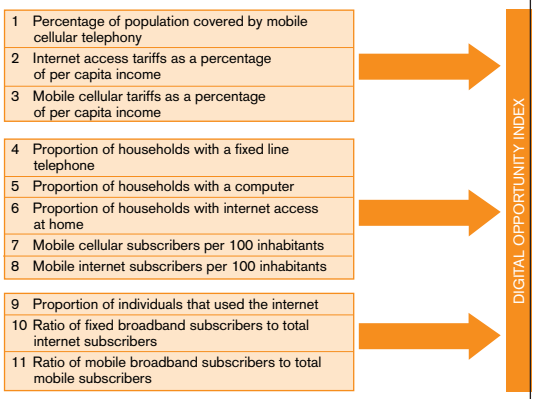
In recent years, development and ICT agencies have put less emphasis on the "digital divide" and more on "digital opportunity", i.e. on different countries' capacity to take advantage of the empowering potential of ICTs, and the different capacities of social groups within each country. The development of thinking along these lines is described in the next section of this chapter.

The most prominent measure for ICT access and use is now the Digital Opportunity Index (DOI), which was developed for the ITU, endorsed in the Tunis Agenda of the World Summit on the Information Society, and has since been developed further to provide a basic index of ICT capacity which is comparable in some ways with the Human Development Index described above. In the ITU's words, the DOI aims to provide "a standard tool that governments, operators, development agencies, researchers and others can use to measure the digital divide and compare ICT performance within and across countries."[3]

The structure of the Digital Opportunity Index is set out in Figure 6.2.[4]

Data for these eleven indicators for 181 countries over the years 2004-2006 were used to compile the DOI published in the ITU's 2007 *World Information Society Report*. The results of the DOI, illustrated in the map in Figure 6.3,[5] are not dissimilar from those of the Human Development Index which was illustrated earlier in this chapter.

Figure 6.2: **Structure of the Digital Opportunity Index**



Bridging the digital divide

The concept of the "digital divide" (although not then the term) was first publicised by the Maitland Commission, a commission of enquiry undertaken for the ITU in 1983/1984. The Maitland Commission contrasted the telecommunications experience of industrial and developing countries as follows in its report, *The Missing Link*:

> In the industrialised world telecommunications is taken for granted as a key factor in economic, commercial and social activity and as a prime source of cultural enrichment. Moreover, in these countries telecommunications have come to be regarded as an engine of growth and a major source of employment and prosperity. … The situation in the developing world is in stark contrast. In a majority of developing countries the telecommunications system is inadequate to sustain essential services. In large tracts of territory there is no system at all.[6]

"Neither in the name of common humanity nor on grounds of common interest," the Commission concluded, "is such a disparity acceptable." It recommended concerted action by the international community to extend telecoms networks in developing countries.

The Maitland Commission's ideas were not, in fact, influential during the following decade. It was only in the late 1990s, after the internet began to reach a worldwide audience, that a number of development agencies began to argue that the "digital divide" was becoming an additional barrier either to development itself or to the prospects for achieving greater equality between countries and between individuals. Key moments in this development were a conference jointly organised by the European Union and the government of South Africa in

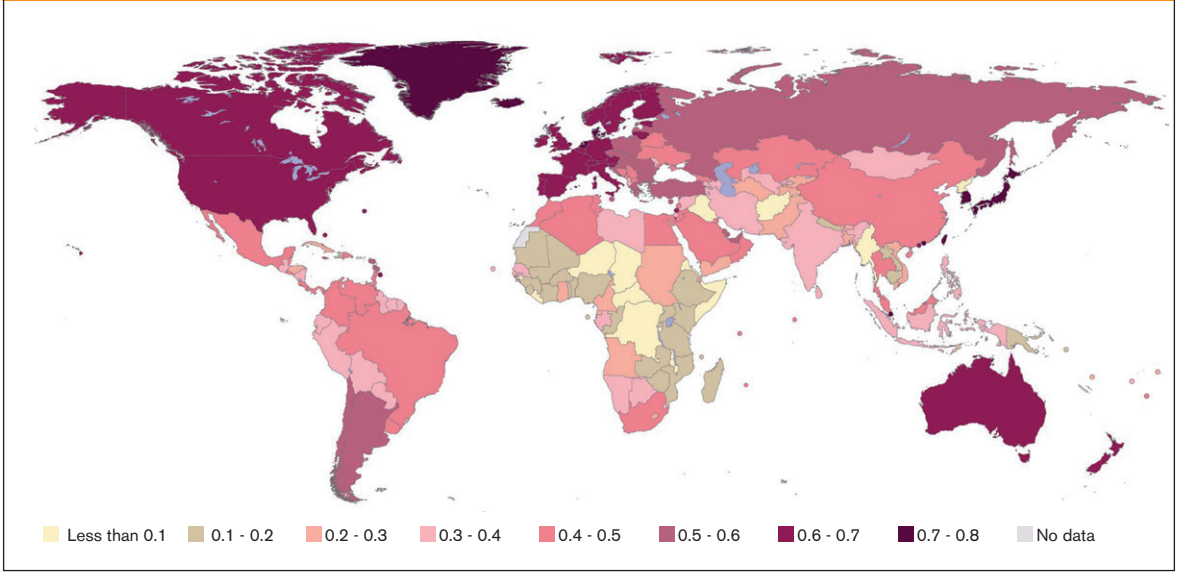
3 www.itu.int/ITU-D/ict/doi/index.html.

4 ITU *World Information Society Report 2007* (Geneva: ITU, 2007), 40

5 ITU *World Information Society Report 2007* and www.itu.int/ITU-D/ict/doi/index.html

6 Independent Commission on Worldwide Telecommunications Development (Maitland Commission) *The Missing Link* (Geneva: ITU, 1985) www.itu.int/osg/spu/sfo/missinglink/index.html

Figure 6.3: **The Digital Opportunity Index 2005-2006**



Midrand in 1996; the first Global Knowledge Conference, held in Kuala Lumpur in 1997; and the work of the G8 Digital Opportunities Task Force (DOT Force) from 2000 to 2002.

Central to the new concern with digital development which first emerged in the late 1990s has been a sense that the availability and use of ICTs are so empowering that, if they are dependent on current wealth and social status, they will intensify the gap between rich and poor across the whole range of social and economic life. The rich, in short, will use the internet and other ICT resources in ways that will increase the gap between them and the poor in knowledge, education, health and future wealth. Rich/industrial countries will exploit ICTs to increase their competitive advantage over poor/developing countries. In these circumstances, the "Information Revolution" could tend to increase the disparities which are measured by the Gini coefficient at national level and by GDP per capita in international terms.

The corollary to this argument is that, if ICTs are so empowering, then enabling the poor to gain access and make use of them could empower the poor themselves, and so enable them to reduce the disparities which they experience in access to health, education, welfare and power. This perceived "digital opportunity" – the opportunity to achieve greater parity between industrial and developing countries, and between rich and poor within them – has been prominent in a good deal of policy thinking about ICTs in recent years, including WSIS.

Issues concerning the impact of ICTs on social and economic development are discussed further in Chapter 7 and Chapters 22 to 29 of this handbook.

Are digital divides growing or shrinking?

There has been a good deal of debate in recent years about whether digital divides are growing or receding. One reason for the debate is that the technology concerned is changing rapidly, and so it is sometimes unclear what is being measured.

The rate at which access to mobile telephony and to the internet is growing in developing countries is now faster than the rate at which it is growing in industrial countries. The starting points for measuring increases in access and use in industrial and developing countries are, however, different, with developing countries starting from much lower initial figures and markets in industrial countries at or approaching saturation. Nevertheless, these illustrations show that the divide in access to voice telephony, in particular, has shrunk greatly over the past decade, not least because mobile networks have addressed the rural-urban divide in developing countries; and that there has been a reduction in the degree of difference in access to the internet, measured in basic numerical terms. A similar picture could be given for television ownership and use.

A more complicated picture emerges concerning the higher-end device which is most important to ICT use in industrial countries, the personal computer. Although the absolute ratio of computer ownership between industrial and developing countries has fallen over recent years, the starting point for developing countries was so low in this case that a narrow statistical view gives a misleading picture. What is more important for society and the economy as a whole is that growth in PC ownership has made computing more or less pervasive in industrial countries, certainly in business and to a large extent also in family life, so giving it a much more fundamental role in

the dynamics of industrial societies and economies than it has achieved elsewhere. Developing countries have not yet reached this "tipping point" in the use of computers by individuals/families or even by small businesses.

Similarly, the capacity and quality of communications access in industrial countries have continued to increase, so that simple access measures do not compare like with like. The internet access which is measured in developing countries, for example, is mostly dial-up access, operating at speeds of up to 64 kbps, while industrial country internet users now mostly enjoy broadband access with much greater speeds and lower real access costs. Similarly, mobile phone users in industrial countries have been moving to third generation mobile technology – which has far greater capabilities, including internet capabilities – sooner than developing country mobile markets, which were still dominated by second generation networks.

It is, therefore, difficult to say that the "digital divide" is either growing or receding: the picture is more complex than that simple juxtaposition allows, reflecting wider changes in technology, society and the economy. Claims that new technologies enable developing countries to "leapfrog" older generations of technology need to be kept in perspective (and have now been largely abandoned). Certainly, new technologies have allowed major advances to take place in communications access and the application of information and communications resources. By the time developing countries have adopted one particular new technology (such as mobile telephony or internet access), however, industrial countries have generally moved on to a newer form of that technology which offers much higher capability (such as 3G mobile telephony or broadband access).

The digital divide between industrial and developing countries is, perhaps, moving its location rather than growing or receding. One suggestion is that, over the past two decades, the bigger international picture has been moving from one in which ICT access and use in industrial countries was markedly better than that in all other countries, to one in which access and use in low-income developing countries is markedly worse than that in all other countries. The implication of this view is that the digital divide between rich and middle-income countries is shrinking while that between middle-income and least-developed countries is still growing. However, all of these things are difficult to measure and subject to rapid change. They may well be radically altered again by the migration of internet service delivery to mobile devices which was beginning to take place at the time of writing (late 2008; see also Chapter 17). ■

Chapter 7
INFORMATION AND COMMUNICATIONS IN DEVELOPMENT

Lead author ***David Souter***

Information, communications and ICTs play an increasingly important part in all aspects of human life. APC and its partners are particularly concerned with their potential for enhancing human rights (see Chapter 4) and social and economic development. This chapter introduces some of the issues concerning ICTs in development, which are discussed in more detail in Chapters 22 to 29.

Defining development

Development is a complex area of public policy, and the word itself means different things to different people. The online encyclopaedia Wikipedia, for example, once defined it thus:

> Development is a process of change that leads to improved well-being in people's lives, which takes into account the needs of future generations and is compatible with local cultural and environmental contexts.[1]

Different people emphasise different aspects of development. Almost everyone who uses the term, however, has in mind change which s/he regards as "progress" or "improvement" – the sense that development involves enabling people to live more fulfilled and less vulnerable lives in more secure and prosperous societies. Most development professionals would see this as a mixture of social and economic "progress". Many would also emphasise rights – there is a longstanding debate, for instance, about whether democratic institutions are required for economic development – and also sustainability, i.e. the potential for development to be maintained and to continue without depleting global resources or irrevocably damaging the environment.

Development, in these terms, is something that may occur in all societies, regardless of their current state of social and economic welfare. In the past, it has often been associated with levels of industrialisation. Industrial countries such as those in Western Europe continue to grow economically and to experience social and economic change, including a transition from industry/manufacturing-based production towards service sectors. Many countries in Central and Eastern Europe, Asia and Latin America – sometimes described as "emerging markets" or "transition economies" – have experienced high rates of economic growth in recent decades and are becoming economically similar to richer industrial/post-industrial countries. The two major countries in Asia, China and India, are often referred to as "emerging markets".

However, most people think of development as being especially relevant to what are usually called "developing countries", i.e. those which have not reached and are not approaching the levels of prosperity achieved in Western Europe, North America or some Asian countries; and, above all, to "least developed countries" (LDCs) – a group of around 50 countries, mostly in sub-Saharan Africa, which the United Nations defines as experiencing low income, weak human resources (poor health, nutrition, education, etc.) and economic vulnerability (for example, because of high dependence on particular commodities). Most LDCs are predominantly agricultural and rural in character, although they have large and growing urban populations. They include the majority of people living in "absolute poverty" (see Chapter 6), although a substantial number of people living in absolute poverty can be found in more prosperous countries.

There are many ways of measuring levels of development. For purposes of international comparison, the two most widely used measures are GDP per capita (or GDP per head), which divides national income by population as a proxy for standard of living,[2] and the Human Development Index, which brings together GDP per capita with measures for health and education (see Chapter 6). However, these do not capture many of the issues which most concern development agencies, including issues of social equity. More targeted measures are needed to address these, including the Gini coefficient (which measures income distribution, see Chapter 6) and specific indicators of the social and economic characteristics of communities and individuals and of particular sectoral outcomes (such as health and education).

National economic development is affected by many internal and external factors. Internal factors include the availability of local capital for investment, the skills available within the workforce, the prevalence of HIV/AIDS and other epidemic diseases, the quality of governance (including the level of corruption), etc. External factors include the availability of external finance for capital

1 Wikipedia "Development" as at 31 January 2008

2 GDP is "the total market value of all final goods and services produced in a country in a given year, equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports." www.investorwords.com/2153/GDP.html

investment, the terms of trade for commodity exports and the challenge of environmental change (such as global warming). Although it receives a great deal of attention, and contributes a high proportion of national budget in some countries, overseas aid is generally less important than fluctuations in trade in influencing national economic performance. (Remittances from migrant citizens are also now more significant than overseas aid in the financial flows to many developing countries and approximately the same value globally as commercial foreign direct investment.)

The management of social and economic development is generally regarded as the responsibility of governments. This is particularly true of economic growth. However, over the past 50 years, international development agencies – multilateral agencies like the World Bank and bilateral agencies like the UK Department for International Development (DFID) or the US Agency for International Development (USAID) – have played an important part in development policy, especially in LDCs. The nature of their engagement has changed over the years. In the past, it has often emphasised economic growth, i.e. increasing GDP and GDP per capita as proxies for making the nation as a whole more prosperous. Today, the emphasis is more on poverty reduction (i.e. on reducing the number of citizens living on the margin), and on equity (i.e. on reducing the differentials between rich and poor). Current priorities in international development policy, including Poverty Reduction Strategies and the Millennium Development Goals, are discussed further in Chapter 23.

For APC and other civil society organisations, development is primarily concerned with communities and citizens, and especially with the poor and marginalised, rather than with national economic growth. NGO attention is particularly focused on issues such as health, education and equity, including gender equity. NGOs have also emphasised the importance of community participation in the design and implementation of development activities.

Defining ICTs in development

Information and communications technologies (ICTs) were defined in Chapter 3 as "electronic means of capturing, processing, storing and distributing information." Their capacity to increase the information and communications capabilities of people and communities lies at the root of their perceived value for social and economic development. This value is inherent to development in all countries, not just developing countries – although it is with the latter that the development section of this handbook (Chapters 22 to 29) is primarily concerned. It is relevant to both economic growth and poverty reduction; in the management of development work, the delivery of services, and the empowerment of communities and individuals to access resources and influence the policies that affect their lives.

ICTs play an increasingly important part in society. As such, their use is changing the ways in which many aspects of government and business and of social and economic life are carried out. This is particularly true in industrial countries, where many people – perhaps most – would now find it difficult to imagine running their lives without mobile telephones, computers or the internet. ICTs are much less pervasive than this in developing countries, but there too they are having a substantial impact in their own right on the way society works. These processes of social transition are sometimes described as leading to a "knowledge society" or "information society", concepts which are described later in this chapter.

The specific role of information and communications for development, as it is understood in this handbook, is both broader and narrower than the impact which ICTs are now having on societies in general. It is broader because it involves more information and communications resources than just ICTs, as they have been defined above. It is also narrower, however, because most of the changes which ICTs are bringing about in society and the economy are the result of interactions between ICT businesses and users, not of interventions by governments or others which are intentionally developmental in their purpose.

There has been a good deal of confusion in development literature over the terms which are used for information, communications and ICTs in development. Two definitions are used in this handbook to clarify how these terms are used within it.

- The term **information and communications for development (ICD)** is used in this handbook to describe the use of information and communications resources and initiatives to pursue development objectives, whether or not these involve new technology. "Communications for development" has been an important strand in development policy for many years, going back long before the introduction of computers and mobile telephony. It concerns the ways in which communities and individuals gain access to information and knowledge which they can use to improve their lives; the ways in which they communicate their needs and concerns to those in authority; and their ability to coordinate collective action on issues that matter to them. ICD is often primarily concerned with social dynamics rather than with service delivery, with the social and economic environment rather than specific aspects of people's lives.
- The term **information and communications technology for development (ICT4D)** is used in this handbook to describe the deliberate use of ICTs to pursue explicit development objectives

– including both the use of ICTs in general to increase the opportunities available within communities (for example, the provision of a telecentre giving access to computers and the internet) and the use of specific ICTs to deliver particular social or economic outputs (for example, the development of a computer database to manage a vaccination programme). ICT4D is often primarily concerned with providing equipment and delivering services rather than with any indirect impact these and other ICT facilities may have on social dynamics and empowerment. It is essentially instrumental or operational in character.

Obviously, there are many ways in which these two categories overlap. ICT4D, in particular, can be seen as a subset of ICD, which itself can be seen as strongly affected by the impact which ICTs are now having within societies as a whole. It is often difficult to disentangle ICD and ICT4D activities and many agencies, including APC, are advocates of both. The distinction is, however, an important one, and has had an important bearing on the ethos of many initiatives taken by governments and development agencies.

The extent to which development gains can be achieved through ICTs depends substantially on three factors:

- The availability of the human capacity and other resources necessary to make effective use of them.
- The geographical availability of networks, which enable collective use of individual capacity and resources.
- The existence of an enabling policy and regulatory framework that will facilitate the development of services and applications that make use of them.

Issues concerning the geographical availability of networks, access to them and the enabling policy framework are usually the responsibility of national ministries of communications and communications regulators, i.e. ministries and regulators responsible for the ICT sector (or at least for telecommunications). In some countries, these have recently been redesignated as ministries and regulators of information technology.

These sectoral issues are primarily dealt with in Sections 3 to 5 of this handbook. Two aspects of them, however, are worth noting in this chapter: the development of ICT strategies, and the debate between ICT-focused and "mainstreamed" approaches to ICT4D.

ICT strategies

A number of countries, including developing countries, have adopted national ICT (or ICD) strategies in recent years. These have been promoted by various international agencies, including most notably the UN Economic Commission for Africa, through its African Information Society Initiative (AISI).[3]

Different countries have taken different approaches to these national strategies. Some strategies have been little more than sketchy outlines of policy and regulation, while others (such as those in Ghana and Rwanda) have included detailed programmes of initiatives which governments intend to undertake (or for which they intend to seek external funding). Some strategies are concerned primarily with policy and regulation for the ICT sector, while others are more concerned with the application of ICTs – though usually more with ICT4D than with ICD, as these are defined above. Of the latter, many pay particular attention to e-government, i.e. the use of ICTs to change internal government administration and/or service delivery to citizens.

Table 7.1: **Approaches to ICT strategies**

Strategic approach	Prime objective
ICTs as contributors to macroeconomic growth	To develop the ICT sector as an important focus for economic growth, including employment and participation in the global economy.
ICTs as a productive sector in their own right	To develop the ICT sector itself in order to create employment, exports and income substitution.
ICTs as cross-cutting instruments of development	To use ICTs in all development sectors in order to improve the administration and delivery of development activities.
ICTs as enabling instruments for initiatives and applications	To use ICTs as the primary instrument for delivering specific ICT services, including both existing services and new services only deliverable with ICTs.
ICTs as tools for empowerment and voice	To enable individuals and communities, particularly the poor, to articulate their concerns and bring them to the attention of decision makers.

3 www.uneca.org/aisi

A review of ICT strategies to date suggests that they take one or more of five broad approaches to the role of ICTs within development. These are summarised in Table 7.1.[4]

The differences between these approaches, and national ICT strategies in general, are considered in Chapter 24.

Approaches to ICT4D

Two main approaches can be distinguished in the way in which development agencies – both international donors and national implementing agencies – have approached ICT4D:

- Some agencies have focused on the provision of infrastructure and frameworks for the delivery of services and content, rather than on services and content themselves. These agencies attach high value to access to ICTs as such, anticipating that access will be used by citizens and citizen groups to enhance their individual opportunity and collective voice. Their key concern has often been with equitable access, i.e. with identifying ways in which high quality access (including internet access) can be made available in all geographical territories (including remote areas) and to all social groups (including the poor and marginalised).

  This approach emphasises the role of ICTs as information and communications channels, and sees them as primarily additional and complementary to other development initiatives.

- Other agencies have focused on the application of ICTs within established development areas – for example, in their incorporation within national programmes to promote health, education and agricultural productivity; or within local delivery of services such as vaccination, support for teachers and health workers, and the certification of land.

  The key concern of these agencies is with service delivery rather than access or ICTs themselves. Their approach, which is generally known as "mainstreaming", emphasises the role of ICTs as agents for implementing mainstream development initiatives and objectives – to which the ICTs themselves are essentially subservient.

The enthusiasm for ICT4D which emerged in the late 1990s placed a lot of emphasis on the potential of technology, and so on access and on ways of bridging the "digital divide" (see Chapter 6). More recently, development agencies have been more concerned with "mainstreaming" ICTs, looking in particular for ways in which they can be used to achieve the Millennium Development Goals, the targets for development progress which the United Nations agreed in the year 2000.

There is still a significant difference of view within and between ICT4D specialists and the majority of mainstream development agencies concerning the most appropriate role for ICTs within development. This "paradigm gap", and the issues associated with "mainstreaming", are discussed further in Chapter 23 of this handbook.

The "information society"

Some discussion about ICTs and development has focused on the potential which many believe ICTs have to achieve large-scale social and economic transformation. This debate has revolved, in particular, around terms such as the "information society" or "knowledge society".

Here again, there is a good deal of difference in the interpretation of these terms between different actors. For the purpose of this handbook, **information** is defined as the facts and opinions which are available and can be used by individuals and organisations. **Knowledge** is defined as the accumulation, analysis and interpretation of information and experience in ways that enable individuals or communities to improve their performance, productivity or quality of life. Information provides the raw materials from which knowledge can arise, but information itself is insufficient to generate knowledge (just as activity alone is insufficient to generate experience). Indeed, too much information can be more difficult for individuals and communities to process into knowledge, especially if its reliability is difficult to validate.

Modern ICTs greatly increase the amount of information which is available to individuals and organisations that have access to them. This is particularly true of the internet. It makes it possible for individuals to use ICT resources in order to improve their understanding of the processes that matter to them (for example, reproduction, soil fertility, health protection) and to analyse their situations in order to achieve improvements. Their ability to do this is, however, highly dependent on whether they have or can obtain the underlying resources which are required to make use of access through reading, interpretation and analysis. These include funds to enable internet access, as well as literacy, research and analytical skills which enable them to find relevant information, assess its reliability, and integrate it with existing knowledge and experience.

An "information society", in essence, is one in which information and the ability to communicate it have become fundamental aspects of both economic production and social behaviour. In such a society, it is suggested, information and knowledge will displace manufacturing as the foundation for economic activity. Proponents of this view sometimes talk of an "Information Revolution" or "Knowledge Revolution" comparable in importance to the Agricultural Revolution that initiated human settlements in the prehistoric period and to the Industrial Revolution of the 18th and 19th centuries.

4 This table is derived from work by David Souter and Abiodun Jagun for the World Bank.

The engines of future economic growth, and so development, in this view, will be information and services rather than food and farming or industrial production and manufactured goods. Knowledge represents the bringing together of information and experience in a way that can be used to improve the quality of productive outputs – from design to decision making; from product development to service delivery, maintenance and use. A society which has enhanced access to information and transforms that information into knowledge, it is believed, will have a competitive advantage in the international community, and will also be able to address internal challenges such as social inclusion more effectively. In the words of the World Bank, "Countries with pervasive information infrastructures that use innovative information technology applications, possess advantages for sustained economic growth and social development."[5]

Networking is fundamentally important to the "information society" or "knowledge economy". Networks facilitate communications – the means by which information is transferred from one individual (or computer) to another, and so accumulated – which is a key stage in its transformation into knowledge that society can use. Networking also permits the pooling of knowledge between larger groups of individuals, increasing problem-solving capacity. The value of networks grows rapidly, as does the potential for such pooling of knowledge, as networks themselves grow (see Figure 15.2 on "network externalities" in Chapter 15). The development of an "information society" therefore depends on the availability, capacity and affordability of the ICT networks that are available within a country.

The concept of the "information society" was strongly backed by many governments in the industrial world – not least the European Union – and by multilateral institutions – not least the World Bank – around the end of the 20th century. It led, in the early years of the 21st century, to two meetings of a World Summit on the Information Society (WSIS), which sought to establish global consensus on what an information society could achieve and how it might be best brought into being. (WSIS is discussed in Chapter 29.) Some governments, such as that in Malaysia, have consciously put the development of an information society at the heart of their national economic policy; and it remains an important part of European Union strategy.

In spite of this, however, there are still many who question whether the "information and communications revolution" has the same transformative potential as the Agricultural and Industrial Revolutions of the past. Others have found the emphasis it puts on large-scale transformation unhelpful in understanding the processes which are currently taking place or their potential application to the poor. The issues surrounding these different interpretations are discussed further in Section 6. [6] ■

5 World Bank *Information and Communication Technologies: A World Bank Group Strategy* (2002) info.worldbank.org/ict/assets/docs/ExecSum.pdf

6 Internet World Statistics as at 5 November 2008 www.internetworldstats.com/stats.htm

Section 2
Computing and information technology

Chapter 8
COMPUTING AND INFORMATION TECHNOLOGY

Lead author ***David Souter***

Computers lie at the heart of information and communications technology, storing and analysing information and enabling the transfer of that information between people, locations and devices.

Information technology has been defined by the Information Technology Association of America (ITAA) as "the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware."[1] It represents the use of computers to do the tasks of collecting, storing, sorting, analysing, managing and distributing data which are described in Chapter 2. This is manifested in a wide variety of uses, ranging from robotics and management information systems to e-government and e-commerce.

This chapter provides a brief, non-technical introduction to some of the issues concerned with computing and information technology that are significant in wider discussions about ICTs. The first section considers some of these issues within a framework of the history of computing. The second section looks at issues concerning hardware and software, particularly for PCs, and at issues concerned with proprietary and open source software.

History

People have used devices to help them with calculations for more than two millennia. A number of such devices which are still in use today – such as the abacus – were first developed by ancient cultures. Their value lies in enabling large and complex calculations to be made more quickly and more accurately or reliably than if they were undertaken manually (using written arithmetic, geometry, algebra, etc.).

Over the centuries, mechanical processes have also automated the production of many goods, enabling these to be made to an increasingly reliable common standard and in much higher volumes than could be achieved by manual labour. The production of textiles provides a good example in which successive generations of technology have added more and more automation to the production of cloth and clothing.

With few exceptions, however, these mechanical processes were not programmable, i.e. they did not enable the machine itself to undertake a lengthy sequence of processes without significant human intervention. The concept of a programmable mechanical computer was articulated theoretically as early as the 1830s by the British engineer Charles Babbage. During the 19th and 20th centuries, a significant level of programmability was added to many productive processes, and the impact of automation increasingly intruded on employment and social organisation – a development famously satirised in Charles Chaplin's 1936 film *Modern Times*. The Enigma cypher machine is another well-known example of mechanical computation being used in the first half of the 20th century to achieve something (encryption and decryption) too complex to be achieved by human activity alone without exceptional cost in time and efficiency.

A number of crucial technical developments occurred in computing during the latter half of the 20th century. Each of these has had a major impact on the nature of computing and its relationship with its users and society. The most important of these developments are discussed in the following paragraphs.

- The first was the invention of digital electronics in the 1930s. This applied a relatively recent development in mathematics (Boolean algebra, developed in the 19th century) to electronic equipment.

  Boolean algebra is a system of mathematical logic built around binary choice, i.e. the selection at any point within a logical sequence of one (and only one) of two (and only two) possible alternatives. In computing terms, this is usually described as a choice between the two digits 0 and 1 (hence the term "digital"), although it can also be expressed as a choice between "yes" and "no", "on" and "off", or any similar binary pair. It might be described as mathematical reductionism, i.e. the resolution of a complex problem into a logical sequence of successive simple choices.

  The introduction of binary logic enabled much more flexibility to be introduced to computational devices, or computers. In particular, sequences of "logic gates", making binary choices, could be programmed in order to automate much more complex calculations and productive processes. As with musical scores, this logic could include instructions to move forwards or backwards to different points within the programme sequence (saving time). Programmes could be stored

1 Quoted at www.itconcept.net and elsewhere.

and repeated as required, and it is this stored programme architecture that essentially distinguishes computers from other machines we use.

- The first computers were very large, very expensive and very limited in what they could achieve. Initially, they relied on vacuum tube electronics, similar to that used in radios and televisions of the day. It is often said that there is more computing power in many wristwatches today than there was in computers that filled entire rooms or even buildings in the 1950s.

  As a result, computers were only realistically available to very large organisations – i.e. to government departments and to large businesses – which had the investment capacity to buy, run and make use of them. Very few computers could be found outside industrial countries, and the skills required to make use of them were highly specialist. These included both technical skills required to maximise the efficiency of costly and experimental equipment ("hardware"), and the programming skills to write the programmes that became known as "software".

  A series of technical developments in electronics gradually reduced the size and cost of computers during the middle years of the 20th century. These included the introduction of transistors (again, as with radio and television) in the 1960s, and then of integrated circuits and microprocessors in the 1970s.

  The logic systems and programmes in any computer are managed by what is generally termed a "processor" or CPU (central processing unit). Originally, these were developed individually for each computer, but over time they became standardised, significantly reducing cost. Integrated circuits, which are miniaturised electronic circuits built with semiconducting materials such as silicon, have revolutionised electronics in general, and the processing functionality of computers and other computational devices (calculators, telephones, etc.) in particular. In practice, they have enabled computers to become much smaller, much cheaper and much more powerful. This is related to a concept known as "Moore's Law" (see box below).

- Miniaturisation of components enabled computers to become smaller and cheaper during the 1970s and 1980s. Up to the 1980s, almost all computing had been based around large multi-user computers known as "mainframes" and smaller (but still large) "minicomputers" (not to be confused with "microcomputers", see below). Mainframes typically filled a room, while minicomputers were perhaps the size of a large freezer cabinet. Both required specialist expertise to run and use them, though the systems that they managed could be implemented through local workstations which enabled many users within an organisation to access the power of the mainframe from local terminals.

Moore's Law

"Moore's Law" is an observation first made by Gerald Moore, co-founder of the microprocessor manufacturer Intel, in 1965. He observed that the number of microprocessors that could be placed on an integrated circuit was increasing exponentially, specifically that it was doubling about every two years. Given the importance of microprocessors to the capability of computers, this exponential growth in capacity extends to many aspects of computers and other digital devices including, for example, memory, processing speed and storage capacity.

The rate of growth described in Moore's Law has now continued for more than 40 years, and has been the principal driver of the expansion in computer use throughout society over that time. It has also been a principal enabler of the cost reductions that have led to a mass market in computing. It shows no sign of abatement, but is expected to continue at least substantially into the future. The rate of growth of computer use and capacity are therefore likely to be limited more by constraints in the pace of human adaptation than by constraints on technical capabilities.

The third crucial step in the transition to today's computing environment was the development of the desktop PC, originally known as a "microcomputer". This resulted partly from the continuing miniaturisation of hardware, which allowed substantial computing power to be located in smaller hardware units, but also from advances in networking, particularly the viability and reliability of wired local area networks (LANs).

These developments made it possible for computing power to be located within the terminals at users' desks (i.e. at workstations) rather than centralised in a mainframe or minicomputer. This offered more flexibility, and transformed the business model for organisational deployment of computing. Microcomputers could be mass-produced, using standardised components and software. They could also be deployed and upgraded incrementally: instead of major one-off investments in new large-scale equipment, networking allowed organisations to build their computing capacity gradually, at much lower cost. In the late 1980s to the early 1990s, networks of desktop computers replaced centralised computing systems for standard computing applications in most organisations.

The advent of the PC also began the democratisation of computing – the movement away from computing as a tool only available to organisations to the situation today in which it is widely available for

personal use. Desktop machines which were built and/or used by individuals became available to hobbyists in the 1980s. Cheap standardised PCs began to be produced from the mid-1980s, notably by the British company Amstrad, using mass-produced floppy disks to load software and store data. Rapid increases in the capacity of processors, memory and storage then enabled more sophisticated stand-alone PCs to be developed and mass-produced.

During this period, a standard PC format evolved, based around a platform that had been designed by IBM in the early 1980s. These "IBM clones" are the ancestors of the large majority of PCs now in use worldwide, desktop and laptop, with machines of different specifications being produced by a variety of companies to common interoperable standards. Only one alternative PC platform to the IBM clone has remained commercially successful, the Macintosh range of computers manufactured by Apple Computer, which today is said to have between 3% and 7% of the global PC market. The success of the IBM standard PC has been facilitated by the corresponding emergence of a de facto global standard in software operating systems (see below).

- From a user's point of view, computer software can be divided, by and large, into operating systems (OS, which are used, in effect, to run computers themselves) and applications software (which manages the activities that computer users want to do, such as word processing, database management and web browsing).

  In the days of centralised computers, within single organisations, software was often highly specialised for the organisation's own purposes, using any one of a number of different programming languages. As computing shifted its emphasis towards PCs, however, software needed to be standardised, with standard operating systems providing common platforms for standard applications which could be tailored by users themselves to meet their own requirements. Like standardisation in other areas, this enabled computing to become much more accessible to non-specialists and facilitated the development of more diverse applications which can run on the computers that most people use.

  The critical development here was the concentration of operating system software, in the late 1980s and early 1990s. While large-scale specialist computing systems within major government departments and organisations have continued to use their own dedicated operating systems (OS), often built around versions of the Unix OS, PC operating systems have become much more concentrated. Apple computers use Apple's own operating systems but 90% or so of PCs worldwide now use the operating systems developed by Microsoft (initially MS-DOS, now Windows). MS-DOS (Microsoft Disk Operating System) was first released in 1981 and was the first operating system designed with the assumption that desktop computing would become the global norm. It used a relatively simple language which allowed many more people, without specialist knowledge, to manage their own computers than was the case with more complex operating systems, broadening the user base for home computing (and giving organisational users more input into managing their work computers too). This was a significant point on the road towards a mass market for home computers.

- The second step along that road was also the result of software development, the emergence of the graphical user interface or GUI.

  While MS-DOS was reasonably straightforward to use, it was based, like other operating systems, on an artificial language of instructions that needed to be learnt and understood by users and input as text. Although more intuitive than other operating systems, it was still not very accessible to non-enthusiasts.

  A graphical user interface replaces written text instructions with system management options that are based around images, particularly those now known as "icons", and is therefore much more intuitive and accessible to non-specialist users. The first GUI for the mass market was released by Apple for use in its Macintosh computers in 1984. Like Apple, Microsoft began to develop its Windows GUI for IBM-clone PCs in the late 1970s, but it was not until the release of Windows 3.0 in 1990 that it began to become popular. It has since gone through a number of further variations, the latest known as Vista,[2] and is the operating system used by some 90% of PCs around the world.

  Graphical user interfaces, in effect, turned computers from being tools that were used by particular people for particular purposes into user-friendly consumer goods. They made specialist computer knowledge unnecessary for computer use, opening up a mass market which has continued to grow worldwide.

- The sixth critical transition in the growth and development of computing to date is described in Section 5 of this handbook. This is the development of the internet and, in particular, of a mass market in internet use following the widespread availability of the World Wide Web (the network equivalent of the GUI) in the later 1990s.

  Before the internet, computers were deployed mostly within stand-alone systems. Where they were networked, this was either in a mainframe-and-workstation model or through a local area network that was

2 Windows 7.0 is expected for release in 2009.

available only within a single building or organisation. Although wider networking was possible and used, this was almost entirely through closed systems, i.e. systems which were only available to specified groups of users, usually within a single organisation, and whose available content was defined by what was available within those user groups.

The internet enabled users to access not just closed networks of computers but also many other computers and computer networks worldwide, with whom they could share content. This broadening of the user base – to a billion or more users worldwide by 2008 – was greatly facilitated by the development of the World Wide Web, whose use of hypertext links between graphical "pages" made the internet much more visually attractive and much simpler to navigate. As the internet has developed a mass market, it has in effect made computing into a globally networked phenomenon, which individuals can use as effectively as organisations to access information and disseminate opinion.

In some writing about the internet, there is a temptation to see the internet today as the core of computing rather than as something complementary. However, it should be remembered that a large proportion of the time which most users spend with their computers is not shared but based around their own individual or organisational requirements, such as word-processing for a business or government department or managing their personal accounts.

The number of computers worldwide has grown enormously in recent years and continues to grow at an exceptional rate – far greater than was anticipated by computing pioneers.[3] By 2006, it was estimated that a billion PCs were in use around the world,[4] equivalent to one for every six people or one for every four adults. Between 2008 and 2020, it is estimated, PC ownership in China will grow from 10% to 70% of the population, with similar large increases in other developing countries.[5] Computing, in short, has come to play an essential part in the lives of most people, if not through their own use of computers then through that of their governments and the businesses they use, and its role and importance will continue to grow quickly during the coming years.

Hardware and software

Computer systems are made up of two types of component: hardware and software. Hardware refers to the equipment which has physical substance; software to the virtual components, the operating systems and application programmes, which enable that hardware to deliver something valuable to its users. The value of any computing system depends on the combination and integration of hardware and software – as well as on the capabilities of those that make use of it and the data which they feed into it. The following paragraphs discuss this with particular reference to PCs.

Hardware

There is insufficient space here to provide a detailed account of computer technology. A few words are worth adding, however, about the main components determining the capacity of a computer to deliver what users want from it.

When customers buy a new computer, they are often faced with a complex set of choices about which they know very little. Computer performance – whether for desktop or laptop PCs, or for other devices that offer computing capability – is determined by these choices. Some seem relatively straightforward, but need to be understood in conjunction with others. The screen size of a monitor, for example, does not tell you anything about its potential clarity, refresh rate or ability to handle output from different kinds of programme.

A number of configuration issues are critical to determining what a computer can do and how efficiently it can perform. Among the most critical are:

- The amount of memory space available for data storage (hard disk size).
- The amount of random access memory or RAM (i.e. the memory space available for the computer to perform functions in real time, a key determinant of the speed with which computer functions can be performed).
- The availability and type of sound, graphics, video, networking and wireless cards (which determine whether and how well the computer will be able to do things that most users now require).

Moore's Law applies to many of the components within computers. The capacity of hard disks, the amount of available RAM, the speed of graphics and video cards and other hardware specifications are constantly improving, with the result that PCs are naturally obsolescent, i.e. in the process of becoming obsolete over a short period of time. This is not just a matter of old hardware having less capability than new hardware, but also of changes in the software which computers need to use. Software programmes are regularly redesigned and upgraded to make use of the increased capacity of

3 However, it should be noted that the remark attributed to one-time IBM chairman Thomas J. Watson that there was "a world market for maybe five computers" is almost certainly spurious; see en.wikipedia.org/wiki/Thomas_J._Watson#Famous_misquote

4 Computer Industry Almanac www.c-i-a.com/pr0907.htm

5 The Climate Group *SMART 2020: Enabling the Low-Carbon Economy in the Information Age* (Brussels: Global e-Sustainability Initiative, 2008) www.theclimategroup.org/assets/resources/publications/Smart2020Report.pdf

the latest hardware available. This keeps them competitive against other software products, but also means that new versions of software can often not be used effectively with hardware that is more than three or four years old.

As a result, many organisations in industrial countries and high-end-users worldwide depreciate and replace their PCs (desktops and laptops) on around a three-year cycle. This is obviously expensive, and beyond the means of many smaller organisations or organisations in developing countries.

It should be remembered, too, that other hardware is required in order to enable computers to deliver what users want from them. Some of these "peripherals" are essential for working with the computer itself: keyboard, monitor and mouse. Others are essential or highly valuable for making the most of what it can do – for example, printers and the devices used to enable internet access (modems for dial-up access, routers for broadband). Others again are required for particular functions, such as scanners, digital cameras, external storage devices and audio equipment. Budgets for computing within organisations need to include these peripherals as well as computer equipment itself (and also the costs of software and of connectivity if computers are used for internet). These costs are often underestimated.

A further point about both hardware and software, which is often overlooked, is maintenance. PCs require regular maintenance – clearing old files, defragmentation, etc. While this can often be automated by operating systems, in many cases this does not happen and the lack of maintenance slows systems and makes them prone to failure. The problem is accentuated where, as is often the case in developing countries, computer use is shared by many users, including inexperienced users, and where system crashes frequently result from power outages. Networked and internet-using PCs also need regularly updated protection against viruses, trojans, spyware and other malicious programmes which have been unintentionally downloaded and which can affect both software and hardware functions. This also adds recurrent costs.

A number of attempts have been made over the last twenty years to produce alternative computer hardware for developing countries, usually with lower specifications than mainstream PCs. The "Simputer" was one such device, developed in India in the 1990s, which was much lauded at the time but failed to make an impact. More recently, the "$100 laptop" associated with the Massachusetts Institute of Technology was launched at the World Summit on the Information Society. This uses flash memory rather than a hard disk drive, and a Linux operating system, and was designed to be robust in difficult working environments. It has proved highly controversial. Some have strongly supported it as a cheap alternative to mainstream computing which, they argue, can provide mass access in developing country schools. Critics have pointed to the limitations of the technology compared with increasingly low-cost conventional PCs, to the fact that it can only be purchased at low prices in large volumes, to the potential high costs of connectivity involved, and to the lack of complementary teaching skills in schools.

Software

As noted earlier, computers make use of two main types of software: operating system software, which manages the computer itself and provides the environment for other programmes; and applications software, which runs specific programmes of different kinds.

By far the most significant operating system software worldwide today is the Microsoft (MS) Windows programme. Windows variants (usually Windows 95, Windows 98, Windows 2000, Windows XP and Windows Vista) run on some 90% of PCs worldwide, providing a graphical user interface which is easy to use and which integrates closely and shares common features with other Microsoft programmes.

Windows has effectively become a global standard in PCs. It is pre-installed on most computers sold today (though Apple computers still use their own proprietary operating system). However, it does not have the same near-monopoly status in high-end computing, including the systems developed by or for governments and major businesses, or within the internet sector. Other, more specialised operating systems are much more common in high-end environments, many of them developed from one or other variant of Unix (see above).

Since the beginning of the century, an increasing number of organisations, and some more experienced individual users, have made use of Unix operating systems based around the "Linux kernel". A kernel is the central layer or component of an OS that lies between the processors, memory and devices that make up hardware, on the one hand, and applications on the other. The Linux kernel, named after the Finnish computer scientist Linus Torvalds, provides this central component for many current Unix systems, and is the most significant instance of free and open source software (see below).

The near-monopoly status which MS Windows enjoys in PC operating systems has been controversial, for several reasons:

- On the one hand, Microsoft and its supporters argue, the availability of a straightforward de facto universal standard, which is easy to use, has facilitated familiarity with computer systems within the general population and so contributed greatly to the development of cheap mass market computing. Far fewer people, it is argued, would have become computer literate if they had had to learn several operating systems rather than becoming

familiar with just one, while standardisation around MS-DOS and subsequently Windows has greatly facilitated interoperability, in particular the sharing of applications between computers (since applications do not then require multiple variations to suit many differing operating systems), and so of data stored and managed through them.

- On the other hand, critics of Microsoft argue that its de facto near-monopoly over PC operating systems has concentrated PC development around a less efficient operating system than can be offered via Unix/Linux. They also claim that Microsoft has leveraged its near-monopoly in operating systems to support its market position in other software areas (such as office suites, see below) and to leverage its market share in new areas of computing (for example, by bundling application programmes like Windows Media Player and Internet Explorer – for which there are competing products in the market – in Windows itself). Accusations of anti-competitive behaviour by Microsoft have been the subject of longstanding disputes between it and competition authorities in Europe and elsewhere.

Applications software markets are more diverse than operating systems software markets, because there are many more different kinds of application of value to different computer users. Some common types of application software include:

- Word processing
- Spreadsheet and calculation programmes
- Databases
- Statistical analysis
- Presentation programmes
- Desktop publishing
- Project management
- Contact and appointment management
- Personal and business bookkeeping and financial management
- Image and video manipulation
- Media players
- Web browsers and other internet access programmes
- "Utilities", such as compression programmes and virus checkers, which are concerned primarily with improving the use and performance of operating systems.

Most commercial and almost all individual users of computers make use of standardised programmes in some or all of these areas. However, large organisations still make use of applications programmes which are designed to meet their specific needs, and there is a good deal of tailorisation of standard applications software to meet the needs of middle-ranking and smaller businesses and governmental organisations.

Some applications software markets are highly competitive, while others are highly concentrated. One that has become highly concentrated is the market for standard office functions, which are bundled together in what are known as "office suites". These typically include word processing, spreadsheets, databases, presentation programmes and contact and appointments management programmes.

In the mid-1990s, there were four or five global branded suites marketed by competing software houses. Since then, however, one suite – Microsoft Office, which includes the word processor Word, the presentation programme Powerpoint, the spreadsheet Excel, the contact management programme Outlook and (in some versions) the database Access – has come to dominate the global market. In recent years, Sun Microsystems has made its competing office suite programme, OpenOffice, available either free of charge or at low cost to consumers by internet download. There are still some compatibility issues between OpenOffice and MS Office, but the Sun system has found favour with a number of non-governmental and other organisations.

Microsoft's critics argue that its strong position in the office suite market, together with its near-monopoly in operating systems software for PCs, gives it too strong a position in the overall software market; and some have argued that the company should be divided into separate businesses dealing with operating systems and applications (rather as some telecommunications companies have been separated into local and long-distance, or fixed and mobile companies).

Two issues in particular are worth noting in this debate:

- Functionality: Each new generation of office suite software provides more and more functionality and uses more and more hard disk space and RAM. However, the vast majority of this functionality is unused by most users. Even in business environments, most users only use a small proportion of the functionality of a word processing programme like MS Word, and a high proportion of users never use other programmes in the suite.
- Cost: Regular updating of programmes is highly expensive, particularly if little or none of the new functionality included is actually used. Nowadays, many software houses include a high degree of backwards compatibility in programmes (i.e. enabling older versions of a programme to understand and amend files written in a newer version). However, this is not always the case.

Proprietary, free and open source software

The majority of software discussed above is proprietary software, i.e. software that is produced and sold by a software design and production company, with intellectual property restrictions on its use, particularly copying rights. In some countries, a high proportion of copies of application software programmes are "pirate" copies, i.e. copies which have been made and installed without respecting intellectual property laws and norms. Software houses have sought to counter piracy by incorporating sophisticated registration and installation requirements in software, with variable success.

Two aspects of proprietary software are challenged by some within the computing industry.

The first of these is cost. Although proprietary software programmes are much more widely used, alternative programmes offering similar functions (for example, word processing or project management) are often available free of charge. Sometimes, major software houses make fully functional programmes available free of charge or at very low cost, or offer partial or earlier versions on this basis. The most famous example of this is the office suite OpenOffice (see above). The majority of free alternative programmes, however, come from independent software designers, and are highly variable in quality. Some such programmes are available as "shareware", which is a "try before you buy" arrangement.

Free software should not be confused with open source software – or, more confusingly, with "free and open source software" (FOSS), where the word "free" refers not to cost ("freedom from charge") but to intellectual property ("freedom to distribute").

Software programmes are written in what is known as "code" or "source code". Source code is composed of the sequence of instructions, written in programme language, which tell a computer to follow a particular course of actions. It is what makes the programme what it is, and it determines how it works and interoperates with both hardware and other software.

Commercial software companies are generally concerned to restrict access to their source code, which has been developed by their own personnel or within their businesses, in order to avoid giving an easy ride to their competitors. However, much code needs to be shared between companies for reasons of mutual benefit. Access to the source code of existing programmes is particularly important for new software developers who are concerned that their programmes should interact effectively with those of other software designers. Such issues of compatibility are very important, for example, in ensuring that applications work with operating systems, and so sharing source code also has value to OS vendors. For this reason, although Microsoft guards some areas of code very closely, about 90% of the code for its Windows operating system has been shared with other software developers.

Some software designers have a different, non-commercial philosophy concerning the sharing of code. Definitions of open source software vary, but at heart the term "open source" means that the source code for a programme is available to others as a point of principle – either openly available in the public domain or generally available through a software licence – so that they can use, adapt and develop it, either for general distribution (in a new version) or for particular purposes (such as developing more specialised applications). Some, but not all, open source software is therefore developed collaboratively, on the basis of shared code. The Linux kernel is the most important example of open source code, as it provides a framework for the development of many other open source programmes and applications.

It should be noted that open source software is not necessarily associated with a particular ideological position on intellectual property. Open source software is widely used by governments, businesses and in the internet sector to develop and manage large-scale computing and information technology functions. However, it is also strongly advocated by many computer scientists who are opposed to the dominance of major commercial software houses, and by civil society organisations which advocate change in intellectual property regimes. Although the "F" in FOSS stands for "freedom to distribute" rather than "freedom from charge", much FOSS software has in practice also been available free of charge or at very low cost.

There is an ongoing debate about the relative merits of proprietary and open source software within the development community. In recent years, FOSS has been strongly backed by a number of development agencies keen to promote diversity and local software development sectors. These have argued that it enables developing country users to reduce costs and achieve greater autonomy from commercial software businesses based in the global North. Some development specialists, however, question this, arguing that the use of open source software raises compatibility problems for developing country businesses and governments, has significantly higher training costs, and puts barriers in the way of non-specialists participating in the computing services sector.

The debate around FOSS was highly polarised during the World Summit on the Information Society, whose closing texts endorsed both proprietary and open source software development. The debate is likely to continue, and there is a clear need for more evidence about the impact which different approaches to proprietary and open source choices have on the development of local software industries and applications from the points of view of governments, businesses and users. ■

Section 3
Broadcasting

Chapter 9
BROADCASTING TECHNOLOGY AND NETWORKS

Lead author ***Peter da Costa***

Broadcasting has become an essential tool for information and communications the world over. Since its invention more than a century ago, continued experimentation and innovation have resulted in the development of a range of technologies that have made it possible for more and more people to receive as well as transmit information. Today, because of its affordability and ease of use, broadcasting is more widely available than any other electronic medium. As convergence brings new possibilities, the relevance and impact of broadcasting are set to grow.

According to the International Telecommunication Union (ITU), 95% of the world's surface is covered by terrestrial radio broadcast signals and 89% by television service. Radio, the world's cheapest means of mass communication, is also the most accessible broadcast technology, with some 95% of the world's population within easy reach. Something like 86% of world citizens can be reached by television, but this can be up to twenty times more expensive to access than radio.

History: From dot-dash to the digital age

Radio was first used to send messages from one point to another as far back as the late 19th century, spurred by Guglielmo Marconi's invention of wireless telegraphy. These messages took the form of dots and dashes (Morse code), and wireless radio telegraphy gradually becoming the standard means of ship-to-shore communication. However, broadcasting in its strict sense – the transmission of sound (and later images) from an originating point to a receiver – only became possible in 1906 when the US engineer Lee De Forest invented the Audion tube. This innovation enabled sound to be modulated – modulation being the mixing of an electrical signal that represents sound with a radio signal so that it can be broadcast.

During the First World War all non-military broadcasting in the United States was banned, and it was only after the war ended in 1918 that the full potential of radio began to be realised. Over the following 30 years or so, radio moved from being an experimental and largely amateur medium towards commercial viability. The Radio Corporation of America was established in 1919, and its first formal broadcast took place in November 1920. From these beginnings, a variety of broadcasting networks developed. Starting with as few as five stations, the major US networks grew to such an extent that by the 1930s they boasted between 80 and 120 affiliate stations and could broadcast from coast to coast. In 1922, meanwhile, a group of radio manufacturers in the United Kingdom set up a private company which later became the non-commercial British Broadcasting Corporation. In 1923, Sri Lanka made history by becoming the first Asian country to begin radio broadcasts.

From crystal to transistor technology

Early radio sets were rudimentary, based on crystal technology which had been used in the era of radio wireless telegraphy. Typically, crystal radio sets had three-dial tuning, earphones and wet as well as dry batteries. By the end of the 1930s, radio receivers had evolved and were now enclosed in cabinets, had loudspeakers and single-dial tuning, and ran on mains power. Studio technology also improved, with ribbon microphones, condenser cones and faders, volume controls and mixing panels coming into use. Along with these developments came regulation and standardisation, with technology becoming increasingly streamlined and user-friendly.

By 1947, Bell Laboratories in the United States had demonstrated a new type of radio set – the transistor radio – and mass production of this began in the 1950s. Whereas previous receivers had used vacuum tubes to amplify sound, these new radios used electronic chips known as transistors. The name "transistor" then became generic for all radio sets made with these. Transistor sets were much smaller than previous models, could run on small flashlight batteries, and could fit into a pocket. Transistor radios remain the most popular mass communications device in existence today, particularly in developing countries and regions where they are easily affordable. However, the emergence of digital devices that incorporate radio is already leading to the decline of the transistor in industrial countries.

From AM to FM transmission

AM (amplitude modulation) was the standard technology used for broadcasting in its early years. Long wave, medium wave and short wave are the bands commonly associated with AM radio. However, in 1933, as concern

The radio spectrum

The **radio frequency spectrum** (or **radio spectrum**) is a comparatively small part of the electromagnetic spectrum, covering the range from 3 Hz to 300 GHz. It includes a certain type of electromagnetic waves, called radio waves, which can be generated by transmitters and received by antennae or aerials.

The radio spectrum is the home of wireless communication technologies such as mobile phones, radio and television broadcasting, two-way radios, broadband services, radar, microwave links and satellite communications. It has excellent ability to carry codified information (signals), and can also provide mobility and portability. It is relatively cheap to build the necessary infrastructure.

The radio spectrum is divided into frequency bands and sub-bands. Different signals make use of different frequency bandwidths. For example, an FM radio station might broadcast on the 92.9 MHz frequency, but require 0.3 MHz (equivalent of 300 kHz) bandwidth – the spectrum between the frequencies 92.8 and 93.0 MHz inclusive. Other stations cannot broadcast on these frequencies within the same area without causing or receiving interference.

For planning purposes, these spectrum bands are divided into **channels**. The bandwidth of spectrum channels can vary band by band. VHF Band II, the home of FM radio, for instance, is sliced up in 100 kHz-wide channels. An FM station requires 300 kHz bandwidth, and so each FM radio station takes up three spectrum channels. In the case of television broadcasting, the agreed bandwidth of a channel is 8 MHz in UHF Band IV/V. The bandwidth requirement of an analogue TV programme channel happens to be the same as the bandwidth of one spectrum TV channel, i.e. 8 MHz.

Lower frequencies have less bandwidth capacity than higher frequencies. This means that signals that carry a lot of information (such as television, broadband or mobile phones) are better placed in the higher frequency bands while simple radio (audio) signals can be carried by low frequency waves. Since low frequencies travel long distances but have less bandwidth capacity, placing one television channel (which uses a lot of bandwidth) in the lower frequency bands would squeeze out many long wave and medium wave radio services.

The radio spectrum is managed by a combination of bodies, with international harmonisation taking place at three levels:

The **International Telecommunication Union (ITU)** is responsible for developing international regulations and standards for spectrum covering all electronic communication and broadcasting technologies, including radio, TV, satellites, telephony and the internet. It plays an important part in the allocation of frequencies, and is responsible for ensuring optimal, fair and rational use of the radio spectrum, as well as for managing satellite orbit resources. Its recommendations set the technical standards for global broadcasting and telecommunications.

Regional agreements govern spectrum allocation in some areas.

Bilateral country-by-country arrangements ensure harmonisation of broadcasting signals across national borders. The national telecommunications and broadcasting regulators usually play an important role in this area.

Source: Summarised from BBC *The Spectrum and its Uses – a simple guide to the radio spectrum* (2006) www.bbc.co.uk/info/policies/pdf_text_archive/radio_spectrum.pdf

grew over the poor sound quality of AM transmissions, a US electrical engineer, Edwin Howard Armstrong, invented FM or frequency modulation. Instead of modulating the amplitude of the signal carrier wave, as with AM, FM modifies the frequency of the wave. This allows higher-quality sound broadcasting.

There are two types of FM: narrow band FM, which is mainly used by point-to-point mobile communications such as walkie-talkies; and wide band FM, which is used for broadcasting. FM signals fall within the very high frequency (VHF) range of the radio spectrum (87.5-108 MHz in most parts of the world). Given its limited coverage area, VHF FM is the most widely used form of broadcasting in areas with high population density. Its high bandwidth means that it can carry high quality transmissions, stereo, and textual information (see below).

FM broadcasts were originally monaural (mono), meaning that all the sound was broadcast through a single channel and received by listeners through a single speaker. Typically, early transistor receivers were also mono. However, stereo technology was soon developed and has in recent years become the standard for VHF FM transmission. Stereo broadcasting is the transmission of sound through two separate channels, meaning that each of the two speakers plays different components of the complete broadcast sound. Stereo offers a more holistic listening experience. However, owners of mono-only radio sets can still receive stereo broadcasts without significant deterioration in quality.

It took a number of years for FM radio to catch on. In the United States, the Federal Communications Commission (FCC, the regulatory body for the broadcasting sector)

authorised wide-band FM in 1941, while imposing a number of restrictions that effectively slowed down its adoption. As a result, it was only in 1978 that the number of radio listeners to FM broadcasts overtook those tuning in to AM broadcasts. During the 1980s and 1990s major US music stations migrated to FM. As the medium wave band in particular became congested, leading to deterioration in sound quality, a number of European countries (such as Germany, the Netherlands, Belgium and Denmark) also moved to adopt FM. In the UK the BBC began FM broadcasting in 1955. The Sri Lanka Broadcasting Corporation, a radio pioneer, started a parallel FM service in the 1980s. It took time for other countries in the developing world to follow suit, and it was only in the 1990s that governments in many Southern countries began to deregulate the airwaves, allowing non-state broadcasters to set up FM stations (see Chapter 11).

AM's disadvantages include its relatively narrow bandwidth, poor sound quality in car radios, higher cost of AM receivers compared with FM, and increased interference from electronic devices and fluorescent lighting. Nevertheless, AM has survived as an alternative to FM, carrying news, talk shows, minority and other niche programming. As many FM stations have become more commercialised and popular music-oriented, listeners looking for more specialised and talk programming have sought refuge in AM.

The birth of television

A 30-year period starting at the turn of the 20th century saw a series of developments that laid the groundwork for the birth of television. In 1873, a man named Willoughby Smith discovered the photoconductivity of the element selenium, which was later used to transmit images. In 1884, Paul Nipkow designed a rotating scanning disc, a key component in mechanical television. And in 1927, Philo Farnsworth invented the image dissector camera tube, which set the stage for electronic television.

Efforts to build prototype television transmitters based on Nipkow's rotating disc and other technologies resulted in the transmission of still as well as moving silhouette images, with John Logie Baird becoming the first to transmit moving silhouette images over wire circuits in 1924. These harnessed the cathode ray tube (CRT), invented by Karl Braun in 1897. A key component in all TV sets (until the arrival of plasma flat screen sets which use a combination of different technologies), the CRT is a specialised vacuum tube in which images are produced when an electron beam strikes a phosphorescent surface. CRTs can be found in a variety of appliances including computers, video game devices, video cameras, oscilloscopes and radar displays.

While early television used the CRT to receive images, some of the same pioneers took things a stage further by using the CRT to transmit images as well. In 1927, Farnsworth transmitted an image using a CRT. In 1934 he became the first to demonstrate a fully electronic television system using both electronically scanned television cameras and receivers to transmit live, half-tone images. Farnsworth's technologies were later licensed by RCA, for which his rival Vladimir Zworykin had successfully created an electronic camera tube in 1931.

A number of other pioneers registered technological innovations and by 1933 the BBC had begun televised broadcasts in the UK. Germany started experimental broadcasts around the same time. In the same year coaxial cable – a pure copper or copper-coated wire surrounded by insulation and aluminium covering – was introduced, making possible the routine transmission of audio radio and television programmes. However, the cost of manufacturing TV sets was so high that television broadcasting took time to take off. In 1936, only 200 TV sets were in use worldwide. By the end of the Second World War, only six or seven TV stations had been licensed for commercial operation in the United States.

In 1950, Brazil, Cuba and Mexico became the first middle-income or developing countries to introduce television, and did so ahead of a number of European nations. They were followed by Argentina in 1951; the Dominican Republic and Thailand in 1952; the Philippines and Venezuela in 1953; Colombia, Morocco and Puerto Rico in 1954; Algeria, Guatemala, Iraq, Nicaragua and Uruguay in 1956; Chile, Kuwait and Saudi Arabia in 1957; Bermuda, Costa Rica, El Salvador, Iran and Peru in 1958; Ecuador, Haiti, Honduras, India, Lebanon and Nigeria in 1959; and Panama, the United Arab Republic (Egypt and Syria) and Southern Rhodesia (now Zimbabwe) in 1960. The majority of developing countries followed after 1960, with Malawi and Bhutan the last two countries in the world to introduce television in 1996 and 1999, respectively.

Colour television was developed more or less in parallel with black and white. Baird was a key innovator, demonstrating the world's first colour transmission in 1928, making the world's first colour broadcast in 1938, and unveiling a fully electronic colour television display with 600 lines in 1944. In 1953, the FCC authorised a colour television system based on a design by RCA, marking the start of commercial colour television broadcasting in the United States. The rest of the world soon followed.

The development of television

The last 50 years have seen the development of a host of new technologies, peripherals and broadcasting innovations. These have included the invention of the remote control and the advent of videotape (1956); the debut of satellite broadcasting, which enabled the international relay of broadcasts (1962); the first television transmission from the moon, watched by 600 million people (1969); the introduction of high definition TV (HDTV),

with 1125 lines of resolution (1981); the approval of stereo TV broadcasts in the United States (1984); and the arrival of the Super VHS format (1986). By 1996 there were a billion TV sets worldwide, although ownership was highly skewed towards industrial countries and higher income groups.

Given that technologies were being developed on both sides of the Atlantic, it was no surprise that the United States adopted different systems and standards to those in Europe. In 1941, the FCC released the NTSC standard for black and white TV. NTSC (named after the National Television System Committee that adopted it) was the first broadcast colour system to be adopted. Variations of NTSC are currently in use in the USA, Canada, Japan, Mexico, the Philippines, South Korea, Taiwan and a number of other countries, mainly in Latin America. NTSC mandated 525 lines of picture information in each frame, and 30 refresh frames per second. A second NTCS standard was issued in 1950 that allowed for compatibility between colour and black and white television.

Due to differences in power frequencies, NTSC could not be readily adopted in Europe. Another major problem with NTSC was the tendency for the colour tone to change depending on transmission conditions. This led to the development of two new television standards aimed at delivering a better picture than NTSC. PAL (phase alternating line) was developed in Germany and launched in 1963, with British and German broadcasters starting to use PAL in 1967. It remains in use in much of Latin America, Africa and South Asia.

SECAM (sequential colour with memory) was developed in France, launched in 1967 and became the first European colour standard. It was later adopted by former French and Belgian colonies, Greece, the Soviet Union and most Eastern Bloc countries, and the Middle East – although after the end of the Cold War a number of Eastern European countries shifted to PAL. SECAM uses technology that makes it less compatible and more expensive than PAL or NTSC, which explains why some countries have chosen to move over to these standards.

From analogue to digital technology

All the television and radio systems, standards and equipment described so far are analogue.[1] An analogue radio or television programme[2] is a direct analogue, or copy, of what was transmitted. This is because the information being transmitted is contained in wave amplitude, representing the amount of information. Analogue signals sound and look the same when they arrive at their destination as they did when they left the source. Any interference or distortion of the sound or image being transmitted will be passed on to the listener or viewer. This explains the poor sound and picture quality that plagued the analogue era of broadcasting.

Digital signals, on the other hand, are transmitted not as complete copies, but in numerical "bits" (0 or 1) bundled in "packets" of data. (The word "digital" derives from the word "digit", meaning number symbol, and digital systems process numbers.) In the case of digital recording or transmission, a numerical description of the original signal is made, and it is this description, rather than a direct analogue, which is stored. Anything produced, recorded, stored, or transmitted in digital format is therefore likely to be of higher quality and more stable than that in analogue format.

Digital broadcasting has a number of advantages over analogue broadcasting:

- Digital broadcasts are much clearer and suffer from much lower levels of noise interference.
- Error correction enables sound distortions caused during transmission to be fixed.
- Transmission in packets means that a wider range of services – including digital radio and text-based information – can be transmitted to consumers.
- Up to ten different TV emissions can be broadcast on a single digital channel (or multiplex), as opposed to one TV emission per analogue channel.

The main downside of going digital, for broadcasters and consumers, is the start-up cost. Because the technology is different, listeners and viewers have to invest in new radio sets, TVs or digital set-top boxes.

New and emerging technologies

A wide range of digital standards, receivers, services and content is already available. However, it is important to remember that there have been many influential precursors to today's digital revolution, which reach beyond or interact with broadcasting. These include audio and video cassette recorders and players, invented in the 1940s and 1950s, and the Sony Walkman in the 1980s and 1990s. The following paragraphs provide a brief inventory of some of the latest digital technologies in use and under development.

Digital audio broadcasting (DAB), or **digital radio**, enables the broadcast of compact disc (CD)-quality sound. The benefits of DAB include much clearer sound quality; instant identification of radio stations (making retuning much simpler); the transmission of news, text,

1 The terms "analogue" and "digital" have been applied not only to transmission systems and standards but also to recording and playback systems (e.g. tape and video cassette recorders, DVD players/recorders).

2 Analogue radio programmes are broadcast on the AM and FM bands, while analogue television signals are usually broadcast via the ultra high frequency (UHF) part of the radio spectrum.

images and other value-added services such as news updates; and the use of less power than other transmitters (although receivers typically require more power than analogue receivers). DAB also extends the reach of radio. As well as being accessible through digital radio sets, DAB programmes can be rebroadcast to different audiences via digital television, digital satellite TV and the internet (see more on streaming below).

DAB has spread rapidly in industrial countries and is now becoming available in developing countries. An initial problem with availability of digital receivers was solved when a special chipset was designed for DAB, allowing receivers to be produced (including those for use in cars) that are significantly cheaper in real terms than were FM receivers when they were first launched. At the time of writing (early 2008), it was estimated that more than 475 million people around the world could receive more than 1,000 different DAB and DMB (digital multimedia broadcasting) services.

The new digital radio system being put in place in the United States to replace existing AM and FM transmissions is called **HD (high definition) radio**. Its advantages are very similar to those of DAB: improved audio quality; a virtual end to interference and static; additional data services; and easy transition from analogue radio.

Digital satellite radio (DSR) involves the direct broadcast of radio programmes around the world from satellites orbiting the earth. WorldSpace Satellite Radio has pioneered DSR technology and is the only company with the rights to the world's globally allocated spectrum for DSR. Subscribers can receive programming transmitted to specially designed, low-cost digital radio receivers from two satellites. These satellites have a broadcast footprint covering more than 130 countries, including all of Africa and the Middle East, India, China, and most of Western Europe.

Digital Radio Mondiale (DRM) is an emerging standard which is promoted by a consortium of broadcasters, network operators, broadcasting associations, equipment manufacturers, regulatory bodies and other organisations. Whereas digital radio (DAB) broadcasts use higher frequencies (VHF and UHF), DRM plans to enhance the listening experience by using existing AM broadcast frequency bands (short wave, medium wave and long wave). It promises near-FM sound quality as well as the user-friendly advantages of digital radio, including text and data services. DRM has been endorsed by the ITU, and a number of consumer and professional receivers are already on the market. Another version of this technology, called DRM+, is under development for VHF band II which has traditionally been used by FM radio.

Digital terrestrial television (DTT) is digital television that can be received on a standard TV aerial, as opposed to cable or satellite networks. DTT uses multiplexing, which combines and compresses multiple TV channels into a single transmission from which they can be decoded by a suitable digital receiver. DTT offers all the benefits of digital broadcasting outlined above, notably a larger selection of free channels. It has become the 21st century standard to replace analogue terrestrial broadcasting. It also allows viewers to interact to some extent with programming that is being broadcast, to control what they watch at any given time with greater flexibility, and to respond to content. Viewers can, for example, cast votes by pressing a button on their remote control devices, shop using the television, or subscribe to other channels at the click of a button.

However, changing from analogue to DTT is not cost-free. Viewers wishing to upgrade to digital either have to buy a special set-top box to attach to their existing TV set, or buy a new TV set with a built-in receiver. Most existing TV sets are enabled to view the standard definition (SD) picture format, which offers an inferior picture to high definition (HD). Viewers wanting to receive the HD signal – which broadcasts audio and video with much higher resolution and detail than SD – will have to buy HDTV-ready TV sets.

The analogue-digital switchover also involves significant costs for broadcasters. Given these costs, it is not surprising that the switchover has begun mainly in industrial countries. A number of these have already switched off their analogue signals and gone digital,[3] while others are in the process of doing so.[4] A handful of other countries – again mostly industrial countries in Asia and Eastern Europe – had announced by the time of writing (end 2008) that they will begin the analogue-to-digital transition shortly.

Digital video broadcasting (DVB) is a worldwide set of open standards for digital television. DVB systems distribute broadcasting and other content by a variety of means, including satellite, cable, terrestrial television, handheld devices, satellite and microwave. Some of these standards enable a range of advanced mobile television services that will only become commercially available in the future. DVB standards are maintained by the DVB Project, an international consortium with 270 members.

Satellite broadcasting involves the distribution of video, audio or data over a satellite network. Satellite broadcasting is enabled by satellites orbiting around

3 Luxembourg (September 2006), Netherlands (December 2006), Finland and Andorra (September 2007), Sweden (October 2007) and Switzerland (November 2007).

4 Brazil started switching over in December 2007 and will complete in 2013. Germany started in November 2002 and planned to complete by the end of 2008. In 2009, NTSC transmissions in the United States will end as new digital standards come into effect and bring to an end the vacuum tube era of television. In the United Kingdom, the analogue signal switch-off started in October 2007 and will be completed in 2012. Norway started in 2007 and will complete in 2009. Austria began switching off in March 2007.

37,000 kilometres (22,300 miles) above the equator. Satellite television originates with a transmitting antenna located at an uplink facility – an earth station that uses an extremely large dish (up to 9-12 metres, or 30-40 feet, in diameter) to target and transmit the signal to a given satellite. Uplink signals are transmitted within a specific frequency range that corresponds to the frequency on the satellite's transponder. The next stage in the process is the downlink, in which the transponder relays the television signal back to a receiver on the surface using a different frequency band (to avoid interference with the uplink signal). The downlink signal is captured by a parabolic receiving dish which includes a low-noise block downconverter (LNB). The purpose of the LNB is to amplify the downlink signal (which loses power as it comes from the satellite down to earth); filter the relevant frequencies; and convert them into a lower frequency range to enable them to be broadcast.

Satellite television is used in three main ways:

- It is received directly by the viewer (either free or through subscription or pay-per-view arrangements).
- It is received by local television stations for rebroadcast to viewers.
- It is received by content providers for rebroadcast to subscribers via cable.

Cable broadcasting is enabled by coaxial or fibre optic cables which are used to transmit FM radio and television programming to the televisions of subscribers. In addition to television and radio broadcasts, cable television providers often offer subscribers a bundle of services including high-speed internet and telephony. (The combination of television, telephony and broadband internet service is known as "triple play".)

Cable broadcasting originated in the late 1940s as an alternative to wireless terrestrial broadcasting, which could not reach remote communities in mountainous areas. In such cases, giant antennae were built that received the terrestrial signal, which was then relayed via cable into the homes of viewers. Cable is most widely used in North America, Europe, East Asia and Australia, and in a handful of other regions and countries. It is not significantly used in Africa because of the prohibitive cost of laying cable, particularly in sparsely populated areas. Instead, microwave-based DBS systems are used, though these are often beyond the reach of poor communities.

Digital multimedia broadcasting (DMB) uses the same infrastructure as a digital audio broadcasting (DAB) network. Multimedia applications such as mobile TV, picture radio, data services and new audio applications can be transmitted by simply adding a video encoder to an existing DAB network.

Mobile telephony and TV: Mobile phones, arguably the most successful communications technology available today, occupy various parts of the radio spectrum. "2G" (second generation) mobile phones – which are most widely available today – operate just under the 1 GHz and around the 1.75 GHz band. The emerging "3G" (third generation) phones operate around the 2 GHz band. In addition, mobile expansion bands have been allocated in other parts of the spectrum to allow the delivery of additional services by mobile phones. Mobile TV is now available in a few countries. It enables users to watch TV at will, wherever they happen to be. There are a number of mobile TV standards on the market.

Software defined radio (SDR) and cognitive radio (CR): Planned for the future, these are not radio sets, but technologies that would combine several services that use radio waves. SDR users would request a service through a device which would then negotiate with the network to identify the most appropriate frequency for that service. Cognitive radio would have the additional ability to recognise and distinguish signals, making spectrum practically abundant.

Convergence – the wave of the future

Broadcasting as we have known it to date is being radically redefined by changes in technology and markets. A range of new and emerging digital technologies reflects the growing convergence between broadcasting, cable, internet, telephone and wireless technologies. This convergence, while blurring the distinction between different technologies, is breathing new life into broadcasting close to one hundred years after it first became available. Broadcast content can now be reduced to the same digital formats as other content, enabling broadcast services to be provided over telecommunications networks and allowing internet services to use broadcast systems. Because of innovations such as digital compression, radio and TV sets can receive additional services alongside broadcast content.

Digital radio is now routinely broadcast over the internet, with the result that radio stations in one part of the world can be heard in real time elsewhere. While most of the radio stations that broadcast live (or "stream") over the internet also broadcast terrestrially, a small but growing number of "virtual" radio stations broadcast exclusively over the internet. According to one estimate, in 2007 there were close to 5,000 streaming radio stations on the internet.

Another emerging application is podcasting, whereby listeners can subscribe to audio content which is then automatically downloaded to their personal media players or computers each time new content is added. Podcasts are downloaded using software known as aggregators or syndication feeds, originally developed for text-based recurrent internet content such as news.

The delivery of digital television content using technologies normally used by computing networks is also spreading rapidly. Because the main technology involved is the unique identification system for computers (the IP address), it is better known as IPTV (Internet Protocol television). This offers a whole menu of advantages to the viewer, not least the ability to interact with the content being broadcast, to multitask across media, and to order services such as "video on demand", whereby films can be purchased over the internet and broadcast specifically to a given computer for playback at the customer's leisure. IP multicasting allows a broadcaster to send one broadcast to multiple, targeted receivers.[5]

As with all digital broadcasting, since it works through the transmission of packets of data, streaming audio and video media via the internet can be problematic if the bandwidth available is too low, if the network used is wireless, or if the content being streamed is not of reliable quality.

The proliferation of technological standards and systems that have come about as a result of digitisation and convergence pose major challenges for the international governance of broadcast technologies. Traditionally, technology standards have been determined partly by national regulators (for example, the FCC in the United States established a National Television Standards Committee, NTSC, to develop a standard for colour television). In many countries there are national bodies responsible for setting or endorsing standards. Global standards are primarily set by three entities:

- The International Organisation for Standardisation (ISO), the world's largest developer and published of international standards.
- The International Electrotechnical Commission (IEC), the leading body for preparing and publishing international standards for electrical, electronic and related technologies.
- The World Trade Organisation (WTO), which aims to ensure free trade and protect intellectual property, including standards.

Standards are also set on a regional basis, with bodies within the European Union, for example, assuming responsibility for standards such as "television without borders".

Conclusion

The story of broadcasting technology is one of continuous innovation and standard setting. Major constraints to broadcasting, such as spectrum scarcity, have been partially addressed by digitisation. This in turn has moved broadcasting from a purely unidirectional flow of information to one with increasing interactivity through which the viewer or listener has more control and more opportunity to respond. Convergence has breathed new life into broadcasting.

However, much as the evolution of technologies has brought about dramatic change in the ways that citizens experience and interact with broadcasting, much has remained the same. Broadcasting technologies have almost without exception been invented, developed and rolled out in the global North, to be later adopted in developing countries. Each new technology, peripheral or device brought onto the market has initially been available only to those prosperous enough to afford it – but has later dropped sharply in cost. Each new leap in broadcasting technology is generally available in industrial countries long before it can be afforded in the developing world.

One dramatic shift has taken place in recent years in the location of innovation and production of technical equipment. This has shifted from Europe and North America to countries in Asia such as China, India, Japan and South Korea. The extent of mass markets in Southern countries suggests that the design of future innovations in broadcasting technology may be more global in nature and less specific to the requirements of Northern markets and consumers. However, for many years yet, radio is likely to remain the most widely available broadcast ICT and the most important ICT available, alongside telephony, in many marginalised communities. ■

5 The BBC's iPlayer was a highly successful innovation in making broadcast material available over the internet during 2008, though one only available to audiences in the BBC's home market.

Chapter 10
BROADCASTING OWNERSHIP

Lead author ***Peter da Costa***

Broadcasting is particularly important in the information and communications environment because more people access radio than any other communications technology. The speed and nature of technological change in the sector, and the new opportunities arising from convergence between different technologies and historically separate media sectors, are changing patterns of production and behaviour within broadcasting. Ownership of broadcasting and other media outlets is an important aspect of this change.

Broadcasting ownership largely mirrors the broader context of media ownership, which has evolved significantly over the past few decades. At a global level, in recent years, media ownership has become more concentrated in the hands of a relatively small number of media conglomerates, which own and control the predominant media outlets for most media consumers today – although the identity of ownership is not necessarily apparent to users because different media brand names have been retained. Ownership also increasingly cuts across traditional media boundaries, so that a large conglomerate may own newspapers, TV and radio stations, cable and satellite, as well as book publishing subsidiaries.

Among the many factors behind this concentration of ownership has been the advent of the digital age. However, while digitalisation has enabled greater media concentration on the one hand, on the other the internet and other factors (including the lower production costs associated with new technologies) have also provided opportunities for greater plurality of voices and diverse perspectives to be broadcast through new radio and television channels and through alternative media, by a wider range of content providers and media outlets. As a result, the shape of ownership continues to evolve, in the process presenting regulators with new challenges (see Chapter 11).

History

At its inception in the 1920s – because of its potential as a medium for disseminating information – radio was seen by most governments as inseparable from the public or national interest, and as too strategically important to be left to the market. For these reasons, and to ensure that the few available frequencies were efficiently utilised, governments in Europe and the United States took steps to oversee or govern the fledgling sector. It is from their protective instinct that the notion of "public service" broadcasting first arose. (Public service broadcasting is described in the second half of this chapter.)

Ownership and nation building

In a number of industrial countries, broadcasting was led by the state and oriented towards public service values. In the United Kingdom, for example, the British Broadcasting Corporation (BBC) was set up in 1926 along independent but non-commercial lines, and became something of a model for public service broadcasting elsewhere. Although established by the UK government, which appointed its board of governors (directors), it had considerable autonomy, sought to avoid exercising political influence, and focused on both education and entertainment, initially at least with a rather "high-minded" sense of mission. Despite its high level of autonomy from governmental influence, it was nevertheless the state that ensured that the BBC maintained a virtual monopoly until the 1950s.

The semi-autonomous UK model was intended to establish a respectable distance between broadcasting and the state, viewing this separation as an integral part of broadcasting for the public good. However, governments in many countries interpreted the public good altogether differently, maintaining broadcasting monopolies for more political reasons. This was the case in a number of authoritarian countries in Europe and elsewhere. In Latin America, meanwhile, broadcasting and newspaper empires were often owned or controlled by a combination of party leaders, military officers and captains of industry – highlighting the fact that media concentration is not just a contemporary trend.

In much of the developing world in the 1950s and 1960s, the governments of many newly independent countries regarded state control over the airwaves as essential to nation building and to the promotion of the national interest, development and citizenship. The period of state monopoly over broadcasting that resulted was often marked by propaganda, censorship and a general intolerance for dissenting views. In a number of countries broadcasting served to consolidate state control, offering little or no space for, and sometimes stifling, free expression.

The birth of private networks

However, it was not long before the landscape of broadcasting ownership began to change in the industrial world. In the United States, a strong ethos separating state and media, as a means of guaranteeing free speech, led to a broadcasting sector which was increasingly owned by corporations. By the mid-1930s, four networks – born barely a decade earlier – had established and begun to dominate private broadcasting. These were NBC (National Broadcasting Company), CBS (Columbia Broadcasting System), MBS (Mutual Broadcasting System) and DuMont Broadcasting. Because of its dominance of the US broadcasting market, NBC was forced by the Federal Communications Commission (FCC) in 1939 to divest itself of its Blue radio network, which became the fifth key network, ABC (American Broadcasting Company). The genealogy of some of today's largest global broadcasting empires can be traced back to these early private US broadcasting networks.

In 1943 the US Supreme Court upheld the FCC's decision concerning NBC's dominance, ruling that because of the scarcity of frequencies, broadcasting should be subject to greater regulation than other media. The FCC today retains extensive regulatory powers over mainstream terrestrial broadcasting, which make it substantially more regulated – notably where content is concerned – than US cable television. However, much of mainstream broadcasting continues to be dominated by the major networks.

Free flow of ideas versus international regulation

The Cold War period, from the late 1940s to the late 1980s, saw significant use of broadcasting, and in particular short wave radio, to disseminate propaganda in the hope of winning hearts and minds. While such stations as the Voice of America, Radio Free Europe and Radio Liberty extolled the virtues of capitalism, Radio Moscow, the Chinese State Radio and Radio Tirana, among others, promoted different strains of communism.

By the early 1970s, the Cold War stand-off between West and East led to international debate or argument about the ethos of broadcasting, notably between the United States' push for "free flows of information" – led by large private media networks in the North – and Soviet calls for state control.

Perceptions of Western dominance over media, broadcasting and global communications (and of a global economic order skewed in favour of the global North) also led a group of non-aligned countries in this period to challenge what they described as an "imperialist" information order based around what they saw as unilateral flows of information from North to South. Their underlying concern was that, because the largely state-controlled media systems in the South were poorly developed, countries in the South relied on Northern communications systems and content, potentially enabling cultural domination by foreign private media corporations, many of which were seen as promoting US culture and values.

This debate came to a head under the auspices of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in the 1970s. In this debate, non-aligned countries proposed a New World Information and Communication Order (NWICO), based around what they called "the Four Ds" – "democratisation", "decolonisation", "demonopolisation" and "development". The United States and other industrial nations, on the other hand, argued that privatisation of media and deregulation of global markets was the best way to ensure professionalism, free flows and plurality of information.

In the late 1970s, a commission was set up by UNESCO, chaired by an Irish UN official, Seán MacBride, to review these issues. Its report argued that dominance over the international information system by a handful of transnational companies posed a threat to the cultural integrity and national independence of a number of countries. It asserted that everyone had a right to communicate, and proposed that limits be placed on media concentration and monopolisation. It further urged the adoption by developing countries of local radio, low-cost small-format television and video systems, and other appropriate technologies that would enable the production of community-relevant programmes, in order to stimulate participation and provide the opportunity for diversified cultural expression.

Non-aligned countries saw the MacBride Commission as a vindication of their stance. However, the debate over NWICO and the release of the MacBride Report catalysed the United States' withdrawal from membership in UNESCO in 1984, when it accused the agency of becoming a forum for Cold War politics rather than impartial promotion of education, science and culture.

Privatisation and the public interest

In the 1980s, globalisation began to have a substantial impact on media ownership in the North. While the principle of ensuring the "public interest" remained paramount, as broadcasting evolved and grew regulators faced growing pressure from media companies to enable their expansion, leading to a relaxation of ownership rules. As a result, they moved away from state ownership towards more private sector participation.

On the one hand, this meant that more space was created for independent commercial broadcasting and for local broadcasting stations. In the United Kingdom, for example, commercial television was introduced in 1955. The BBC introduced local radio stations in 1967, while

legal commercial local radio stations followed in 1973 (there had been considerable unlicensed or "pirate" commercial radio broadcasting in the 1960s).

Globalisation, however, also enabled greater media concentration to take place. In the United States, for example, the 1980s and 1990s saw a marked shift from locally owned media enterprises with a degree of public service ethos, towards transnational media corporations which tended to have less of a public service focus. Concentration and consolidation of ownership have increased, with privatised broadcasting outlets now forming part of multimedia empires that transcend both media and national boundaries.

Today, the top ten media businesses worldwide are among the largest corporations in the world. Seven of them appear in Fortune's 2006 list of the world's top 500 corporations by financial value. By 2005, the size of the global media market had reached USD 258 billion. Although this market included hundreds of firms, the "big ten" global media enterprises accounted for more than 80% of all revenues.[1]

This concentration of ownership reflects a succession of mergers and acquisitions, which has been spurred by technological convergence, and illustrates the extent to which media ownership has become linked to financial markets. However, it is worth noting that four of the top ten global media firms are still owner-controlled, so that despite decades of development, family control of broadcasting and other media remains a key dimension of ownership.

While most major media enterprises have broadcasting as their core business, a crucial feature of today's media empires is that they cut across historic boundaries between communications sectors, owning a suite of different media outlets under the same corporate control. Between them, the top ten media companies own the US television networks; major film studios; more than 80% of the formal music publication market (i.e. sales of music on CD, via downloads, etc.); the majority of satellite broadcasting worldwide; a significant percentage of book publishing and commercial magazine publishing; all or part of most of the commercial cable TV channels in the US and worldwide; and a significant proportion of European terrestrial television.

The major media corporations have become increasingly transnational – spreading from what was once, in most cases, a base in the United States to seek growth opportunities in the rest of the world. Additionally, a group of second-tier firms has developed, many established from a base in publishing or television, in the United States, western Europe or Japan. Nor has this concentration of media ownership been limited to the global North. In Latin America, for example, family-owned firms in Brazil, Mexico, Argentina, Colombia and Venezuela dominate the marketplace, with interests which stretch across the press, broadcasting, music, the internet, cable and telecommunications.

The establishment of large multinational media corporations is one of the most important developments in media ownership of the last quarter of the 20th century. However, it is not the only story of that time. As noted above, new technological developments and liberalisation of broadcasting regulation have also enabled the establishment of a wide range of different broadcasting operators, with a wider range of perspectives and the ability to reach particular niche audiences, whether local communities or national interest groups. The breadth of choice for broadcasting consumers has, therefore, often expanded while media ownership has concentrated. Broadcasting consumers in the UK, for example, can now access far more radio and television channels, and more diverse broadcasting, than they could in the 1950s or the 1980s. Similarly, as described below, restructuring of broadcasting in Africa has enabled a wide range of local commercial and community stations to introduce much greater diversity into broadcast radio.

Public/private co-existence

It is important, in this context, to understand the relationship between public, public service and commercial broadcasting.

As the liberalisation of broadcasting began to take root in the 1980s, governments regulated to put in place arrangements covering both public and private broadcasting. Under these arrangements, public and private broadcasters share available radio and television frequencies, while encrypted and special interest programmes are transmitted via cable and satellite, extending the number of programmes available to listeners and viewers.

This concept of hybrid public-private systems has influenced the liberalisation of broadcasting in many developing countries, just as the end of authoritarianism and advent of electoral democracy have, in some cases, also stimulated media diversity and pluralism. In many African countries, for example, the unwieldy state media apparatus established after independence is being superseded by waves of private and non-profit media. The privatisation or commercialisation of state-owned broadcasters is also well underway. The exponential growth of FM and community radio stations in countries of the global South has sparked lively debate as to the type of regulation needed to reflect the emergence of diversity in ownership.

Technological innovation – and in particular the emergence of cable/satellite broadcasting and digitalisation

1 Winseck, Dwayne "The State of Media Ownership and Markets: Competition or Concentration and Why Should We Care?" *Sociology Compass* 2 (2008): 34-47 www.blackwell-synergy.com/doi/pdf/10.1111/j.1751-9020.2007.00061.x

– have also impacted significantly on broadcasting ownership. Barriers to entry have been removed, with new media such as cable TV, cable radio and webcasting enabling more players (large, small and community-based) to enter the media sector.

Ownership models

At least four models of broadcasting ownership can be identified:

- State ownership
- Public service broadcasting
- Commercial or private broadcasting
- Community radio and television.

None of these types of ownership mutually excludes the others within any broadcasting environment. All four may be and often are found in a given national setting, and there is significant crossover from one to another. Some characteristics of these models are set out in Table 10.1, and described in the following paragraphs.

State ownership

The discussion of the evolution of broadcasting ownership above has highlighted the tendency towards control of radio and television by the state, particularly in broadcasting's early days and following decolonisation. It was noted that while in some cases this came out of a genuine desire to promote broadcasting as a public good, in others it was driven by ideological and political considerations. A key distinction therefore needs to be made between state-controlled broadcasting with a "public service" character and state-controlled broadcasting which is intended to act as an instrument of state control.

In theory, state broadcasting is led by the state's or government's perception of the *national interest*, while public service broadcasting (discussed in more detail below) is geared towards the *public interest.* The "national interest", as the term is used here in relation to state broadcasting, refers to the interests and values of those in power. This may represent a narrow range of policy choices and governance approaches that excludes access to broadcasting by other social, political and cultural groups and viewpoints. The "public interest" is a broader concept that speaks to and reflects values and approaches over which no single organisation, individual or entity has ownership, and so implies access to broadcasting for the diverse opinions that make up national or local society.

The strongest state model of broadcasting ownership is one in which state authorities have a complete monopoly over broadcast media, and total control over staffing, content, scheduling, reach and all other aspects. In such a model, state broadcasters are typically funded from public funds reflected in state budgets. Depending on how the national interest is defined, such a model is highly likely to be driven by political considerations (for example, the desire to prevent alternative viewpoints from being broadcast), but may also include didactic content (for example, the promotion of government social and economic objectives).

This model of broadcast ownership ceased to apply in industrial nations following the collapse of Eastern European autocracies around 1990, and is fast disappearing in developing countries. Instead, faced with the reality

Table 10.1: **Characteristics of media ownership models**

Type	State	Public service	Commercial	Community
Description	State authorities directly supervise the media and have full control over content and/or programming	The media structure is defined through a legislative framework in which the media is in public hands but management and operations enjoy substantial programming autonomy	Private ownership, usually accompanied by some degree of state regulation	Collective ownership by community-based organisations
Operating rationale	Programming driven by political interests	Programming driven by public interest	Programming driven by commercial interest, i.e. the need to secure revenue from subscribers (viewers) and/or advertisers	Programming driven by the interests of the owning community organisations and/or by community/public interests
Audience	Citizens as subjects	Citizens	Citizens as consumers	Targeted community members
Usual revenue sources	Taxes; advertising	State funding; subscription fees from viewers/ listeners; advertising	Private investment; advertising	Community funds; in-kind contributions; advertising; donor grants

Source: UNDP *Supporting Public Service Broadcasting: Learning from Bosnia and Herzegovinia's Experience* (2004) www.undp.org

of a rapidly diversifying media landscape, governments are choosing either to privatise their radio and television services, or to reinvent them as public service broadcasters. However, this does not mean that authoritarian governments necessarily forgo content control, either over state-owned broadcasters or over the private sector broadcasters that enter the market. High levels of political control can be exercised even in ostensibly open broadcasting environments.

Public service broadcasting

There are many different definitions of public service broadcasting (PSB). According to UNESCO, PSB is broadcasting made, financed and controlled by the public, for the public. It is neither commercial nor state-owned, and should therefore be free from political interference and pressure from commercial forces. The role of PSB is to inform, educate and entertain the public. When associated with pluralism, programming diversity, editorial independence, appropriate funding, accountability and transparency, PSB can serve as a cornerstone of democracy.

Although there are variations in the types of PSB in place depending on the setting, a number of standards are common to all models:

- Universality, or the commitment to broadcasting to all citizens of a given country as opposed to a segmented audience.
- The establishment of a sense of national identity, belonging and participation, which supports democratic participation and the engagement of all communities within the nation.
- Independence from state and commercial interests to ensure the provision of quality programming.
- Impartiality in programming and content.
- Diversity of programming, including provisions for local content to suit local needs.

User fees are charged for public service broadcasting in some countries. In the United Kingdom, for example, the owners of all television sets are required to pay a licence fee, which helps to fund public service broadcasting by the BBC (and enables the BBC to broadcast without advertising).

The purposes and characteristics of PSB are illustrated in Table 10.2, which is derived from the UK communications regulator Ofcom.

In practice, it can be difficult to apply these standards across the board. Although strong jurisprudence has been established in international and comparative law against state interference in publicly funded PSB, in practice many public service broadcasters are funded from a combination of public and commercial money. This being the case, it is not always easy for broadcasters to ensure impartiality and non-interference. The production of local content also involves significant costs which public service broadcasters in many developing countries find it hard to meet. As a result, there is a tendency – particularly where there is a shortage of local content – for cheap or free-to-air global programming (such as *telenovelas* and soap operas) to dominate PSB broadcast airwaves. However, innovations such as the broadcasting of parliamentary proceedings also demonstrate that it is possible to meet PSB local content provisions in ways that enhance public understanding of national issues.

PSB is interpreted and implemented in different ways in different countries and regions. The European Parliament has identified three types of PSB structures in Europe:

- Integrated structures, as in the UK, Spain and Italy, where the BBC, RTVE and RAI control every area of public service broadcasting activity.
- Federated structures, such as the German system, which is derived from the integrated model but reflects the country's political organisation, and so delegates responsibility for matters, as appropriate, to federal or state level.
- Fragmented structures, as in France, where each branch of the audiovisual sector is controlled by one or more separate public operators.

On a sliding scale from complete independence to state tutelage, two broad approaches to PSB can be identified:

- One is the "Anglo Saxon" model involving considerable independence of public service broadcasters which receive sufficient funding to allow them to avoid direct competition with commercial broadcasters. In the UK, for example, strict requirements for political balance are placed on all broadcasters (both public service and commercial). This model has helped PSB broadcasters to retain their niche as providers of distinct, unique content. The UK, Germany and Scandinavian countries fall under this category.
- The other is the "Latin" model, found in Italy, Spain and Portugal, where PSB is politically controlled. In Italy, for example, the three television channels of RAI were historically associated with three major political parties. In Spain the director-general of public service broadcaster RTVE is still appointed directly by the Cabinet. A feature of this model in some countries has been chronic underfunding, with the result that PSB has been eclipsed by commercial broadcasting.

Table 10.2: **PSB purposes and characteristics: A UK view**

Purposes	Characteristics
Informing our understanding of the world: To inform ourselves and others and to increase our understanding of the world through news, information and analysis of current events and ideas. *Stimulating knowledge and learning:* To stimulate our interest in and knowledge of arts, science, history and other topics through content that is accessible and can encourage informal learning. *Reflecting UK cultural identity:* To reflect and strengthen our cultural identity through original programming at UK, national and regional level, on occasion bringing audiences together for shared experiences. *Representing diversity and alternative viewpoints:* To make us aware of different cultures and alternative viewpoints, through programmes that reflect the lives of other people and other communities, both within the UK and elsewhere.	*High quality:* Well funded and well produced. *Original:* New UK content rather than repeats or acquisitions. *Innovative:* Breaking new ideas or re-inventing exciting approaches, rather than copying old ones. *Challenging:* Making viewers think. *Engaging:* Remaining accessible and attractive to viewers. *Widely available:* If content is publicly funded, a large majority of citizens need to be given the chance to watch it.

Source: Ofcom *Ofcom review of public service television broadcasting: Phase 3 – Competition for quality* (2005) www.ofcom.org.uk/consult/condocs/psb3

In many countries, new developments in broadcasting may lead to more discussion of policy, regulation and legislation concerning public service broadcasting. One issue here is the idea that the traditional concept of PSB could be extended to cover a wider range of broadcast platforms, with specialised services aimed at minorities and marginalised groups, as well as free public service content delivered via internet portals, websites and on demand over broadband networks. Under such a model, and with appropriate regulation, public service broadcasters could also be allowed to offer pay-TV channels and to pursue other commercial means of revenue generation.

Commercial/private ownership

The main features of commercial broadcasting are its ownership, the way in which it generates revenue and investment funding, its mission and its audience.

As described above, much of global broadcast media has consolidated around a small number of transnational corporations. Many of these have originated from family-owned media businesses, have expanded as a result of mergers and acquisitions, and are listed on major stock exchanges. Broadcasting operators from these global media enterprises are present in most national broadcasting environments, together (usually) with other commercial/private sector broadcasters.

Revenue for commercial broadcasting is sometimes generated in part from subscription fees. This is particularly common in cable and satellite television, but is rarely found in radio. Advertising, however, is a major driver of commercial revenues in the large majority of private sector broadcasting. Globalisation and the emergence of new digital technologies have made much advertising international rather than local.

As they are commercial enterprises, private sector broadcasters aim to achieve a profit from broadcasting which is sufficient to enable them to provide a dividend to shareholders and invest in future production. This, including the need to attract advertisers and maximise advertising revenue, influences programming content. Commercial stations are more likely to concentrate on programming that achieves a mass audience, or an audience with high levels of spending power (which attracts advertising), and may have less flexibility to offer niche or minority programming than public service broadcasters.

Given the above, some argue that a defining feature of commercially owned broadcasting is that the audiences are viewed not as citizens of countries or regions, but as consumers; and that commercial radio stations tend to concentrate on entertainment rather than public service content. Others argue that commercial radio is much less didactic than state or public service radio, offering listeners and viewers what they want rather than what their governments think is good for them.

In recent years, digital technologies have made it easy to personalise programming for individual subscribers via cable, satellite or the internet. This is sometimes referred to as "narrowcasting" (although the term is more often used to refer to niche broadcasting to selected groups through channels specifically oriented towards them). Commercial broadcasters and others argue that this level of personalised programming offers much more choice to consumers. Opponents of commercial broadcasting have argued that it provides more choice to those who can afford it than to those who cannot, in comparison with universally available broadcasting which offers the same (if smaller) menu of choices for all (see also Chapters 11 and 12).

Community broadcasting

Alternative approaches to broadcasting production and distribution are beginning to emerge. Community media outlets have brought to the fore the notion of collective ownership, and are seen by their advocates as providing an important countervailing force to growing commercialisation and global concentration in the rest of the media.

Community broadcasting spans radio, video, television and the internet, though most attention has been paid to community radio. It has been defined in the African Charter on Broadcasting as "broadcasting which is for, by and about the community, whose ownership and management is representative of the community, which pursues a social development agenda, and which is non-profit."[2] In this context, the community is taken to be represented by an ownership entity which has civil society or NGO characteristics. However, it should be noted that these may not be representative of the community as a whole (for example, they may come from a particular ethnic or religious group).

Community radio has spread quickly during the past two decades. By the middle of the first decade of the 21st century, it had become well established in Europe, North and Latin America; widespread across Africa; and of growing significance in Asia and the Pacific.

Some key features asserted by community broadcasters for community radio are its ownership and operation by citizens and/or community groups; its mission; its non-profit status; its potential to reach excluded and marginalised communities not reached by commercial broadcasters or PSB; its assertion of linguistic and cultural diversity; and the provision in some cases for community members to be content producers (although this is also evident in the widespread use of phone-ins and other interactive broadcasting modes by commercial and PSB stations).

At the same time, it should be noted that a number of broadcasters targeting specific communities (for example, on the basis of religion, race or culture) do not possess all of these features; and some confessional stations have been highly criticised, in Africa as in the United States, for the partisan and ideological nature of their output. Under-resourcing is also a problem for many community radio stations, including limited journalistic and technical skills. Journalistic capabilities can be particularly important where broadcasting takes place in highly contested or near-conflict situations.

Community radio stations tend to be owned by community-based organisations, such as local NGOs, workers' organisations, educational institutions, religious or cultural organisations, or by associations of one or more of these forms of civil society entity. In Latin America, community radio stations are owned by trade unions, peasants' organisations and by women's groups, as well as by the Catholic Church and universities. The Bolivian miners' radio stations, for example, which first started in the 1940s, were owned collectively by the miners themselves, who pledged a portion of their monthly salaries towards the stations' running costs.

The reach of community radio stations can be considerable, though much depends on the context and the availability of other radio stations which address issues of interest and concern to targeted communities. In practice, the reach of individual community radio stations varies on a case-by-case basis and is dependent on several factors – including availability of stations in a given area, transmitting power, geographic terrain of the target area, etc. Excluding South Africa, in 2000, a typical sub-Saharan African population of 100,000 people had, on average, 20,000 radio receivers, or one per household. A community of 100,000 people can easily be served by a single local commercial or community radio station, broadcasting on either FM or AM.

The governments of some countries, such as South Africa, Benin and Colombia, have recognised the role of community radio and put in place supportive policy, legal and regulatory frameworks. In addition to legal recognition, these supportive frameworks include clear definition of a social purpose for community radio; reserved radio spectrum at adequate power; fair and transparent licensing procedures; affordable or free broadcast licences; and access to multiple funding facilities or a state-established community radio fund.

Future trends

The liberalisation of media markets is continuing in a period of globalisation, and the outcome of this is likely to vary from place to place. Some have argued that the concentration of ownership in commercial broadcasting is likely to deepen as a result of technological and media convergence. Others see liberalisation and new technologies leading to more diverse media ownership, content and modes of broadcasting, with community radio, television and internet broadcasting set to extend their reach and audience in coming years. Fears that the migration from analogue to digital standards and technology will negatively affect the viability of community radio stations remain largely unproven. ■

2 African Charter on Broadcasting (2001) portal.unesco.org/ci/en/ev.php-URL_ID=5628&URL_DO=DO_TOPIC&URL_SECTION=201.html

Chapter 11
BROADCASTING REGULATION

Lead author ***Peter da Costa***

In most parts of the world, broadcasting has usually been highly regulated. For several decades, and with few exceptions, it was regulated by the state. In the last two to three decades this has changed significantly, particularly with liberalisation of media ownership and content. More regulation is now exercised at arm's length by autonomous or semi-autonomous regulatory bodies.

Earlier command-and-control modes of regulation have given way to a variety of different approaches. These have ranged from total devolution of regulatory responsibility away from government agencies, through shared responsibility between government and industry (co-regulation), to self-regulation by the industry alone. Most new approaches have involved some loosening of political control, and the opening of the airwaves to allow some or more commercial broadcasting. This is often referred to as "deregulation", although it may represent a shift in regulation rather than its removal. In some countries "deregulation" has led to a loss of public service focus within broadcasting, and this in turn has led to calls from some observers for regulation to be strengthened in order to sustain public service broadcasting in the future.

The development of technological convergence has led in a number of countries to converged regulation, in which regulatory agencies and approaches for broadcasting, telecommunications and the internet are brought together into a single framework (see Chapter 16). In a number of countries[1] a common regulator has been established for these sectors, although there is considerable variation in the extent to which regulation of the different sectors overseen by this regulatory agency has been conjoined in practice. The trend towards converged regulation is continuing.

1 The US, UK, Malaysia, Singapore, South Africa and Tanzania are among countries that have a common regulatory agency for the communications sector as a whole. However, the nature of these agencies varies. Some, such as those in the UK and South Africa, have merged existing agencies which were responsible for different markets. Others, like those in Malaysia and Singapore, have been based on reconceptualising the information and communications sector.

History

Three successive waves of broadcasting policy and regulation can be identified:

- The period of state-led broadcasting
- The period of liberalisation and deregulation
- The period of new technology and convergence.

These are discussed in turn in the following sections of this chapter.

The period of state-led broadcasting

As described in previous chapters, the early tendency of policy makers in the United States and Europe was to ensure strong oversight of the fledgling broadcasting industry. This approach was based on the perception of broadcasting as a strategic service warranting special treatment – partly because of the limited number of frequencies available on the radio spectrum, partly because of its potential political significance. In some cases, the paternalistic role of the state in regulating broadcasting was also justified by governments as being necessary to ensure that broadcasting served the public interest rather than specific private interests. In the Eastern Bloc, broadcasting was tightly controlled to serve the interests of authoritarian governments.

West European regulation of broadcasting therefore initially followed a highly regulated, public service-driven model. This was, for example, the intention behind the 1949 Wireless and Telegraphy Act in the United Kingdom, which established broadcast licensing while reaffirming the monopoly status of the British Broadcasting Corporation (BBC). Although commercial television appeared in the 1950s with the birth of ITV, it was only in the early 1970s that UK-based commercial radio stations started broadcasting. As late as 1967 the Marine Broadcasting Offences Act was passed to ban offshore broadcasting by "pirate" radio stations.

In the United States, the Department of Commerce began to regulate radio in 1909, and by 1912 the government had begun to require radio operators to obtain licences. The 1927 Radio Act created a five-person Federal Radio Commission (FRC) to regulate broadcasting. In 1934 the FRC was superseded by the Federal Communications Commission (FCC), which was created by

the Communications Act with the remit to establish a "rapid, efficient, nation-wide and world-wide wire and radio communications service." Early US regulation imposed complex and detailed technical and operating rules on broadcasters, while allowing licensees the latitude to determine what constituted the public interest and local needs.

In the global South, the end of the colonial period saw newly independent states apply a view of broadcasting regulation derived in principle from the European state-led model. From the 1960s to the 1980s, in most of Africa, Asia and Latin America broadcasting remained a monopoly of the state. This was justified by governments on the grounds that broadcasting was a public service which was critical to development, the fostering of unity and the promotion of national culture and identity. Implementation of this model was, however, often more authoritarian than it had been in Europe. The responsibility for broadcasting regulation was usually located in ministries of information with the state broadcaster answerable and accountable to the minister of information and the head of state. This allowed the executive branch of government a direct say in appointments to boards, management issues and programming of content in "the national interest".

The period of liberalisation and deregulation

It is worth noting that the rationale for broadcasting regulation in the United States differed significantly from those in much of the rest of the world. Initially robust regulation of broadcasting in the United States in the 1920s and 1930s ran up against a widely held "American" value: that state regulation stifles free enterprise and free speech. Within the broadcasting sector, since its formation, the FCC has treated economic competition as preferable to behavioural regulation and argued that there is no overriding issue of national interest that demands regulation of broadcasting. There is disagreement about the impact which this has had on the ownership and diversity of broadcasting in the United States.

By contrast, Europe and the rest of the world have tended to proceed on the basis that regulation is necessary to ensure diversity, freedom of expression and democracy. During the 1980s and 1990s, this view was given added urgency by the transition from totalitarian to more democratic political systems in Eastern Europe, which enabled the very rapid growth of FM and community radio and the emergence of satellite and other pay-TV services.

This complex environment posed major challenges in broadcasting policy and regulation. Achieving both *pluralism* (many owners and operators including genuine public service broadcasters) and *diversity* (different owners and operators offering the widest possible range of content relevant to the needs and expectations of democratic citizens) required careful policy development. As the state ceded its monopoly over broadcasting, the desirability of separating policy making from regulation became increasingly clear.

In the United Kingdom, the 1990 Broadcasting Act radically recast the broadcasting landscape, mandating separate regulatory authorities for radio and television. While this streamlined the number of regulatory institutions, it only constituted a halfway house, as telecommunications remained under the regulation of a third agency. This regulatory structure was typical of the regulatory systems in most countries until the late 1990s.

The period of new technology and convergence

Regulatory arrangements for broadcasting began to change again with the advent of digitalisation, satellite broadcasting and technological convergence. Digital technologies offered the opportunity to provide and receive many more channels, promising an end to the scarcity that had underpinned previous regulation. Satellite broadcasting spelled an effective end to the nation-state as the sole arbiter of broadcasting space and brought into sharp relief the question of regulation of transnational broadcasting. Convergence between broadcasting and telecommunications – as a result of which previously distinct services could be delivered over either network, on platforms and to terminal equipment that were previously distinct – added to the complexity on the ground. All these phenomena posed new questions and raised new issues for regulation.

In Europe, the principal challenge has been one of constructing uniform regulation to cover both broadcasting and telecommunications. Since liberalisation, the regulation of telecommunications has been largely economic, focusing on eliminating anti-competitive behaviour (see Chapter 16). Broadcasting regulation, on the other hand, has traditionally focused primarily on content. The growth of subscription services has introduced a more substantial economic dimension into broadcasting, adding new relationships between producers and consumers, that suggests the need for a shift in regulation.

Some in broadcasting were concerned that the telecommunications approach would win out as a result of convergence, and that broadcasting content would not be subject to the same degree of control in converged markets – just as some in the telecommunications sector were concerned that converged regulatory approaches would lead to more political intervention in telecommunications. In the event, to date, the "public interest" argument for broadcasting regulation in Europe has been balanced against the desirability of choice, leading to different approaches being adopted to telecommunications and broadcasting even by converged regulators like the UK's Office of Communications (Ofcom).

This regulatory structure has resulted in public service broadcasters being subject to tighter regulation than subscription service broadcasters (satellite and cable), with the internet – which is much more of a telecommunications-based service – regulated even less than satellite broadcasting. Although the European Union's new regulatory framework is oriented strongly towards convergence, a differential approach has made it more difficult to manage the convergence of broadcasting and telecommunications regulation at an administrative level, and helps to explain why in countries such as the United Kingdom, the United States and South Africa converged regulators have nevertheless maintained a separation between the two sectors within their bureaucratic structures.

The European debate on regulatory convergence has taken place in the context of regional integration, in which European Union directives require member governments of the Union to legislate in line with EU policy. The current European communications regulatory framework is technology- and service-neutral, aimed at enabling any service to be delivered over any network to any platform. At national level, however, implementation can vary to meet the requirements of national markets and legislative structures.

Rationale and approaches

It is important to note the difference between broadcasting policy, legislation and regulation. Policy provides the overall framework for development of the sector, and, in industrial countries, is usually now developed by governments in ways that include consultative processes that engage the views of different stakeholders. Legislation is usually an outcome of policy discussions, and enshrines the key tenets, principles and mechanisms that are to be applied in law. Regulation is the process of implementing and enforcing the policy as established by legislation. Once established, regulators often also play a significant advisory role in developing policy and drafting legislative proposals.

Why is regulation important?

As discussed above, while economic considerations are paramount in telecommunications regulation, broadcasting regulation has been focused more on its social and cultural impact. Broadcasting has been considered by most governments at most times to be a strategic public resource (though this is less so today in industrial country markets). Its regulation has therefore been seen as critical to the development of political norms (democratic or otherwise), to the promotion and protection of cultural values, and to economic management.

UNESCO and the Commonwealth Broadcasting Association have summarised the main objectives of broadcasting regulation as follows:

- **Technical regulation:** The regulation of transmission or communications. This includes radio and digital TV spectrum licensing, monitoring and enforcement.
- **Regulation of content:** The regulation of information and knowledge transmitted over the airwaves. This includes setting of programming and editorial standards; public service broadcasting obligations; quota regulations; advertising and sponsorship; and the protection of minors.
- **Regulation of ownership and competition:** This includes regulation to ensure plurality and diversity; the application of competition policy; and the appointment of management bodies.[2]

One common basis for technical regulation has been the need to manage the allocation of the radio spectrum to broadcasters. Frequencies are limited and often scarce. For this reason, governments have traditionally viewed spectrum as a public resource and sought to place public interest obligations on broadcasters. In order to be able to use the airwaves broadcasters must secure licences, the common means of allocating frequencies on the radio and TV spectrum. Almost without exception, licences are allocated for a finite period, after which they expire. While licences are often sold, some may be allocated free – for example, to community radio and other non-commercial broadcasters. Allocation is commonly done on a first-come, first-served basis although in some cases, particularly more recently, would-be broadcasters must compete for the award of a licence. Competition for licences can be judged on a mixture of economic and content criteria.

Some have criticised this state-led approach to spectrum allocation for allegedly fostering technical and economic inefficiencies and posing obstacles to technological innovation. Two alternative approaches are currently being tried or considered in a number of countries:

- One of these is tradable spectrum rights, a market-driven approach under which licence-holders can sell their right to spectrum in a private transaction, with the spectrum subsequently being put to a different use than that originally designated. This approach is in use in a few countries, including Australia, New Zealand, Guatemala and the United States.
- Under a second possible approach, spectrum commons, spectrum is neither assigned by the government nor by the market and there are no rules limiting who can use what part of the spectrum. Instead, it

2 Eve Salomon *Guidelines for Broadcasting Regulation* (Paris: UNESCO and CBA, 2006) and Open Society Institute *Television Across Europe: Regulation, Policy and Independence* (New York: OSI, 2005)

is based on an open sharing of spectrum and users are left to avoid interference with each other. All they need to do is comply with a few established technical standards. The major driver for this approach is technological innovation, which is leading to more efficient sharing of the radio spectrum and may ultimately render scarcity obsolete and frequency cost-minimal. Different forms of spectrum commons regulation are reported to be in place in some 55 countries – usually in relation to the bands allocated to industrial, scientific and medical devices.[3]

Areas of regulatory intervention

The following paragraphs look in turn at three important areas of regulatory intervention:

- Democratic and participatory rights
- Cultural norms and consumer value
- Economic markets.

Regulation oriented towards democratic and participatory rights is underpinned by the desire for broadcasting to adhere to the freedom of expression and associated rights established by Article 19 of the Universal Declaration of Human Rights, by Article 19 of the International Covenant on Civil and Political Rights, and by regional human rights agreements. The significance of guarantees of freedom of expression is particularly strong where media, including broadcast media and public service broadcasting organisations, are concerned. Although the obligation to respect freedom of expression lies with states and not with the media *per se,* resulting obligations do apply to state-funded broadcasters and, many would argue, across the board. A number of common elements of freedom of expression and broadcasting laws have been identified.[4] They include:

- Right to reply and rules on fairness
- A stipulation that news must be impartial and accurate
- A stipulation in some countries that *all* content must be impartial
- Explicit rules preventing discrimination
- Special rules on religious broadcasting
- An independent broadcasting regulator
- Mandatory public service broadcasting.

Democratic participation and freedom of expression are not, of course, universally respected by governments, and in some countries broadcasting regulation is more concerned with maintaining the primacy of government or established views than with providing space for equitable debate or for dissent.

Where freedom of expression rights are incorporated in regulation, their application is rarely unrestricted because of the potential impact which unrestricted broadcasting can have on public order. In 1994, in Rwanda, Radio-Télévision Libre des Mille Collines was consistently used to transmit instructions to citizens of the Hutu ethnic group to kill their Tutsi neighbours, and directly contributed to the country's genocide. Cases such as this have illustrated the potential power of broadcasting and raised issues concerning the balance between the rights of the broadcaster, of society as represented by the state, of minority communities and of the individual. Hate speech of the kind represented by this example is barred in many states.

A second common objective of broadcasting regulation is to protect cultural and consumer rights. The globalisation of culture, in particular the spread of US culture through satellite television and the rebroadcast of cheap imported programming, is often cited (particularly in the global South but also in France) as a threat to national identity. This has led many governments to put in place quota systems, for example, requiring that a specified proportion of content aired must have been produced locally, and/or limiting the amount of foreign programming that can be broadcast.

Such approaches can impact on the range and choice of available services. They can stimulate pluralism in media ownership and local broadcasting content production. However, given the high cost of producing film and television programming, in many of the world's poorer countries, the state is unable to provide the financial incentives needed to stimulate local production. Restrictions on foreign content may also limit the ability of listeners and viewers to access the culture and views of others outside their own countries, including their own national diasporas.

There are a number of features of consumer protection regulation which are common to many countries. At the most general level, these include standards to protect the quality of the viewing and listening experience. The protection of minors is commonly mandated in regulation, with restrictions on violence, sexual portrayal and offensive language in place in most countries. These usually take the form of warnings, on-screen symbols, rating systems and "watersheds" (whereby programming deemed unsuitable for children can only be broadcast after a certain time of day). Such approaches are applied not just to state-owned broadcasters, but across the board.

Advertising standards are another common feature of consumer protection. In many countries, advertising is significantly constrained – for example, by the prohibition of broadcast advertising of tobacco – although the social impact of regulatory prohibition is often balanced against the need for revenue generation.

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3 Bjorn Wellenius and Isabel Neto *Managing the Radio Spectrum: Framework for Reform in Developing Countries* (Washington: World Bank, 2007)

4 Salomon *Guidelines for Broadcasting Regulation*

In much of Europe, strict rules apply to the quantity of television advertisements allowed, spacing of breaks within programmes, and scheduling of advertisements. Advertising is also strictly separated from editorial content. The intention of these regulations is to limit interference with viewing, and to ensure that the integrity and quality of editorial content are not undermined. In the United Kingdom, the advertising industry regulates itself with the aim of ensuring that advertising is not misleading, does no harm, and is not offensive. Advertisements must be honest, decent, legal and true. These criteria are policed by a self-regulatory body, the Advertising Standards Authority (ASA), which is run not by the government but by the advertising industry itself.

The third key objective of broadcasting regulation is concerned with economics. A central objective here is the need to enable the generation of income for broadcasting whilst ensuring adherence to other regulatory criteria. The imposition of limits on broadcasting, for example, while protecting the public, can have the effect of raising the cost of advertising or of reducing the revenue that can be generated by it.

In addition, regulators often act to ensure the domestic application of international trade agreements, such as the 1997 World Trade Organisation (WTO) Agreement on Basic Telecommunication Services or the EU Directive on "Television Without Frontiers" (see below). State regulation may also impose constraints on ownership of broadcasting outlets – for example, restricting the extent to which broadcasters can be owned by businesses that are based in other countries.

Regulation can be used to apply competition law, as in the telecommunications sector. Given the high barriers to entry into broadcasting, governments sometimes apply industry-specific competition provisions (rather than relying on general competition law) to prevent abuse of monopoly or near-monopoly positions. As noted above, many countries set quotas for the amount of local broadcast content, and quotas may also be imposed on the amount of independent production allowed. These are primarily aimed at supporting domestic production. Finally, as with the 1996 Broadcasting Act, which put the UK at the forefront of digital television and radio, regulation can be used to promote the development and adoption of new technology and standards.

The structure of regulation

There are many different models of regulation, which imply different degrees of autonomy and accountability. As discussed in Chapter 16 in connection with telecommunications, approaches to regulatory governance vary according to the bureaucratic and political structures of the countries in which they apply. Different models will work best in different circumstances.

In the United States the communications regulator, the FCC, is accountable to the legislature. Congress has historically voted the budgetary allocation to cover its running costs, but in recent years the FCC has also been allowed to supplement its funding from licence fees. It is made up of five commissioners (no more than three from any one political party), who are nominated by the US president and are confirmed by Congress. Critics of the Commission have commented on its relatively high cost, and alleged that it is too open to influence by lobbyists.

The current United Kingdom structure is built around a single regulatory body for broadcasting and telecommunications. Ofcom is led by a part-time chairman and board of non-executive appointees who oversee the work of its chief executive and staff in much the same way as a company board oversees a business. This is a common arrangement for quasi-governmental bodies in the UK. Ofcom is accountable to Parliament and is funded by a proportion of the licence fees it collects from telecommunications operators, broadcasters and others for allocating the use of the radio spectrum.

An example of a structure which is somewhere between the US and UK systems is that adopted in Botswana. Its National Broadcasting Board (NBB), legislated in 1998, has an executive director who reports to a board made up of eleven part-time members with five-year terms of office, who are nominated and appointed on the basis of representation of citizen interests. The legislation requires "transparency and openness" in the nominations process. The NBB has specific responsibility to regulate broadcasting content, and is separate from the national telecommunications regulatory agency.[5]

International regulation

Initially, broadcasting regulation was mainly in the hands of governments as it involved the management of broadcasting resources within national territories. Now that broadcasting has become global in some respects, international regulation has become important in addressing new and emerging issues – such as the regulation of cross-border digital satellite TV, questions of languages to be mandated, issues of affordability of access, and copyright protection in the digital age. This has put more emphasis on established divisions of responsibility between international and national bodies.

The International Telecommunication Union (ITU), originally established in 1865 as the International Telegraph Union, is the world's longest-established international regulatory body. It has some coordinating responsibilities for telecommunications networks and services, for managing spectrum at an international level, and for

5 www.bta.org.bw/nbb.htm

developing international regulations and standards spanning all electronic communications and broadcasting technologies – including radio, television, satellite communications, telephony and the internet. The ITU's Radiocommunications Sector (ITU-R) plays an important role in the allocation of frequencies and seeks to enable optimal, fair and rational use of the radio spectrum, as well as managing satellite orbit resources. While its recommendations are non-binding, they set the technical standards for spectrum use in global broadcasting and telecommunications.

Rules made under the aegis of the WTO are increasingly significant in broadcasting. The best-known of these is the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which lays down standards for many forms of intellectual property. Broadcasting is included in this agreement, which was negotiated in 1994 at the end of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT). For producers of sound recordings and broadcasting organisations, TRIPS provides protection of patented inventions and broadcast signals for twenty years, and copyright protection for a minimum of 50 years.

In 1998, the World Intellectual Property Organisation (WIPO) started discussions with a view to establishing a "Treaty on the Protection of Broadcasting Organisations". The idea of this was to take TRIPS further by prolonging the protection term to 50 years; extending coverage to broadcasting, cablecasting and webcasting; and granting new rights to those transmitting broadcast content. In particular, the draft treaty proposed to expand or grant new rights to broadcasting distributors, even if they were not the creators of the content concerned. This provoked widespread opposition, notably from developing countries. Opponents felt that the proposals could constrain the exercise of the rights held by copyright and related rights owners, restrict access to knowledge and information in the public interest, retard technological innovation and hamper competition.

In addition to global regulatory and standard-setting bodies, countries are bound as signatories to treaties and other norms developed by intergovernmental regional bodies, such as the European Union.

Future trends

In the future, as technological innovation continues, there are likely to be further efforts to reach a new model of converged regulation. Only a minority of Organisation for Economic Co-operation and Development (OECD) countries had by the time of writing (2008) placed responsibility for broadcasting with the same regulator or government department as telecommunications. Few countries have yet implemented unified legislation, leaving open questions such as whether audiovisual content offered through the internet or mobile telephones should be defined as telecommunications or as broadcasting. This indicates that there is still some way to go before regulation catches up with the range of new technologies and services that convergence has enabled. ■

Chapter 12
BROADCASTING CONTENT

Lead author ***Peter da Costa***

Broadcasting is a powerful medium, whether for the promotion of freedom of expression and cultural diversity, or as a means of exercising political control and ideological, social or cultural conformity. Its power rests in the extent of its reach, the relatively low cost of participation and the ability to transmit sound and pictures in ways that are both attractive and persuasive. The programming or content broadcast over the airwaves is therefore of substantial importance to social development. Many have argued that, as a result, it is necessary to establish clear ground rules about what can and what should not be broadcast.

History

Control over broadcasting content is associated with the exercise of power. As discussed in previous chapters, key periods in the history of broadcasting – including the two World Wars, the Cold War era and the period following decolonisation – have seen high levels of state control being exercised over broadcasting. This has usually been justified by governments as being necessary to ensure that broadcasting serves the public interest and/or promotes development.

In many cases, however, broadcasting has been used by authoritarian regimes as a means of asserting authority and/or ensuring ideological conformity. Opposition and alternative voices have generally been excluded from the airwaves in such cases. Sometimes, on the other hand, dissident groups (such as social movements in Latin America) have also used broadcasting to promote political and ideological alternatives (see below).

From Article 19 to WSIS

Disputes over the means of broadcasting have often mirrored broader international debates about freedom of expression. The following paragraphs reflect briefly on the historical development of a rights-based approach to broadcasting content by drawing attention to a selection of international declarations and statements relating to communications and development.

The principal rights-based justification for diversity and pluralism in broadcasting is derived from Article 19 of the 1948 Universal Declaration of Human Rights, which states that "everyone has the right to freedom of opinion and expression" and that "this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers." Broadcasting provides one of the principal means by which freedom of expression has been enjoyed and exercised by citizens.

In 1980, UNESCO's MacBride Commission (see Chapter 10) took the view that existing media channels were insufficiently diverse and advocated that more attention should be paid by media to human rights, peace, disarmament, development and the creation of a new communication order. The Commission called for the imbalances it perceived in flows of information to be addressed and for media content to serve all language groups. Where broadcasting content was concerned, the MacBride Report suggested that "utilisation of local radio, low-cost small-format television and video systems and other appropriate technologies would facilitate the production of programmes relevant to community development efforts, stimulate participation and provide opportunity for diversified cultural expression."[1]

In 1991, the Windhoek Declaration – prepared by a group of African journalists and later endorsed by UNESCO – called for media censorship to be declared a violation of human rights and urged media funders to encourage pluralism and independence. UNESCO's 1992 Declaration of Alma Ata (Almaty) also sought to promote independent media. In particular it addressed content issues, advocating the case to "upgrade educational broadcasting through support for distance education programmes such as English language instruction and formal and non-formal education, literacy programmes, and information programmes on AIDS, the environment, children, etc."[2] The same agency's 1994 Declaration of Santiago encouraged all states to provide constitutional guarantees for freedom of expression with specific reference to the media, while its 1996 Declaration of Sana'a also focused on the need for a pluralistic and diverse media environment.

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1 The MacBride Report also asserted that education and information should be given equal priority to entertainment, and that the concerns of children and youth, national, ethnic, religious and linguistic minorities, people living in remote areas, the elderly and people with disabilities should be reflected in media content.

2 portal.unesco.org/ci/en/ev.php-URL_ID=5349&URL_DO=DO_TOPIC&URL_SECTION=201.html

Non-governmental agencies have played a part in developing thinking about these issues. One significant document in this context is the People's Communication Charter, drawn up in 1993 by the Third World Network, based in Malaysia, the international community radio association AMARC and other groups. This sought to move the emphasis beyond formal media and address issues concerned with the generation and dissemination of content from a citizen's point of view. Asserting that everyone has the right to acquire skills and information necessary to participate fully in the public sphere, the Charter emphasised the right of all people to protect their cultural identity, and their right to a diversity of languages.

In 2001 the African Charter on Broadcasting, drawn up by a group of African media practitioners, proposed that broadcasters be required to promote and develop local content, and that states should create an environment that facilitated independent production and diversity in broadcasting. It recommended, *inter alia*, that all state broadcasters should be transformed into public service broadcasters. The Charter also urged that African governments should promote the development of African content on the internet.

These issues were raised during the World Summit on the Information Society (see Chapter 29), although in practice there was very little discussion of broadcasting at WSIS. Nevertheless, the 2003 Geneva Declaration of Principles – one of the WSIS outcome documents – asserted as follows:

> The creation, dissemination and preservation of content in diverse languages and formats must be accorded high priority in building an inclusive Information Society, paying particular attention to the diversity of supply of creative work and due recognition of the rights of authors and artists. It is essential to promote the production of and accessibility to all content – educational, scientific, cultural or recreational – in diverse languages and formats. The development of local content suited to domestic or regional needs will encourage social and economic development and will stimulate participation of all stakeholders, including people living in rural, remote and marginal areas.[3]

Ownership and content in broadcasting

Recent years have seen extensive liberalisation of broadcasting ownership in many countries. This has resulted in a relaxation of state control and the introduction of many new media outlets – local, national and international – owned or managed by private sector businesses and by non-governmental organisations. Ownership issues are discussed further in Chapter 10.

Although widespread, this development has not been uncontentious. Opponents of the liberalisation of broadcasting ownership have argued that commercial and non-commercial owners of broadcasting stations may use their media outlets to further vested interests, whether commercial or political. Attention has been drawn, for example, to the proliferation of radio and television channels owned by religious interests around the world; to the perceived bias of some television news networks in the United States and Italy; and to the combined impact of broadcasting and newspaper ownership.

Some have argued that the commercialisation of media focuses on citizens as consumers rather than participants in society. Proponents of this view have argued that only the state – and specifically a democratic and accountable state – can prevent ownership of the airwaves from being exploited by vested interests. The high degree of media concentration at a global level, described in Chapter 10, is also cited in support of this view.

On the other hand, others emphasise that the relationship between ownership and control is indirect, and that it is clearly possible for radio and television networks, large and small, which are owned by individuals, non-profit organisations or commercial enterprises to broadcast content that is balanced, fair, accurate and rich in educational and other public interest content – just as it is possible for governments to do the opposite.

Much in this context depends on the rationale, scope and impact of regulation in specific contexts. As described in Chapter 11, content regulation is an important component in most, if not all, models of broadcasting regulation. Advertising plays an important part in this debate: on the one hand, owners of broadcasting stations need to maximise revenue and so attract advertising to their stations; on the other, they are aware that unwelcome or inappropriate advertising can deter listeners and viewers, especially in a more competitive environment.

Preaching hate

Whatever legal steps are taken to ensure that broadcasting content is politically and morally neutral, recent history has illustrated the potential for broadcasting stations to promote ideology and socially disruptive behaviour. Hate radio has been seen at different times in a number of countries, including Nazi Germany, the Democratic Republic of Congo and Burundi. Inflammatory broadcasts played an important part in provoking the wars in the Balkans in the 1990s.

The most prominent example of broadcasting being used for harm is the case of Rwanda during the genocide of 1994. The Rwandan broadcaster Radio-Télévision Libre des Mille Collines (RTLM) – established in 1993 as an independent station but allowed to make

3 Geneva Declaration of Principles, Article 53 www.itu.int/wsis/docs/geneva/official/dop.html

use of government radio facilities – was closely associated with militias and politicians pushing for members of the minority Tutsi community to be expelled or killed. In its presentation and format, RTLM resembled and is said to have modelled itself after Western-style radio talk shows, complete with audience participation, phone-ins, jokes and popular music. The content of its broadcasts consisted largely of unstructured commentaries on various subjects, usually in the form of dialogues, and relied on lengthy interviews with guests to fill airtime. From denouncing members of the opposition as "traitors" and associating them with the Tutsi-led RPF rebellion, RTLM moved on to target individuals and communities during the genocide, even encouraging listeners to phone in with details of people for the security forces to attack.

This experience in Rwanda has reinforced calls for extremist or "hate" media to be banned. The issue is a difficult one for content regulators – partly because it can be difficult to define what is "hate speech", and partly because of the fear that prohibition may encourage rather than discourage extremist hostility. Some commentators on the experience in Rwanda have suggested that RTML may have had the impact it had because of the absence of alternatives. Moderate newspapers and broadcasters had been systematically marginalised in the run-up to the genocide, giving extremist media a larger market share. If this is so, then ensuring pluralism and diversity may be the best way to reduce the potentially inflammatory nature of broadcasting – something that regulators may be able to achieve through the licensing regime.

Major issues

Broadcasting and development

In all societies, entertainment has been a principal, and probably the principal, driver of broadcasting use. Access to music, drama, sport and other forms of entertainment is greatly increased by broadcasting and this is highly valued by consumers. Broadcasting stations that have been primarily didactic – in particular, those that have emphasised a government or establishment point of view or sought to guide behaviour – have generally been less successful than those which have also understood the public demand for entertainment.

Nevertheless, many broadcasters have felt a responsibility – especially in the monopoly era – to promote the "public good", for example, by improving people's ability to maximise their earnings, to maintain health, to understand society or to enjoy wider diversity of culture. In the United Kingdom, this approach was strongly associated with the BBC's first director-general John Reith, who has been seen by some as the epitome of responsible public service broadcasting, by others as paternalistic and unresponsive to consumer demand.

This debate is current today in relation to broadcasting and development. At least 75% of the world's population is within easy reach of radio, and broadcasting can therefore reach throughout society, including into vulnerable and marginalised communities, in ways that other media including newspapers and the internet cannot reach. Proponents of broadcasting as a tool for development argue that it can and should be harnessed to promote better health, provide early warning of environmental and natural disasters, make important government information more widely accessible, enable learning by children without access to regular schooling, create employment, and equip farmers with information that will enable them to improve their productivity and income.

Content for children is another issue that has received significant attention. The 1993 People's Communication Charter emphasised the right of children to high quality cultural and entertainment materials created especially for them. This is an area that has seen major growth over the years, aided by the work of child-focused charities and international organisations. The participation of young people in developing broadcasting content aimed towards them is a significant methodology used in radio and television dramas. Plan International, for example, has pioneered child media in West Africa, working with children to produce a range of radio programmes that address issues of children's rights and seek to influence society in ways that give children greater opportunity to exercise their rights. In Uganda, the Straight Talk Foundation (STF) uses behaviour change methodologies to develop and broadcast radio programmes in several local languages, aimed at reducing the spread of HIV. STF evaluations report high impact of its radio dramas on behaviour change among young and adolescent Ugandans.

"Soul Buddyz" is another well-known example, a multimedia "edutainment" programme aimed at South African children aged between eight and twelve. Based on a successful project targeting adults, Soul Buddyz was developed by the Soul City Institute for Health and Development Communication. It uses a participatory approach involving child rights NGOs, children themselves and the educational arm of the national broadcaster, SABC Educational Television. It includes a 26-part television drama, a 26-part radio drama in three different languages, and a life skills book distributed to one million twelve-year-olds. An advocacy campaign accompanying the programmes has targeted children's rights and the work of NGOs and government policy makers. In 2002, an evaluation study found that 67% of targeted South African children who were interviewed had accessed Soul Buddyz.[4] Those who did so showed increased

4 Susan Goldstein et al. *The treatment of AIDS in "Soul Buddyz": A Multimedia Campaign for Children's Health in South Africa* (Johannesburg: Soul City Institute, 2003) www.soulcity.org.za/publications/papers-1/3sb-arvind.pdf/view

knowledge, changed attitudes and more ability to discuss issues than those who did not. The evaluation suggested that the campaign had also improved parents' willingness to interact with their children about difficult issues such as sex, AIDS and gender.

Costs and returns

Not all broadcasting content is freely accessible. Pay-per-view satellite and cable television, for example, require specific payment by users, either on a subscription or a one-off basis. Technological convergence enables more sophisticated "narrowcasting" – or the delivery of broadcast material to specific users or user groups. The internet also provides a delivery mechanism for broadcast content, either in real time or as an alternative to time-shift recording. The BBC's iPlayer has been particularly successful as a means of time-shift viewing in the UK since its introduction in 2008. All of these developments are leading to new models of broadcast delivery, either free or on a commercial basis.

Broadcasting content – in particular film and television programming – is costly to produce. Large media conglomerates are able to distribute their paid-for content widely and put in place the technologies which can reduce unauthorised access or piracy (although media piracy is commonplace in many countries). Because large producers and distributors benefit from economies of scale, they are able to disseminate programming such as soap operas and "reality shows" relatively cheaply. This is attractive to many poorly capitalised developing country broadcasters, and some believe that the availability of such material undermines the production of more local content.

However, a number of innovations are encouraging and stimulating the production of local content in different countries. One approach is regional sharing of broadcast materials, whereby a broadcaster rebroadcasts content produced in a different country within the same geographic region. The widespread rebroadcast of dramas produced in "Nollywood" – the video industry in Nigeria – provides one example of this trend. Nollywood produces video soaps and dramas in high volume, at low cost and with generally low production values. These are either purchased at low cost for rebroadcast or pirated for illegal sale on DVD. While viewers may not be from the same country, they can identify with many of the issues raised in the dramas. Consequently, Nigeria has become a market leader in the field, in Africa and in diaspora African communities in the global North.

Stipulations by national regulators that a certain proportion of content aired must originate locally may encourage local production, but have limitations because production resources are hard to come by and few governments are in a position to invest in local content production themselves. Government-led production also raises issues about the autonomy of content and the risk of propaganda. However, with an appropriate regulatory environment in place, broadcasting content can generate significant revenue for producers. In South Africa, for example, the creative industries account for as much as 3% of GDP, while shooting commercials for foreign clients alone brings about USD 40 million a year into the economy.

Advertising

The scale and content of advertising are contentious in many countries. As discussed in Chapter 11, advertising standards are an important issue in consumer protection, and in most countries some form of restrictions on advertising are in place. In 2004, for example, the Council of Europe's Independent Television Commission included, as part of its definition of public service broadcasting, a limitation of advertising to a maximum of seven minutes per hour across the day. Other advertising limits include constraints on the advertising of certain products (such as tobacco and alcohol), including constraints on the timing of their broadcast and on the way in which these products are presented. (In the UK, for example, advertisers are required not to associate alcohol consumption with sexual success.) Such measures can be implemented by either self-regulation or formal regulation by the state.

Languages and diversity

The language(s) in which content is broadcast obviously impact on the reach of content across national societies. Radio content is relatively cheap to produce, making it possible to broadcast radio to different language groups in a given country or region much more cheaply than television.

Kiswahili is Africa's most widely used language, understood and spoken by as many as 60 to 70 million people from the Indian Ocean to East and Central Africa. This provides a huge audience for transnational broadcasters such as the BBC World Service and Voice of America, which maintain active Kiswahili language services, as well as for local radio stations.

In more remote areas, local/minority language services are often broadcast by commercial and community stations. An important added value of community radio is that it enables broadcasting in different languages to a range of cultures, both within and across national boundaries. In Dakar, Senegal, for example, Radio Ndef Leng is the main radio station serving the Sérère-speaking community, yet it broadcasts in fourteen languages. In Nepal, during the constitutional reform process in the mid-2000s, community radio stations read the

constitution to listeners in more than twenty local languages. For many in more marginal rural communities, local language broadcasting along these lines is the principal source of information about the world outside their own communities, and the way in which content is presented can therefore have a significant impact on perceptions and behaviour.

Interactivity and governance

In the past, the flow of broadcast content has been essentially one-directional – from the radio or television station to its audience. However, over time, innovations in telecommunications and broadcasting technologies have made it possible to introduce some level of interactivity, for example, by enabling audience members to phone in and comment on, or participate in, live programmes. Audience participation programmes of this kind are now common, especially on FM radio, and contribute significantly to programming content and to the development of ideas and attitudes within society. This movement from a one-dimensional model to a more interactive model has changed how content is generated, disseminated and impacts on society. Its implications are complex. On the one hand, it enables much greater participation by individuals who are keen to disseminate their ideas or have a voice in public debate. However, it also raises challenges for broadcasters, particularly where the verification of content and the balance of ideas and participation are concerned.

Some development agencies are now making active use of broadcasting as a means of influencing social change, including the articulation of the voices of marginalised communities. This approach is strongly championed by AMARC, the World Association of Community Radio Broadcasters. ■

Section 4

Telecommunications

Chapter 13
TELECOMMUNICATIONS NETWORKS

Lead author ***Mike Jensen***

The central value of telecommunications networks lies in their ability to link people and locations with one another, at a distance, in ways which allow them to interact. This distinguishes them from broadcasting networks, which have little or no interactivity.

This chapter looks, from a technical perspective, at the ways in which telecommunications networks are deployed. Policy and regulatory issues concerned with network deployment are considered in Chapters 15 and 16. More technical aspects of telecommunications technology can be found in Chapter 14.

Introduction

Telecommunications networks make use of a number of different physical transmission media that are joined together by the "switches" that interconnect them at different points. Transmission networks are sometimes called "pipes", illustrating the importance of capacity in determining how much information can be delivered through them.

Broadcasting networks have traditionally been built as separate cable or radio communications systems from those used for two-way telecommunications traffic. There is an important difference between broadcasting and telecommunications networks. In broadcasting, information normally only travels in one direction (at least, until recent developments in digital broadcasting), whereas the transmission of data in telecommunications is bi-directional or interactive. Similarly, data transmission – including the internet – has until recently been implemented separately from voice telephony.

However, recent technological advances – underpinned by the increasingly universal adoption of internet networking protocols (IP) for communications traffic – have led to these historically separate networks converging. Usually known as next generation networks (NGN), new IP-based networks are able to provide users with what is known as "triple play" – i.e. the supply of telephony, internet and radio/television over a single broadband connection. This combination also allows for much simplified operations, greater economies of scale and consequent lowering of costs. While the development of broadband and triple play service offerings is, at present, only significant in industrial countries, both are being deployed in developing countries and may represent the likely future direction for communications networks in general.

This convergence in transmission (as well as in equipment), coupled with ever-increasing demands for higher transmission speeds (or "bandwidth"), is leading to much greater use of fibre optic cables as transmission media. Fibre optic cables transmit information in the form of light. They are the medium which is presently best able to carry the vast quantities of data that are required in telecommunications. Most industrial countries are therefore experiencing the replacement of copper and microwave radio links by optic fibre. Even at the end-user level, fibre-to-the-home (FTTH) is being deployed in some densely populated areas.

The most technologically advanced environments are therefore seeing the emergence of some homogeneous networks consisting of an "all-fibre" infrastructure. Because of the very high capacities and relatively low costs of operating this infrastructure, the marginal cost of making voice calls over these networks tends towards zero. They are therefore increasingly being made available to end-users for a small flat monthly fee which covers a basket of telephony, internet and broadcast services.

However, it will be decades, if ever, before widespread use of fibre is available to all customers, especially in developing countries – and future deployment will also be affected by the changing capabilities of various (including wireless) technologies. Most network operators will, in the short and medium terms, continue to operate networks consisting of a diverse range of existing technologies, some of which even date back to the early 20th century when the first national networks began to be established.

Types of network

Communications services, up to the era of convergence, have generally been provided by five separate and virtually independent types of network:

- **Fixed voice/telephony:** Most of the world's telephone traffic is still carried by a mix of copper cables and terrestrial microwave radio and satellite links that were designed to carry two-way real-time audio traffic. Fibre optics have now replaced microwave technology at the core of these networks in most industrialised countries (the national and international "backbones" which carry traffic along trunk routes), while data/internet traffic is accommodated on the same infrastructure by using additional circuits of a kind originally designed for voice.

- **Mobile voice/telephony:** Mobile networks require separate infrastructure to that for fixed networks, although there is some convergence between the two. Those which are increasingly deployed around the world are based on various types of cellular technology, in which calls are handed on from one local "cell" to another within the transmission network. Mobile networks have usually been established by different operators from those responsible for fixed telephony within particular countries, although many fixed operators also carry mobile operator traffic over their national backbones. Increasingly, traditionally fixed-line operators are also providing mobile services, usually through separate businesses, including systems that automatically switch between the fixed network when at the customer premises and the mobile network when elsewhere. Some "fixed wireless" networks, which make use of cordless technology, are blurring the boundaries between fixed and mobile networks so far as customers and regulators are concerned.
- **Broadcast radio:** As they require relatively low bandwidth, low-quality audio signals and narrowband data can be transmitted over distances of thousands of kilometres using the lower frequencies of the radio spectrum. Higher quality audio is possible over shorter distances, leading to the emergence of radio broadcasting stations (with a variety of differently sized geographic footprints) which use networks of radio transmitters that may be linked by microwave radio or cable. Reduced costs and increasing demand for higher quality radio broadcasting are also leading to the use of satellite radio broadcasting systems such as WorldSpace and Sirius.
- **Broadcast television:** Apart from a small but significant number of coaxial cable television broadcasting systems (usually confined to major urban areas), most TV networks are set up in the same way as radio broadcasting networks but use a different range of radio frequencies. Due to the higher bandwidth requirements of video, TV broadcasts cover a shorter distance, leading to the extensive use of satellite networks for covering large areas with TV signals.
- **Data/internet:** The bulk of the world's data and internet traffic is still carried by fixed and mobile networks which were designed for voice. However, at the edges of the network, in connections to the end-user, many new telecommunications networks are being deployed that provide converged voice and data services through copper cable, optic fibre and radio technologies. There are also technologies that provide dedicated mobile or fixed internet broadband services, such as 3G, Wi-Fi, WiMAX and VSAT.

Factors influencing network deployment

Three key factors in particular influence the mix of telecommunications networks which is in use in particular environments:

- **The age of the network:** During the 20th century, industrial countries sank billions of dollars into copper cable-based infrastructure, most of which is able to serve customers adequately with fixed broadband as well as voice services. Younger networks, especially those in developing countries, are less likely to use copper due to the advantages of modern fibre and radio technologies, combined with the lack of earlier deployment of copper networks. New networks in major urban areas (in both industrial and developing countries) are also most likely to use fibre or radio rather than copper cable.
- **Population density:** Radio technologies, including satellite, are particularly suited to connecting areas of low population density, especially for broadband. Even where copper infrastructure exists in more remote areas it is unable to provide high speeds when the distance from the "switch" (or telephone exchange) is more than about four kilometres.
- **Mobility:** Cables are obviously inappropriate where mobility is required and so radio technologies are the primary delivery mechanism for mobile services. At one time, mobile telephony was mainly provided by expensive satellite services and "walkie-talkie" systems, in which conversations could take place as long as only one person spoke at a time. The advent of much more advanced mobile networks in the late 1980s has revolutionised telecommunications markets, leading to the situation today in which these provide the majority of voice services to individuals. Although there are still millions of people without access to either fixed or mobile infrastructure, mobile networks now cover the areas inhabited by most of the world's population and are continually being extended into more remote and underpopulated regions.

Movement towards IP (Internet Protocol) networks

Until the widespread adoption of computers and the internet, the basic architecture of telecommunications infrastructure had remained the same for almost a century. It is often referred to as the public switched telephone network (PSTN) or the plain old telephone service (POTS). The human interface (the telephone) was essentially a "dumb" device and "intelligence" (i.e. decision-making capacity) was located at the core of the network, where all decisions about call routing, call quality and additional services were made by the telephone exchanges ("switches") and computers installed by national operators.

While this is still the case for much of the telephone network that is in place today, there is now a steady move away from the PSTN toward the use of Internet Protocol (IP) as the basic platform for telecommunications traffic. IP networks break up data (including audio information such as voice traffic) into small "packets" which are transmitted separately and reassembled at the receiving end of a communication between two parties. They are described further in Chapter 18.

This process of technological transition is, in effect, steadily turning the network inside out. Instead of intelligence being located at the core, new networks and devices enable the intelligence in IP networks to be located largely at their edges – in the computers and digital handsets that are attached to them – so giving end-users much more control over the services that they receive. Users' terminal devices can now provide a multiplicity of services and service levels, each determined by the choices between applications and settings made by the individual end-user. Instead of a single audio channel of globally uniform capacity being allocated to each customer for voice and dial-up data calls, for example, people can now make use of a wide range of speeds and service levels. These can vary from a few bits per second for reading email, to gigabits per second for acquiring scientific information such as high-energy physics research data.

In this respect, voice telephony is ceasing to be the primary use of the network, at least in industrial countries, and networks are evolving towards a situation in which voice is just one of many services delivered through the internet pipe, be it fixed or mobile.[1] This development has combined with a range of other factors to make it no longer so necessary as before to cross-subsidise infrastructure deployment in "unprofitable" areas (i.e. areas that are poorly served because of low population density, remote location and/or income levels). Provision of multiple services through the same network and devices increases the potential return on investment. The multi-functional nature of today's internet connections is therefore enabling more rapid diffusion of telecommunications networks and facilitating their extension into more remote areas.

These developments are supported by:

The rapidly falling cost of digital equipment

- The much lower human resource requirements of operating digital networks
- Advances in the capabilities of new wireless broadband systems such as Wi-Fi and WiMAX (see Chapter 14)
- The fact that end-users pay for the cost of devices that they choose to connect to the network.

Falling costs and higher traffic volumes, enabled by digitalisation, have already facilitated the great expansion of mobile phone networks for audio calls throughout the world – and voice telephony remains by far the most important use of telecommunications networks in developing countries. However, at the time of writing (early 2008), the industry was already seeing the additional deployment of broadband services and much more development along these lines can be expected in both fixed and mobile networks. Where fixed networks are not deployed, industry professionals increasingly expect wireless networks – mobile and "fixed wireless" networks – to provide the infrastructure for broadband access to new consumers.

Network architecture

As well as diverse media (copper, fibre and radio: see Chapter 14), telecommunications infrastructure is made up of diverse geographical networks – including international links, national backbones, trunk routes, metropolitan hubs and end-user circuits (the last of which are often called the "local loop" or "last mile"). Back-up links[2] are also required to maximise reliability, especially for national and international backbones.

In essence, however, the telecommunications infrastructure that is deployed can be divided into two parts: the core and edges of the network.

Until quite recently all telecommunications infrastructure at a national level was – in most countries – centrally operated by a single entity, the national telecommunications operator, which was responsible for building and maintaining the network in its entirety.[3] At one time, even the telephone handset used to be owned by the operator and rented to the customer. It was up to the operator to determine how to recover costs and make a profit, balancing the revenue-split between monthly rental fees for the connection (and sometimes the equipment), and for the usage of local, national and international capacity. In the absence of competition, "incumbent" national monopoly operators could charge prices that were unrelated to costs, though perhaps subject to some control by governments. They were not under competitive pressure to charge affordable prices, to improve service quality or to extend services to less profitable or unprofitable remote and sparsely populated areas.

1 As long ago as 1999, operators in industrial countries began reporting that internet traffic was exceeding traditional voice traffic on their infrastructure.

2 Often called restoration circuits, or building redundancy into the network, this is usually implemented by building the core of the network as a series of rings, so that if any part of the network is interrupted, traffic can travel from the other direction.

3 The only common exception was satellite links, although even then, in the early days of satellite, there was only one international satellite operator, Intelsat, which was set up and owned collectively by national operators.

In the majority of countries, connection fees and local call charges were cross-subsidised by higher-margin national and (especially) international call charges. In addition, services in less profitable areas were usually cross-subsided with revenues from more profitable areas, through the averaging of prices, e.g. by charging the same for a trunk call anywhere in the country irrespective of the costs incurred by the operator in delivering that call. (This practice of averaging prices, sometimes known as "postalisation", is widespread in the supply of other networked services such as water and power.)

It is generally agreed that this industry structure resulted in higher costs than necessary for users in some areas such as international calls (but low costs in others, such as line connection),[4] poor service and lack of network access in many areas. This situation has changed dramatically, both for businesses involved in telecommunications provision and for end-users, since the introduction of competition in fixed lines and the emergence of wireless mobile operators. Competitive pressure has forced charges (tariffs) down so that they more closely reflect the cost of providing the service, a process known as "rebalancing". The business model for mobile network deployment has also meant that the end-user now (at least in part) usually finances the cost of the equipment (the handset) that is attached to the network.[5]

In today's environment, the infrastructure that an operator may choose to own or operate varies widely. The following are some of the issues that arise in this context.

- While even the most traditional incumbent PSTN operators are unlikely now to require subscribers to use equipment sourced from them, they are still likely to own the local loop, the upstream (backhaul) links, the national backbone, local satellite ground stations and even the international fibre link, or a share in a consortium providing international fibre connectivity.[6]
- In a liberalised environment there may be other operators with similar scope in infrastructure ownership. There are also likely to be other operators who only own small parts of the networks that they use, buying capacity from other operators and infrastructure providers. This can include mobile virtual network operators (MVNOs), i.e. operators that do not own any infrastructure themselves but simply resell the capacity of another operator, using their own brand name and marketing.
- Other models of infrastructure supply include regional operators that provide services in specific geographic areas within a country; and backbone infrastructure providers that only sell wholesale capacity to retail operators while having no retail business of their own. Owners of other utility infrastructure, such as power networks, are often well placed to act as wholesale infrastructure providers in this way.
- A regulatory practice known as "local loop unbundling" is now having an impact on the structure of the telecommunications infrastructure market. To reduce the market dominance of incumbent monopoly operators, especially in industrial countries, many regulators have required them to allow new market entrants and/or other operators equal access rights to the local loop, i.e. the final connection between their network and the end-user. By "co-locating" backhaul infrastructure in the local exchange cabinets of the incumbent operator, this allows competing operators, in effect, to "take over" the end-user's line (at a pre-set fee paid to the incumbent) and to sell services directly to consumers.

Network revenues

The revenues generated from connection and usage charges to end-users have to cover the following costs incurred by a typical telecommunications operator (as well as allowing a profit margin for distribution to owners/shareholders):

- Deployment and operational costs incurred in operating its own infrastructure. These include the capital costs of building the network, and interest on any loans incurred in obtaining the necessary capital; providing it with sufficient electric power; the labour and material costs of managing, maintaining and marketing the network; the cost of supporting end-users and of recovering the fees charged to them; and any other operating costs (such as construction or rental of premises).
- Interconnection costs. These are the costs incurred by an operator in making use of telecommunications infrastructure that is owned by another enterprise (a competitor or a wholesale infrastructure provider).

4 It should be noted that, in areas of low teledensity, subsidised line connection did not – as is sometimes suggested – benefit the poor, since very few of the poor could afford a telephone at home. In practice, it subsidised line connections to businesses, government departments and the rich, and so acted more as a redistribution of costs within their use of telephony.

5 In some countries, handsets are effectively cross-subsidised by operators who bundle together packages of handset and service provision.

6 Aside from links between operators in neighbouring countries, most international fibre optic infrastructure is either provided by consortia of telecommunications operators and other investors, or in some cases by a single specialist international fibre infrastructure operator. Most countries in the world now have international fibre connections, although the African region is notably underserved. However, even if a country does have an international fibre connection, this may not be sufficient to meet current demand, especially if it was designed in the pre-internet era when demand for bandwidth was much lower. The availability of only one international link also provides insufficient reliability for the always-on requirements of today's information-based applications – and is likely to result in monopoly prices being charged down the supply chain.

This cost is balanced against the revenue generated from providing interconnection to other operators. Interconnection payments are sufficient to make telecommunications companies each others' major customers in most telecoms environments.

- Investment in network improvement, upgrades and extension. In practice many monopoly national operators in developing countries passed on most of their profits to the national governments which owned them. This – combined with inefficiencies and in some cases with maladministration - tended to reduce the level of actual reinvestment, resulting in small, congested, unreliable and expensive networks. With the privatisation of many incumbent operators, combined with liberalisation of existing market segments and the introduction of competition in new market segments, new finance has reinvigorated the sector and substantial network improvements are taking place in most countries.

Before liberalisation, interconnection arrangements (the second point above) mainly consisted of bilateral agreements on how to split revenues, which were negotiated between international operators. With the emergence of competition in the international sector and the move towards internet-based carriage, this practice – known as the international accounting rate system – has gradually fallen away.[7] At both international and national levels, it is being replaced by peering arrangements between internet providers of the same size which agree to carry each other's traffic at no cost.

However, the model of the international accounting rate lives on within national borders where the interconnection fees which mobile network operators charge one another for terminating traffic generated from their competitors' networks constitute a major proportion of their revenues and profits. This has led to operators resisting downward pressure on the pricing of mobile networks for the end-user – an outcome that is particularly evident to end-users through the high international roaming charges that many GSM operators levy on users from out-of-country networks.

In the traditional fixed national network, the "last mile" or "local loop" is the most expensive part of the network. Investment in infrastructure for low-income, remote and sparsely populated areas has been difficult for operators to justify on economic grounds, or has at least required cross-subsidy.

More recently, however, a combination of industry restructuring, especially liberalisation, and technical changes, including the relocation of intelligence to the edge of the network, have led to new paradigms in telecommunications infrastructure development. In particular, with the use of IP networks, routing no longer needs to be centrally managed, and anyone can set up an upstream link to the backbone which can independently provide end-to-end services to anyone else that is so connected. This, combined with the radical changes in other factors of network deployment described above, has fundamentally changed the economic dynamics and emphasis of network development. It has even enabled some local communities to work together to build local wireless or fibre infrastructure, and share the cost of satellite links if there is no terrestrial backbone nearby. A number of municipalities are also building their own metropolitan networks, using either fibre or wireless infrastructure.

Some commentators refer to this type of innovation as a transition from thinking of the local loop as the "last mile" to thinking of it as the "first mile". It coincides with a wider trend in communications policy and regulation to reconsider the role of different actors in the supply chain – including the end-user as well as traditional and non-traditional infrastructure providers (national and international, fixed and mobile). Alternative infrastructure operators such as rail, gas and electricity networks now also own and lease out fibre optic backbones.

So far, regulatory attention to network infrastructure has focused particularly on the introduction of competition and on limiting the market dominance of the incumbent operator.[8] However, with increasing demand for greater bandwidth, and the consequent need for more fibre optic infrastructure, new models of service provision have emerged which tend to separate the operation of the underlying physical infrastructure from the services which run over them. Usually called "open access" principles, at the simplest level, these can just mean providing all telecommunications operators with equal access to municipal ducts in which to lay their cables. However, more sophisticated interpretations of open access are also being adopted by some regulators, based on the understanding that in most situations a single pair of optic fibres has more than enough capacity to meet the needs of the people around it, so there is no infrastructural requirement for multiple fibres to be laid. Some national and local governments are therefore establishing or planning to establish their own fibre infrastructure – either to generate revenue or with the aim of leasing capacity to service providers on a non-profit basis. Where this happens, it raises complex and contentious issues of competition policy, network efficiency and government control of communications resources.

7 The use of the international accounting rate system also led to anomalous practices such as "refile", by which a national network would route traffic destined for another country via a third country with which it had more favourable accounting rates.

8 This has generally been a bigger problem for industrial than developing countries, because of their very large sunk investment in existing infrastructure, and close to 100% market penetration. See Chapter 16.

The growth of wireless services

Until recently the radio spectrum was primarily used for broadcasting radio and television. However, following the development of public mobile networks in the 1980s, the variety of wireless technologies available has expanded dramatically. Some of these technologies are described in Chapter 14.

Wireless networks are of particular importance in developing countries. In most industrial countries, the majority of people live in densely populated towns and cities, while rural areas are relatively thinly populated. Cable networks are generally more suited to high concentrations of use in densely populated locations, and have reached almost 100% of households in urban areas. However, in developing countries, the situation is often reversed – with 70% or more of the population located in rural areas where people are spread relatively thinly over the landscape. This makes cabling much more expensive and, when lower usage of the lines in these economically less developed areas is taken into account, investment in cable often cannot be justified on economic grounds. Furthermore, unused radio spectrum tends to be much more abundant in developing countries, particularly in rural areas.

For fixed telecom operators, infrastructure investments in the local loop represent a very large percentage of their costs. This is due to the extensive and labour-intensive civil engineering work involved in building cable networks, not to mention the time required to reach "right-of-way" agreements with landholders. By contrast, wireless capacity can be quickly deployed over many hundreds of square kilometres, simply by erecting a single base station in a strategic location, which is then shared efficiently by the users as they need it. It is also unnecessary to know in advance the location and numbers of all the potential subscribers – and, as demand grows, it is easy to add more capacity to existing base stations and/or add more base stations as required. The average cost of installing a new fixed network line is thereby falling from about USD 2,000 for traditional copper cable systems, to USD 200 or less for wireless services.

For these reasons, wireless systems have become the most viable options for rolling out new "local loop" networks in developing countries – and even industrial countries are seeing increased deployment of them due to the speed with which ubiquitous coverage can be provided at low initial cost.

The added benefits of mobility that wireless systems provide have already been underlined by the explosive growth in the number of mobile cellular telephone users. Aside from the personal advantages provided by mobile connectivity, mobility also allows increased sharing of scarce resources, such as phone lines and internet connections, which is particularly useful in developing countries. More advanced services can also be provided as internet access becomes more available on personal digital assistants (PDAs) or handheld devices (which in turn are converging with mobile phones),[9] through laptops, and on the next generation of mobile phones themselves.

As further deregulation of the telecom sector occurs, it is therefore expected that increasing numbers of new operators will emerge to provide low-cost broadband, fixed and mobile wireless connectivity services. With the rapid roll-out times of wireless systems, they are also able to enter new markets far more quickly than traditional systems that are reliant on cables.

Most industry observers now expect broadband services to reach the majority of people in developing countries through wireless rather than fixed networks. This is partly a matter of technology, and partly of user experience. By the end of 2007, for example, mobile telephone teledensity had reached around 80% in South Africa while broadband teledensity was well below 1%. In such circumstances, the majority of South Africans are likely to experience significant internet use for the first time through wireless rather than fixed devices, and this is likely in turn to influence both the deployment of services by businesses and their use by consumers.

However, wireless broadband connections do not necessarily provide a comprehensive replacement for wired networks, especially in the early stages of transition from wired to wireless systems. Aside from the additional customer equipment which can make wireless systems more costly, they may require more skilled technicians to install them, and can require more network planning for radio spectrum allocation to allow the wide range of wireless technologies to be deployed. Where there are already dense copper cable networks, new digital subscriber loop (DSL) encoding techniques can bring higher bandwidth connection (more than 20 MBps) to subscribers more cost-effectively than an entirely new broadband wireless network. Nevertheless, the final architecture of future networks will continue to evolve as new technologies continue to emerge.

Managing bandwidth

Bandwidth refers to the capacity of communications channels, i.e. to the amount of data that can be transmitted within a given period of time, usually measured in the number of digital bits (the digits 0 and 1, into which information is encoded) that can be transmitted per second. Typical bandwidth requirements for different online services are illustrated in Table 13.1. Demand for bandwidth is changing rapidly as a result of rising user expectations, especially for transmission speeds, the

9 Multi-protocol handheld devices were on the market by 2008, which simultaneously supported GSM, Wi-Fi, Bluetooth, Infrared and FM radio transmission.

Table 13.1: **Bandwidth requirements**

Application	Speed required (bytes per second/Bps)	Typical capacity used
3-minute voice call on a fixed network	4-8 KBps (channels are often split)	720-1,440 KB
3-minute GSM voice call	2 KBps	360 KB
3-minute VoIP call	2-16 KBps (depends on quality of connection)	360-2,880 KB
3-minute internet video call	16-96 KBps (depends on screen size, frames/second)	2,880-17,280 KB
3-minute FM quality stereo music radio channel	30-40 KBps	5,400-7,200 KB
25-page document	Variable, depending on urgency	250-2,500 KB
1 typical digital camera JPG image	Variable, depending on urgency	500-1,000 KB
Digital TV channel (PAL/NTSC)	600-800 KBps (depends on speed of action)	108,000-144,000 KB
HDTV	3-4.5 MBps	540,000-810,000 KB
3D HDTV	20-25 MBps	3,600,000-4,500,000 KB

KB=kilobyte (1,000 bytes) MB=megabyte (1,000,000 bytes) GB=gigabyte (1,000 MB).
Note: These figures are for bytes, not bits. The uppercase B is commonly used to denote bytes, which is the basic unit of digital data. Although other coding schemes are sometimes used, normally each byte of information consists of a combination of 8 bits (0 or 1) using the lower case "b", as in bits per second (bps). While the speed of most telecom links is measured in bits per second, speeds in bytes per second are quoted above as download speeds are usually displayed to the user in bytes per second. Thus a 1 Mbps broadband link would be able to transfer data at a maximum of 1,000 divided by 8, i.e. 125 KBps.

requirements of services and applications that are being made available, and the capacity of infrastructure over which they run.

At the time of writing (early 2008), the ITU defined "broadband" networks as supplying bandwidth of 256 Kbps or greater. By that time, however, in most urban centres in North America, Europe and parts of Asia, a broadband provider only offering 256 Kbps would have been unlikely to gain many customers. In many national markets in those areas, consumer broadband bandwidths of 5 to 20 Mbps were already widely advertised.

It should be noted, though, that bandwidth is poorly understood by the public, and providers often promise more than they can deliver. In particular, while there may be good bandwidth on the link between the customer and the local exchange or wireless base station, upstream bandwidth, especially on international circuits, may be much more constrained. This is especially true in those developing countries where access to international fibre cables is not yet available. The speeds experienced by consumers are therefore not necessarily those that they see advertised.

In determining the bandwidth requirements of upstream trunk and backbone links, operators are guided by averaging of demand, whereby the fluctuating demand of individual users is smoothed (upstream) by the aggregation of user activity. One user may be reading email (which has very low data requirements), while another is speaking on the telephone (small but significant two-way traffic needing good quality of service) and a third is downloading a music file (significant bandwidth in one direction but relatively insensitive to variations in bandwidth availability). At the level of the single household, bandwidth requirements will vary substantially during the course of a day, but when traffic is aggregated over many households, the upstream bandwidth requirements become more uniform – and the more users there are on the network, the smoother the traffic flow will become in the core of the network. However, even so, there are still wide variations in capacity requirements resulting from slumps and peaks caused by the start and end of business hours, and in domestic networks during early evening peak periods.

Balancing these varying traffic loads and predicting future traffic growth has always been a major challenge for telecoms infrastructure planners. It was extremely important in the past when the lack of fibre optic cable severely constrained bandwidth supply. The problem is less severe today, at least where the latest fibre optic cable systems, which can carry thousands of gigabits per second, have been deployed.

Satellite communications systems have not kept up with the growth in terrestrial bandwidth availability. Even on the latest satellites, the available bandwidth is only about 1 Gbps which would be enough to service just a few thousand users with lower-end broadband connections of 1 Mbps. Because of the high costs and risks of satellite launch, along with the limited availability of geostationary orbit slots and the lower quality of service for interactive traffic (a delay of almost a second occurs as the signal

travels the 36,000 kilometres from earth to satellite and back again), satellites are being relegated to a secondary role in the provision of two-way telecommunications infrastructure. However, until high-bandwidth terrestrial connections become universal, satellites will continue to play a role in connecting more isolated areas. Satellites also continue to have particular strengths in broadcasting services because anyone under the footprint of a satellite (which can be hundreds of millions of people) can pick up the signals that it broadcasts.

While not all high bandwidth applications are likely to be used all the time in the average household, there will be times when household members may be simultaneously using different high-bandwidth multimedia services (such as IPTV, video conferencing and online education or gaming). Such aggregate demand could require upwards of a 25 Mbps connection, even for a four-person household. That would, however, be highly exceptional. While this level of bandwidth was (at the time of writing, early 2008) beginning to be achieved in major metropolitan areas in industrial countries, it will be some time before more than a small fraction of those in developing countries have this level of access to telecommunications infrastructure, and much longer before such bandwidth levels become generally available.

Bandwidth demand and compression

Telecommunications circuits almost always carry traffic in a compressed form to maximise effective capacity. The exception to this is in the last mile of legacy PSTN networks where the basic (dumb) handset has no ability to compress and uncompress the analogue audio information. However, even in these systems, voice traffic may be compressed for carriage across the backbone at the digital exchanges that consolidate end-user traffic. As the capacity of the link increases, then the processing power of the computers (signal processors) at each end of the link must also increase if the data is to be displayed in real time ("live"). To date, this processing power has kept up with bandwidth increases, although some extra measures are taking place at the global hubs,[10] where the latest fibre optic bandwidths available are so high that multiple processors are becoming necessary for each cable.

The effectiveness of compression techniques depends considerably on the type of data being carried, and often involves some compromises. While PC application data such as documents, numeric information and software code must arrive in the exact form in which they were transmitted, such data files are relatively small in size compared with those for audiovisual data, and often do not need to be delivered in real time. As a result they are usually compressed prior to transmission using specialised alpha-numeric algorithms such as the zone information protocol (used in the popular .zip format). Depending on the type of data sent, this can result in savings of 60-95% in capacity requirements for these types of applications. As can be seen from the table earlier in this chapter, audiovisual files are much larger in size, and often need to be transmitted live. This makes their transmission much more demanding on the underlying infrastructure and a wide variety of compression techniques (codecs) have evolved to compress different types of audiovisual data most efficiently, often in real time.

At present, the most commonly used audiovisual compression techniques for files include .jpg (images), .mp3 (audio), and .avi and .mpeg (video). Because audiovisual data received do not have to be exact replicas of the original to be useful, most of the methods used involve removing as much data, particularly repetitive data, as can be tolerated by the end-user. The best-known example of this today is in the variable quality of different television broadcasting standards (PAL, SEACM, NTSC and HDTV). Although not as compressible as visual information, audio behaves similarly, as can be seen in the .mp3 music files format. The compression settings for .mp3 files are variable, allowing users to decide between creating a high quality, high bandwidth copy, or a lower quality but more compact file (allowing more music to be stored on an .mp3 player). Most .mp3s available vary in their bit-rate between 92 Kbps and 384 Kbps, which is similar to the variation between FM radio and CD quality. The variation in online streaming services can be even greater, with some users on low-bandwidth connections opting for a 56 Kbps stream, while others are able to take advantage of a 512 Kbps stream.

Similar issues arise when comparing the higher voice quality on legacy fixed networks with mobile networks. A lower bit rate on mobile networks was necessary at the time the technology was first developed because of limitations in bandwidth availability. In a sense, as a result, the mobile networks made the public aware that the higher quality standards set for legacy fixed networks were not necessary for an acceptable conversation. This has paved the way for similar compression techniques in use on voice over Internet Protocol (VoIP) networks, where bandwidth may be even more restricted. In VoIP networks, the software used can be intelligent enough to assess bandwidth available and vary call quality accordingly – or the end-user may be able to determine the amount of bandwidth to be used.

Bandwidth symmetry

Telecommunications infrastructure deployment needs to take into account the symmetry or otherwise of bandwidth requirements in each direction – the speed *to* the

10 Such as those in Amsterdam, London, New York, San Francisco, Singapore and Tokyo.

user (download/downlink), and *from* the user to the remote destination (upload/uplink). Telephony and other two-way audio and video communications require symmetrical capacity, where there is an equal amount of bandwidth available in each direction. At the other end of the scale, one-way broadcast communication only requires capacity on the downlink to the user. Common internet applications such as web browsing and email usually require much more download capacity than upload capacity – a few mouse clicks sent upstream can result in megabytes of web page code, text, images and video being sent back to the user. On average, this type of use of the telecom infrastructure results in about ten times as much bandwidth being used on the downlink as on the uplink.[11]

In the past, telecommunications circuits were provisioned symmetrically because of their roots in telephony, where fairly equal amounts of voice conversation needed to be carried in each direction. More recently, however, to support the generally asymmetric nature of internet traffic in the "last mile", technologies such as asymmetric digital subscriber line (ADSL) have been developed. These technologies typically provide, for example, 5 Mbps incoming capacity and 1 Mbps outgoing capacity. End-user-oriented satellite communications (such as VSAT) also lend themselves to asymmetric communications because a less costly (small and low-powered) satellite antenna will be able to receive data from a satellite at higher speeds than it can send data. In future, the degree of symmetry required in telecoms infrastructure will ultimately depend on the relative usage patterns of two-way communications versus the use of one-way multimedia streaming services.

One further important aspect of bandwidth symmetry is related to the current pattern of international telecommunications traffic around the world.

Because infrastructure is much more developed in industrial countries, global hubs have evolved to which operators of international telecoms infrastructure in countries outside the global hubs must pay for connection. In the past, charges for international links were negotiated on a bilateral basis in which the operator in each country paid or charged for its side of the "half-circuit". In addition, termination fees were charged at each end for calls arriving from the remote network. As traffic tended to flow more from industrial to developing countries than vice versa, the revenues generated for developing countries from international accounting rates were often considerable.

With the move towards the internet (and VoIP) as the primary consumer of capacity, this arrangement is steadily disappearing. One consequence has been that operators in countries outside the internet's core, particularly developing countries, now often have to pay for the carriage of internet traffic which originates at both ends of the link between two countries. The economic impact of this is exacerbated because most of the internet's content and users are hosted in industrial countries, particularly the United States.[12] Many content providers in developing countries also choose to host their websites near global hubs in order to maximise coverage and minimise costs. As a result, there are few large data centres in developing countries which can drive the economies of scale in traffic necessary to peer on a basis of equality with the global hubs.

Lastly, a new dynamic to bandwidth issues is emerging. The impact of the carbon footprint caused by the increasing use of telecommunications infrastructure and the computers connected to it is contributing to climate change. It is estimated that computers alone are responsible for at least 2% of the carbon footprint and large data centres are responsible for a good proportion of this. With advances in the bandwidth capacity of fibre optic cable and with increased concern over carbon emissions, it has now been realised that it is, in effect, cheaper to "ship bits" than it is to provide electric power to the data centres. In addition, with the capacity available on optic fibre, there is no need to host data centres close to their users. As a result, some observers expect increased backbone infrastructure to consolidate closely around sources of power generation – reducing inefficiencies in power transmission and maximising economies of scale in the provision of hosting services. ■

11 In practice, even one-way streaming of audio or video over the internet uses a small amount of uplink capacity due to the nature of the communications protocols used, which require acknowledgement of the receipt of data.

12 The additional traffic generated by video on the internet, such as by YouTube, is even causing industrialised countries to increase their international capacity. Sweden is one such example.

Chapter 14
TELECOMMUNICATIONS TECHNOLOGY

Lead author ***Mike Jensen***

Introduction

Today's telecommunications services are essentially refinements of systems and principles developed in the late 19th century. Enhanced by the later development of fibre optics and powerful computers, together with continuous falls in cost and increases in speed, telecommunications have become pervasive in countries around the world and now affect most aspects of social and economic life. Personal communications have been enriched by telephony, email and instant messaging. Management, government and business have gained access to much wider knowledge and expertise. When combined with the ability to carry out transactions, telecommunications have become centrally important for consumers, government and businesses competing in the economically productive sectors of industry, agriculture and services.

In the past, different communications methods have long been used to convey information over distance and address the need for interlocutors to see and/or hear one another. Before the availability of modern technologies, techniques such as smoke signals, mirrors, horns, drums and flags were used. Naturally these methods were limited in terms of distance, speed and the amount of information that could be communicated.

A little over a century ago, increased understanding of the physics of electromagnetic radiation led to the invention of telephone, radio and television systems by researchers in North America and Europe, among the most notable of whom were Antonio Meucci, Alexander Graham Bell, Guglielmo Marconi and John Logie Baird. While the communication systems they developed were still limited in capability, they represented a tremendous advance on the signalling methods previously available, and within a few decades were being used to communicate within countries and between distant parts of the globe. Telegraph networks had global reach by the end of the 19th century. Australia received its first long distance radio message from England in 1918, and by 1928 the first transatlantic phone call was made. Following the advent of communications satellites in the 1960s, every corner of the planet could potentially be reached with communications services (although, of course, some areas still lack adequate services in practice today).

The two transmission media used in telecommunications networks are electromagnetic impulses and light. Electromagnetic impulses are carried either through conductive metal cables (usually copper) or in the air as radio waves. Light is carried either in fibre optic cables or in a few cases, over short distances, using laser beams.

There is a crucial difference between transmission by radio spectrum and by cable or laser. In radio transmission, the field of electromagnetic energy can be visualised as a cloud that spreads out in three dimensions from the antenna. It therefore dissipates much faster than energy that can be focused to travel in one dimension down a cable or in a laser beam. This is the main reason why radio has been considered to be most suitable for mobile and broadcasting transmission, while cable is considered better for transmitting at high bandwidths over fixed links.[1] This is still the case at the core of the network, where very high bandwidths are required. However, in the "local loop" (see Chapter 13), wireless technologies such as Wi-Fi and WiMAX are now also capable of providing the multi-megabit broadband links required by end-users.

How telephones work

Although telecommunications policy is quite widely discussed, knowledge of the background technical and engineering issues is often confined to those who have specific technical expertise. Understanding how the technology works, however, is particularly helpful for understanding how it can be best deployed and used. The following paragraphs describe some of the technical principles underpinning telecommunications, starting with the user's relationship with the telephone itself.

How does speaking into a telephone mouthpiece enable speech to be conveyed over a distance? The movement of air particles that is created when we speak causes small vibrations in surfaces close to the source of the noise. When a diaphragm is connected to a magnet, the vibrations caused by speech or other sounds can be converted to electrical energy as the magnet moves over a conductive metal. Once converted to electrical impulses in this way, these signals can be transmitted over long distances through cables made of conductive metal. At the receiving end, they can be heard again as

1 The term "bandwidth" refers to the amount of information that can be transferred in a given period of time, usually measured in bits (binary digits, the Os and 1s of computer data) or their multiples per second. Bandwidth is discussed in more detail in Chapter 13.

sound when the electrical pulses cause another diaphragm and magnet to move over a coil, creating vibrations in the air particles around it.

In most telephone networks the process of making a call is as follows. The caller picks up a handset, operating the switch hook which puts the telephone into active state ("off-hook") with a resistance short across the wires, causing current to flow. The telephone exchange detects the current, attaches a digit receiver, and sends dial-tone to indicate readiness. The caller dials the numbers which are now connected to a tone generator inside the dial, which generates different tones corresponding to each number. The exchange connects the calling line to the desired line and alerts that line by sending a ring signal to its phone. Many calls can be transmitted simultaneously over the same infrastructure through a process known as "multiplexing", in which each call is apportioned a small time slot on the network's frequencies.

Early telephone networks had little more to them than microphones, speakers and copper cable. The customer's handset was connected by wire to a local exchange where an operator would be requested to connect the right cables – by hand – to route the call appropriately. Later, a dialler was added which employed a system of pulses to define a numeric code for the recipient of the call and, when combined with automatic switching equipment at the local exchange, this could replace the manual operator. As well as use of copper and (later) fibre optic cable, networks of microwave radio transceivers were used to relay calls over longer distances, and then, when combined with satellite circuits, parts of the world not linked with terrestrial infrastructure could also be reached.

The signals conveying voice telephony – including first generation mobile telephony – were originally in analogue form, i.e. determined by continuous changes in the frequency and amplitude of electromagnetic waves. Since the advent of computers, these analogue signals have been replaced by binary or digital data (a stream of 0s and 1s) which, when combined with the ever-increasing processing power of digital devices to transmit and route data, allow much more information to be transmitted over cables. The move from analogue to digital technologies has laid the basis for the modern use of fibre optic cables, where the binary data are converted to pulses of light. Multiple transceivers can be employed, each tuned to a different light wavelength, further increasing the transmission capacity available.

The design of the "microphones" and "speakers" used for telephony has varied little in the century since they were invented. They are still contained in every fixed or mobile telephone and all other audio devices used to transmit and receive sound. Even in the most advanced voice-over-internet phone systems a microphone is required – the conversion of the audio signal to data packets simply happens in the "computer" of the phone, rather than further up the network.

Transmission media

The following sections describe the main transmission media and technologies in use for telecommunications today.

Cable

Two main media are used for cable communications: copper and optic fibre.

Copper is one of the most widely available conductive metals, making it possible to pass relatively large amounts of data through long lengths of cable. Until recently, it was also relatively cheap. As a result it has provided the basis for much of the world's telecommunications infrastructure. In fact, the world's largest deposit of copper is now said to be in cable ducts below the streets of Manhattan. However, recent increases in price have made it less economically sustainable to lay new copper infrastructure.

There are also practical limits to the data transmission capabilities of copper. A general rule of thumb is that, if a copper cable runs more than four to five kilometres from the exchange, it will not be cost-effective to provide broadband speeds using the digital subscriber line (DSL) technologies available today (see Chapter 13). The transmission characteristics of metal cable are determined by the diameter of the cable. In some countries where substandard cabling has been deployed, the distance from the exchange to the furthest broadband link is likely to be much shorter. Metal cables are also susceptible to lightning strikes. Finally, due to its rapidly increasing price on world markets (said to be partly the result of China's telecommunications demand), copper has become a target for theft, especially in developing countries.

These factors, together with the lower costs and increased capacity now associated with both wireless and optic fibre infrastructure, have combined to make copper cables less popular for serving the end-user. By the same token, increasing bandwidth requirements at the core of the network are resulting in the increased use of optic fibre links.

Optic fibre cables – made from glass or plastic – transmit data in the form of pulses of light. As well as offering greater bandwidth than copper cables, they suffer less data loss over distance and are less susceptible to electromagnetic interference. They have become the cable of preference for telecoms networks, particularly for high-volume trunk infrastructure, where the latest fibre technologies can now provide hundreds of terabits[2] per second on each fibre pair.

One exception to the move away from copper cables is in cable television. Coaxial cable, usually with a copper core, has long been used in large metropolitan areas to

2 A terabit equals one trillion bits.

distribute broadcast television. Such cable networks have now also become a means to provide broadband services and telephony. However, due to the nature of its topology, which was designed to carry data in only one direction, cable TV infrastructure is not as efficient as the traditional POTS ("plain old telephone service") network in delivering the high broadband speeds now required by users.

Power-line communications (PLC) is another exception to the move away from copper cables. In PLC, the electricity distribution grid is also used to carry data, making use of advanced signal processors to separate the "noisy" interference in an electrical circuit from the data that is injected into it. The US chip maker, Intel, has manufactured the "HomePlug" device for many years, for use as an alternative to wired local area networks (LANs). Such devices can work anywhere that is connected to the same substation (the step-down transformer that delivers power to each house in the neighbourhood), and this feature has been used to deliver residential broadband services. In areas where traditional cable telephony networks have not penetrated, PLC can offer an alternative to wireless infrastructure.

Wireless

There is an increasing range of wireless infrastructure options that can provide either narrowband or broadband links over short or longer distances. For most purposes, wireless telecommunications options can be divided into four functional categories:

- Terrestrial systems operating on high frequencies that can only be used over short distances, within line-of-sight, usually providing up to 54 MBps. These can be stretched to 70 kilometres or more where terrain is flat or the transmitter is at a very high location, and can be extended further with the use of repeater stations and mesh networks.
- Terrestrial systems that provide non-line-of-sight communications. In some cases these can be almost completely independent of distance or location, but broadband speeds can only realistically be provided up to 40 kilometres – at a maximum bandwidth of about 3 MBps, but usually around 512 KBps. Shorter distances, however, can now have point-to-point links of up to 100 Mbps.
- Satellite-based systems, which use line-of-sight technology but, because of the satellite's height above the earth, have a much larger coverage area than terrestrial line-of-sight facilities. Transfer rates are usually up to 155 MBps.
- There is also a range of very short distance wireless systems such as Bluetooth, which are mainly used to transfer data between devices in the same location (usually less than 100 metres).

Some wireless systems are specifically designed for data communications, while others are voice telephony applications which can also be used for data. In the same way that there is convergence between mobile cellular technologies and fixed cellular technologies for wireless local loops, there is also convergence between voice-oriented and data-oriented systems.

Aside from data rate capacity, the other important features of the different types of wireless technologies are the radio frequencies used, the efficiency of radio spectrum use, and equipment cost. Recent advances are resulting in greatly increased processing power in the base stations and in subscriber equipment (which is also now more able to overcome channel interference). In addition, the rapid growth in sales of wireless equipment is bringing about significant economies of scale and consequential falls in prices.

The main features of the various wireless technologies can be summarised as follows:

- **The range and capacity of the link (data transfer rate)***:* This is related to the radio frequencies used. Lower frequencies (HF, UHF, VHF, etc.) travel further but can carry less data than higher frequencies (microwave, ISM bands, Ku band, etc.). At one end of the scale, HF/UHF and VHF systems operating below 500 MHz can provide links of 1.2 KBps to 9.6 KBps and are used for limited long-distance voice conversations and data transfers over hundreds or even thousands of kilometres. For public mobile networks serving rural areas, new systems using frequencies in the 400-500 MHz band are being adopted, due to their greater range compared with traditional GSM networks operating in the 900 and 1800 MHz bands. In the mid-range frequencies between 2 and 5 GHz, data and voice links providing up to 54 MBps are becoming common and this area is among the most active for wireless development. At the other end of the scale 155 MBps have long been provided by terrestrial microwave systems and satellites operating in the multi-gigahertz microwave bands, and by terrestrial infrared laser systems covering 2-3 kilometres. Further speed improvements are expected with the latest advances in wireless protocols such as VSF-Spread OFDM.
- **Design of fixed links versus mobile services:** The latter have greater overheads in order to hand mobile subscriber traffic seamlessly from one cell to another, and to provide for the low power of mobile devices dependent on battery power. This in turn affects cost, with differing needs for switching, power, trunking, antennae and radio spectrum.
- **Multi-user access and expandability:** Some systems are purely designed for point-to-point links and cannot be expanded to include other connections. Others, like GSM mobile networks, are designed for operation in a multi-user hub arrangement (with cells

or base stations), which can service a number of users and hand traffic on from one cell or base station to another. In these latter cases, the available bandwidth is usually shared among the active users. As the subscriber base grows, a base station's capacity may have to be increased to ensure sufficient quality of service (depending on the bandwidth needs of the users and the overall network design).

- **Proprietary and open standards:** With such rapidly advancing technologies, proprietary protocols are still very common in wireless networks, which can make them more expensive and less flexible for the user and operator. Providers can also create "lock-in" with these systems. However, open standards have been adopted in the more mature technologies such as GSM and Wi-Fi/802.11b/g (see below). WiMAX (see below) is also expected to become more fully standardised.
- **The latency of the link:** Latency – the delay between sending and receiving a signal – has a limiting effect on interactive communications such as voice calls and real-time simulations. This can be a problem in complex multi-hop cellular networks, but is more usually caused by the use of geostationary satellites which are so far from the earth that the signal is delayed in transit by more than half a second.
- **Operational and design complexity:** Planning large networks and achieving a reliable and efficient wireless connection over distances greater than a few kilometres usually requires experienced radio technicians to design and install equipment. While a growing number of Wi-Fi systems are becoming "plug and play", especially over short distances, squeezing additional bandwidth and distance from long-distance connections can require extensive experience.
- **The amount and range of radio spectrum required:** This reflects how efficiently the finite resource of the spectrum is being used. Different radio transmission techniques are optimised for applications using specific wavelengths, and some technologies, such as CDMA, are able to provide much more bandwidth and serve many more subscribers out of a smaller portion of the radio spectrum than others, such as GSM – making them more attractive in high density situations. They can also allow more operators to co-exist on the waveband, thereby increasing competition.

The most common wireless systems in use by public network operators are:

- **Cellular-based systems consisting of a network of base stations:** These systems include the mobile phone networks which are used throughout the world. They are mainly based on the GSM standard and are highly successful at delivering voice and SMS service, but provide only limited fax/data throughput at the relatively high cost of a standard cellular call. CDMA-based networks, which provide higher data speeds and achieve more efficient use of spectrum, are now seeing growing deployment.

  GPRS (general packet radio service), sometimes called "2.5 generation mobile", is being offered on most GSM networks, and although this is useful for low bandwidth applications such as email and financial transactions, GPRS is no faster for web browsing than a dial-up modem, and latencies preclude the use of real-time services. Furthermore, some operators charge much more for GPRS data than others. EDGE services are also being rolled out on GSM networks, providing improved data rates similar to low-end DSL services.

  Some GSM operators are now upgrading their networks for third generation services, 3G/HSPDA. These can provide speeds of up to 2 MBps - below the speeds now expected from fixed networks in some industrial countries but well above those available to most existing broadband users in developing countries and sufficient for most internet applications. Many telecommunications businesses in Africa now expect mobile wireless networks, with relatively low deployment costs and increasing speed, to provide the main route to broadband access for the majority of users on the continent.

  A few older analogue systems still remain in operation, providing limited speech quality, low data capacity and poor security. Examples include NMT 450/900, AMPS, TACS and N-AMPS.
- **Cordless systems:** Although mainly used within customer premises for mobile handsets, there are also digital cellular systems which can provide low-cost, limited mobility voice services in competition with mobile phone networks. These have been deployed extensively in China and Japan, and to some extent in other developing countries. They provide efficient spectrum usage in high population densities but with limited range, low data rate capabilities (19.2-38.4 KBps) and restricted mobility. Examples of these protocols include DECT, CT2, PAS and PHS.
- **Open and proprietary fixed wireless access (FWA) systems with varying levels of standardisation:** Two major wireless standards which are much discussed today are Wi-Fi and WiMAX. The key difference between them is that WiMAX is intended for licensed spectrum in which contention among providers with different interests is eliminated, while Wi-Fi is designed to allow every party to accept interference within the legal limits.

Wireless hotspots for internet access have been rolled out in many cities, making use of the 802.11 standard, usually described as Wi-Fi. Most of these have been launched by private operators aiming at the high-margin roaming business user, but more recently some have been rolled out by the public sector, and there is a rapidly growing number of free or low-cost municipal wireless networks being established around the world.

New Wi-Fi systems called mesh networks are now on the market.[3] These have the capacity to connect automatically with their neighbours and route traffic through multiple hops in order to provide resilience and routing around obstructions. In addition, these systems only need sufficient power to reach their neighbours, thereby minimising interference problems. Their potential was being explored by the industry at time of writing (early 2008).

Most notable among the upcoming wireless systems is the WiMAX protocol, developed by Intel, which was beginning to be trialled at the time of writing (early 2008) and was expected to reach a high level of standardisation during 2009. Other proprietary voice and data systems based on OFDM, FDMA, TDMA and CDMA protocols in the 1.5-3 GHz range were also being deployed around this time. While many of these systems provide superior data services to the cordless and digital cellular standards, they have varying degrees of mobility and will be in competition with migration toward 3G by GSM networks.

In early 2009, WiMAX was expected to be the most important contender for future fixed multi-megabit broadband links, although CDMA systems, networks of 802.11/Wi-Fi hotspots and some OFDM systems had already gained many users and continued to grow their subscriber bases. It is hard to predict which of these systems will win out, while further advances in wireless networks seem likely to offer significantly better bandwidth in the future.

- **Satellite-based systems:** Satellite communications systems are essentially sophisticated radio repeaters, usually orbiting at about 36,000 kilometres above the earth where they remain stationary with respect to its surface.[4] A telecommunications satellite is equipped with a number of radio transceivers usually known as "transponders". The greater the number of transponders, the greater the bandwidth available on the satellite, which is usually between 36 MHz and 54 MHz. The orientation of different transponders on the satellite determines the "footprint" pattern on the earth in which the satellite can provide a usable service. Some transponder beams can be focused more tightly, which decreases the area of the footprint but results in reductions to the requirements for power and antenna size on the ground.

  For two-way traffic, the cost of equipment capable of transmission to the satellite has in the past put this technology beyond the reach of all but national operators and large organisations which either have sufficient volumes of traffic to justify the cost, or the need for an independent secure system (for example, embassies and the military). Recent innovations in antenna design and digital coding techniques have resulted in hub-based systems using high-powered satellites and shared "mother ground stations" to reduce the size and cost of the equipment required at one end of the link. These very small aperture terminal (VSAT) systems have proved popular, even for low-traffic applications such as connecting an individual branch of a bank in a small town to its head office.

  Because of the high costs of satellite bandwidth and the delay in transmission (of almost one second) which is noticeable in telephone conversations,[5] the use of satellites for two-way communications has declined wherever international and transcontinental fibre optic links have become available, leaving satellite services to focus on broadcasting and rural connectivity services in more isolated areas and on low-volume data transfer services for corporate branch networks such as those of banks and supermarket chains.

The changing wireless environment

A new technology under development since 2008, which is likely to compete with WiMAX and Wi-Fi, is known as Long Term Evolution (LTE). It uses similar technologies to WiMAX and is probably one or two years behind in terms of its specification and manufacturing, with trials only expected in 2010. However, as with any new technology, its success will largely depend on economies of scale when compared to the installed base of existing technologies such as Wi-Fi or WiMAX. LTE's costs are expected to be the same as WiMAX, which are a factor of ten higher than Wi-Fi. Some telecom carriers, such as Verizon and Rogers, had by mid-2009 announced commitments to adopt LTE in their networks.

3 For example, see www.green-wifi.org

4 There are also some low earth orbit (LEO) communication satellites which provide access when the satellite passes overhead. Requiring lower-powered transmitters, these are used for mobile voice services where terrestrial networks are not available, or are used for remote sensing applications such as weather monitoring and early warning.

5 The delay also affects the quality of internet-based multimedia streaming and virtual private network (VPN) services which are not designed to accommodate the long delays introduced by satellite links.

New developments occurring in the higher frequency microwave bands above 5 GHz are creating systems capable of delivering 100 MBps or more to multiple sites, while still making efficient use of spectrum. A growing number of vendors now support the higher frequency bands, which are likely to be best utilised in crowded urban areas.

For great distances, short wave (HF) is normally used, but here the bandwidth is much more limited. Lower-bandwidth and lower-cost VHF or UHF solutions are also in use over shorter connections running at speeds from 1.2 KBps to 56 KBps. Most of these are operated by amateur radio enthusiasts.

As a result, higher bandwidth links to more remote areas are only possible via satellite systems, although these are burdened by higher installation and operating costs. Bandwidth costs are also much higher than terrestrial links.

Hybrid systems which make use of two different wireless technologies were also increasingly being seen by 2008. A common example is the use of a satellite link to bring in a long-distance connection, which is then redistributed locally over line-of-sight wireless links. Also in the hybrid category are direct-to-home (DTH) digital satellite broadcast systems which deliver incoming traffic at high speed (400 KBps), while outgoing traffic travels over a normal terrestrial telephone line.

In the area of very short distance communications, Bluetooth, infrared and radio frequency identification (RFID) technologies operate in the unlicensed spectrum to communicate with devices in their near vicinity, such as to link computers with storage media, printers and other peripherals, and to monitor population, product and vehicle movements. For example, a growing number of countries are implementing RFID "e-tags" placed in cars to automate highway toll gates, and new passports are being issued with RFIDs in some countries.

New potentially disruptive technologies such as ultra wide band (UWB) and ZigBee are being developed for short-range communications applications, including in-home networks, ad hoc linkage of devices and remote sensing.

- UWB devices transmit signals at low power simultaneously over a very wide range of frequencies and are therefore capable of far higher data rates than devices using other wireless technologies. Several companies are already using the technology to develop applications allowing streaming of DVD-quality video content.
- ZigBee's low power consumption, low costs and ease of use make it best suited for control applications such as remote controls and home automation that do not require high data rates. Industrial applications are also likely to use the ZigBee technology to control light fittings, machine control panels, thermostats and other similar equipment.

These smart devices will ultimately lead to much more efficient use of radio spectrum. Although power levels are sufficiently low that interference is unlikely, there may be some degradation in performance caused to other fixed and mobile wireless broadband systems based on older technologies. ■

Chapter 15
TELECOMS INDUSTRY AND MARKET STRUCTURE

Lead author ***David Souter***

The telecommunications industry has changed dramatically during the past twenty years. Telecommunications services have become far more widely available, using a much wider range of technologies and offering a much wider range of services. The structure of the industry has also been transformed, from one dominated by state-run monopolies to one which is competitive and largely in private-sector hands.[1]

History: A tale of two paradigms

Telecommunications began with the telegraph in the middle of the 19th century. Although originally introduced in many locations by local organisations or by private capital, by the early 20th century telecommunications in most countries was provided by state-owned monopolies. Even where private companies remained in charge, as in the United States, monopoly provision of networks and services was the norm throughout most of the 20th century.

There were two main factors underlying this monopoly paradigm:

- **Economic:** In the early days of telecommunications, the cost of building networks was very high and the level of demand for services was very low. It would take a long time for any network to recover its costs or make a profit, making the potential market unviable for second operators. The industry therefore exhibited natural monopoly characteristics (see Figure 15.1).
- **Political:** Most governments at the time were keen to maintain state power over communications and, in practice, saw telecommunications as an extension of postal networks which were already within their control.

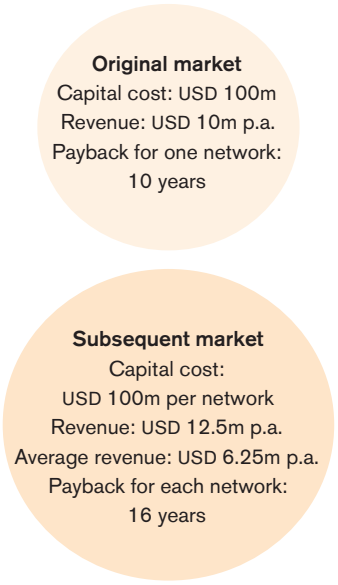
This monopoly paradigm of telecommunications provision went largely unchallenged until the beginning of the 1980s, when restructuring of the industry began in the United States and the United Kingdom. Since then, it has been displaced by an equally pervasive liberalisation paradigm, within which most telecommunications industries around the world have been restructured.

The different structures and characteristics that typify the industry in these different periods are illustrated in Table 15.1.

Figure 15.1: **Natural monopoly**

The markets for most products and services are naturally competitive: if people want something, then a number of suppliers will compete with one another to provide it to them on different terms.

Monopolies arise for a number of reasons. Sometimes they are enforced by governments. Sometimes they result from consolidation with a previously competitive market, or from mergers and acquisitions. Natural monopolies arise when the capital costs of market entry, such as building network infrastructure, are so high that it will not be possible for a second supplier to recover those costs and make a profit. This is most likely to happen where markets are inelastic and so not likely to expand greatly, as illustrated below.



Natural monopolies can be eroded by market changes on the supply side (for example, cheaper ways of implementing infrastructure) or on the demand side (for example, new services which increase the amount of revenue derived); or a combination of the two. Either will reduce the payback time required on capital investment.

1 This chapter includes material drawn from the author's lectures for Strathclyde University and elsewhere.

Table 15.1: **Characteristics of regulatory phases**	
Monopoly period	**Liberalised period**
One telecoms organisation …	Competing telecoms organisations …
… owned by the state …	… mostly privately owned …
… providing one main service (voice telephony) …	… providing four main services (fixed, mobile, internet, broadband) and many niche services …
… using a small range of (fixed) technologies …	… using a wide range of (fixed and mobile/wireless) technologies …
… to supply elite markets …	… to supply mass markets …
… within one country.	… as part of global businesses.

The changing industry

This restructuring has been driven by a number of changes in technology and demand for telecommunications services. The most important of these are as follows:

- The costs of network infrastructure have fallen dramatically, particularly for the wireless infrastructure which enables mobile telephone networks.
- The capacity of infrastructure has increased greatly, enabling more services to be provided to more people at lower cost.
- The range of services which can be provided over networks has increased, most recently including the internet, making telephone line ownership more attractive and enabling more revenue to be derived by infrastructure operators.
- The ability of people to pay for telecommunications services has increased in many societies as a result of other social and economic changes.

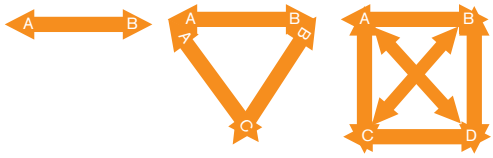
In addition, because they are interactive (i.e. because people use them to communicate *with* one another), telecommunications networks benefit from network externalities (see Figure 15.2). One result of these externalities is that interactive services are likely to take some time to reach a critical mass, after which take-up becomes much more rapid.

The development of mobile telephone services has also sparked tremendous change. Fixed telephone networks in most developing countries were (and remain) concentrated in urban areas and the corridors between them. In recent years mobile networks, based on cellular wireless technologies, have become more widespread than fixed networks in most countries, including all developing countries – reaching into rural areas and now accounting for as many as 95% of telephone subscriptions.

The transition from fixed to mobile preponderance in voice telephony in Africa is illustrated in Figure 15.3.[2] It should be noted, however, that data communications

Figure 15.2: **Network externalities**

Interactive networks (such as communications networks) differ from service networks (such as power and water) because their value to any subscriber depends partly on the number of other subscribers which it enables them to contact. For example, a network with two subscribers includes only one possible connection, while a network with three subscribers includes three possible connections and a network with four subscribers includes six possible connections, as illustrated below.



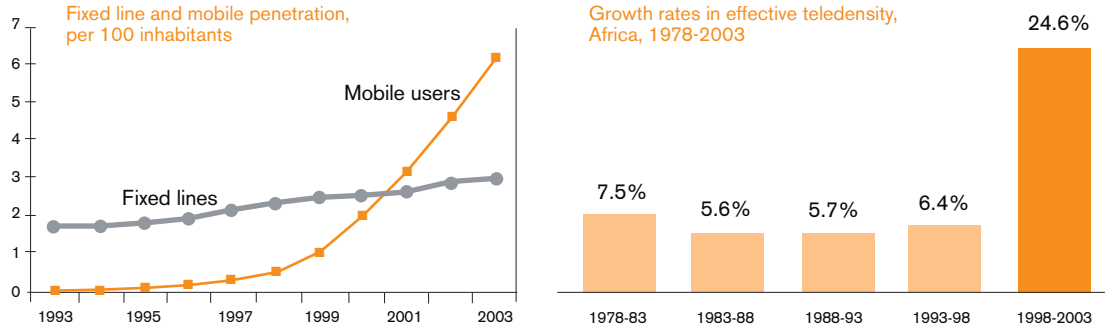
– including the internet – continue to depend at present largely on fixed technology, which currently offers much higher capacity. However, this is changing rapidly. Already, a majority of internet users in some countries access the internet primarily on wireless or mobile devices, and many industry analysts expect mobile access to become preponderant in developing countries in the short to medium term. The potential for mobile technologies to displace fixed networks in data communications is discussed in Chapter 17.

Finally, an important change has also taken place in thinking about how telecommunications services are delivered. Until relatively recently, most people within the industry assumed that telephone *services* had to be delivered – or at least should be delivered – by the same organisations that owned the telecommunications *networks* over which they were transmitted.

However, other industries have operated differently. Many freight and bus companies, for example, compete while using a single road network. In the late 1970s, it became increasingly clear that telecommunications could also be

2 From Tim Kelly *Twenty Years of Measuring the Missing Link* (Geneva: ITU, 2005) www.itu.int/osg/spu/sfo/missinglink/kelly-20-years.pdf

Figure 15.3: **Africa's mobile revolution**



Source: ITU World Telecommunication Indicators Database

provided in this way, and it is now generally accepted that telecoms services do not have to be provided by the same organisation (or company) that owns the network over which they are delivered. This is important because there has never been a natural monopoly in service provision. It is only networks that incur the high capital costs that made early networks natural monopolies.

The net effect of these technical and market changes was to undermine the expectation that telecommunications had to be provided by a monopoly and to open space for competition to emerge. At the same time, in the early 1980s, a number of governments came to the conclusion that governments' record in delivering products and services had been poor and that this was better left to commercial businesses, especially where markets were competitive.

The liberalisation paradigm

The liberalisation paradigm resulted from this change in thinking. Beginning with the United States and the United Kingdom in the early 1980s, this new paradigm has spread, firstly to Asia and Latin America, and more recently to Africa and other regions. With strong support from international institutions (such as the World Bank and the World Trade Organisation), it has become the norm worldwide. Almost all governments now agree that telecommunications services are best provided by commercial businesses operating in competition with one another.

The liberalisation paradigm has restructured the telecommunications industry through three main processes:

- Liberalisation
- Privatisation
- Regulation.

Liberalisation represents the process of transition from a monopoly market to a competitive one.

In classical economics, competition is the natural state of most product or service markets (unless they are subject to natural monopoly, see Figure 15.1). Competition is considered desirable because businesses seek to attract customers to their products or services by offering them something better – lower prices, better quality, more variety, etc. A competitive market is therefore seen to be driven by demand rather than supply, and to encourage innovation in product and service design through which companies can obtain competitive advantage.

In the case of telecommunications, liberalisation has meant two things:

- The removal of exclusive rights ("exclusivities") from the former monopoly fixed network operator, which is often called the "incumbent", so that in future it must offer what used to be monopoly services in competition with other businesses.
- The award of licences for all new services – including mobile networks and services, value-added services and the internet – on a competitive basis.

As a result of the latter, even where there is still a monopoly fixed network operator, the majority of the telecommunications sector is now competitive.

Privatisation is the transfer of ownership of a business from the state to the private sector.

In the case of telecommunications, privatisation has meant two things:

- The privatisation, in whole or in part, of the telecommunications business(es) that were owned by government, either through a share sale (typical in industrial countries) or through sale of a stake in the

company to a strategic investor (more common in developing countries).

- The award of licences in all new services – including mobile networks and services, value-added services and the internet – to private companies.

As with liberalisation, as a result of the latter, even where the incumbent remains state-owned, the majority of the telecommunications sector is now usually in private ownership.

In most developing countries, privatisation of the former incumbent has been partial, with a majority shareholding in the incumbent operator remaining in state hands even if company management has become the responsibility of a strategic investor (usually a foreign telecommunications company). There is still a high degree of state ownership of fixed telecoms operators in Africa, although this is diminishing.

It should be noted that governments may pursue conflicting objectives in liberalisation and privatisation. The principal aim of liberalisation is to provide better, cheaper services through competition. This is likely to lower the value of the incumbent fixed operator. The principal aim of privatisation varies between governments: some have sought to maximise the pace of infrastructure investment by attracting new investors, while others have been more concerned to maximise the revenue generated by selling state assets. Some commentators, for example, have criticised restructuring arrangements in Africa for protecting incumbents against competition by granting them exclusivities in some key areas of the market such as control of the international gateways that enable international calls.[3]

Regulation refers to the intervention by governments in markets in order to achieve certain outcomes in those markets. In telecommunications, it refers specifically to the introduction of an independent agency responsible for overseeing the introduction and maintenance of competition within the telecommunications sector.

Governments intervene in markets in three main ways:

- To facilitate standardisation, which has benefits in terms of public safety and in establishing a level playing field for the delivery of competing products and services (e.g. standard electrical sockets, company accounting standards, telecoms equipment standards).
- To secure public policy objectives which are counter to natural market behaviour (e.g. restrictions on the sale of alcohol, tobacco, firearms and pornography; universal provision of telephone networks).
- To maintain competition, which may be undermined if businesses achieve and abuse a dominant position in the market.

The principal role of telecommunications regulation is concerned with competition. In most countries, in most economic sectors, this is a matter for general competition authorities which apply common principles of competition law across the whole economy. These principles regulate relationships between companies to ensure that powerful businesses do not unfairly use their market power to drive competitors out of the market, and to ensure that companies to not collude in "cartels", for example, to maintain high consumer prices rather than competing on price.

In telecommunications, however, things have been different because competition was absent when regulation was introduced. Competition regulation in telecommunications can therefore be divided into two phases:

- A liberalisation phase, in which the main objective is to enable new businesses to enter the market in competition with the incumbent.
- A competition phase, which follows when competition has become established.

The regulatory issues and powers associated with these phases are described in Chapter 16.

Continuing change

These processes have been accompanied by four further processes, which are driven more by technology and by global economic change. These are:

- The displacement of fixed by mobile services
- Service and market diversification
- Technological convergence
- Globalisation.

Historically, telecommunications services were provided over fixed networks between locations. The development of mobile wireless networks since the 1980s, however, has led to **the displacement of fixed by mobile services**, which provide communications between individuals rather than locations. In industrial countries, the large majority of people now have access to both fixed and mobile services, and many individual users predominantly use mobile services and networks for voice telephony. The preponderance of mobile usage is even greater in developing countries which do not have pervasive fixed networks. Advances in the capabilities of mobile devices, particularly the advent of 3G and other high capacity mobile phones, are making these increasingly attractive options also for individual access to the internet while on the move, and may provide a more rapid route to internet access in developing countries which lack fixed network

3 On regulatory outcomes in Africa, see for example Alison Gillwald "Good intentions, poor outcomes: Telecommunications reform in South Africa" *Telecommunications Policy* 29 (2005): 469-91

capacity. Fixed networks continue to provide the main means of access for telephone communications with organisations rather than individuals.

Service and market diversification concerns the proliferation of new services which can be offered as a result of new technology. In the past, telecommunications offered only one basic service (fixed voice telephony). Nowadays, it offers three or four basic services, depending on the market (fixed and mobile voice telephony, the internet and, in many cases, broadband) and a very wide range of niche services for groups of customers (which can be offered by major companies or niche businesses). New services continue to proliferate as a result of technological change, including some (like mobile banking) which combine telecommunications with other service industries. These enable market disaggregation, including the provision of service packages aimed at small groups or even individual consumers.

Technological convergence concerns the bringing together of economic sectors which were previously distinct. This happens:

- Because they now use much the same technologies (particularly bit transmission, i.e. the transmission of data in the digits 1 and 0 as these are understood by computers).
- Because different platforms can now be used to deliver a wider range of services (e.g. the use of the internet to deliver broadcast radio).

The sectors most affected by this are telecommunications, computing, broadcasting, information technology and perhaps, in future, financial services. Companies which previously operated in one sector can now compete across this range of sectors.

Globalisation is not confined to telecommunications, although telecommunications has been one of its important drivers. In the telecoms industry's structure, its main impact can be seen in the proliferation of international cable and satellite communications infrastructure, and in the transition from the separate national telephone companies which predominated in the monopoly era to the global or multinational operating companies that are common today. There is now widespread cross-ownership of telecommunications (and other communications) businesses, while the telephone services available to customers in most countries are frequently provided by companies which are wholly or partly owned abroad.

Telecoms markets today: A summary

Telecoms markets today are much more complex than they were in the monopoly era. They can be categorised in a number of different ways. The three most useful ways of looking at them focus on the supply chain; on types of technology; and on user priorities and experience.

The supply chain

The supply chain for telecommunications services is long and involves a number of different elements. For example, an international phone conversation may well:

- Originate on fixed or mobile network A in country X.
- Transit from its point of origin in country X on infrastructure network B to an international gateway operated by network operator C.
- Use an international satellite or cable link owned by operator D for transit to country Y.
- Transit from its landing point in country Y on infrastructure owned by network operator D.
- Finally terminate on fixed or mobile network E in country Y.

This example involves five separate but interconnected markets – two for the local loop (the end-user connection), one in each country; two for national transit; and one for international transit. Levels of competition in each of these markets will vary: for example, the originating customer in country X may have a choice of network operators, while the terminating customer in country Y may be subject to monopoly.

The point and nature of competitive choice will also vary. In the local loop, end-users make choices between operators, usually (if they are subscribers) by contracting with a particular network or service provider for a period of time. The choice between national and international transit networks is made by network and service providers, not by end-users, and is more likely to vary according to available capacity and costs at the moment that the specific connection is made. International transit markets may be highly competitive (as they are, for example, across the North Atlantic) or monopolistic (as at time of writing – early 2008 – is the market for cable connectivity along the coast of West Africa). In addition, in most countries, end-users access some services – such as the internet – through intermediary service providers rather than directly from network operators.

These markets are also interlocking. Some businesses will be engaged in markets at several, or even all, stages in the supply chain, providing local loop access, national and even international transit, perhaps including national networks in both countries. Others will operate in only one part of the supply chain. The need for networks to interconnect means that the relationships between businesses within the supply chain can be both competitive and cooperative. Interconnection charges mean that competing telecommunications businesses are often one another's most substantial customers.

End-users generally do not want to engage with the complexities of this market. What the vast majority of users want is a "seamless" service which they can use with the minimum of effort – for example, through a

single contract and a single bill. In other words, they want to benefit from competition but to exercise choice on the minimum necessary number of occasions, leaving businesses to sort out most of the market choices for them.

Types of technology

A second useful way of distinguishing between market types is by technology. Different telecommunications technologies have different characteristics – for example, concerning mobility or capacity – and these characteristics are important drivers in consumer choice. As with the supply chain, however, different technological markets are interlocking, because consumers usually want a range of services which may be better supplied by different technologies. Many companies also compete with one another to provide services operating on different technical platforms.

Three variations of technological market diversity are particularly important to end-users: that between fixed and mobile access, that between dial-up and broadband access to the internet, and that between conventional and internet telephony. All of these paired variants form markets which are competitive within themselves but also with their technological pair.

When mobile telephones were first introduced, they were considered complementary to fixed networks. Handsets were bulky and call charges high. The only major advantage which they offered users was, therefore, mobility, and even that was limited because mobile services were first introduced in industrial countries, which had geographically pervasive fixed networks, while the connectivity range of mobile networks was initially quite poor. Over time, however, mobile services have improved greatly in quality, connectivity and price, and begun to offer additional services to voice telephony (such as SMS and music downloads through networks, photography and video on handsets) which are highly valued by many customers. In non-industrial countries, too, the range of mobile connectivity very quickly exceeded that of fixed networks, so that only mobile networks were available in many areas. Mobile charging practices (especially prepaid service) added to their attractiveness for customers. These factors quickly made mobile markets competitors to fixed networks as well as complementary to them. Today, almost everywhere, they have become consumers' preference for voice telephony, though fixed networks still have the edge on quality and capacity. (A separate but similar competition is now arising between second and third generation mobile networks.)

The quality and capacity of fixed networks, meanwhile, has seen a marked change as broadband networks have complemented conventional telephone networks, offering high data speeds at affordable prices to residential as well as business customers. Broadband makes relatively little difference to voice telephony, but its impact on the market for internet services has been tremendous. Although subscription charges for broadband connectivity are higher than those for conventional telephone lines, higher speeds for internet access (typically ten or more times faster) and the absence of telephone usage charges mean that, at all but the most modest usage levels, broadband internet access has become cheaper than dial-up as well as offering much superior quality. Nevertheless, as with fixed and mobile telephony, the two markets intersect – both competing with and complementing one another. The introduction of local loop unbundling (see Chapter 13) in a number of industrial countries has also added to the competitive mix.

Broadband has enabled the telecoms network to develop much more diversity in service provision, including offerings like triple play (the "bundling" of telephony, internet and cable television service). These, too, have extended competition between historically distinct but now converging markets. One of the most familiar new forms of competition of this kind is offered by alternative telephony providers, such as Skype, which enable computers and the internet to be used for voice telephony. These voice-over-internet services generally provide poorer quality connectivity than conventional telephony, but, by using the internet as a delivery mechanism, offer much lower costs – with services usually free between users of the same service provider and well below public switched telephone network (PSTN) prices for calls to telephones. They have established a substantial market wherever telephone charges are high, particularly for international calls. Once again, this represents competition between, as well as within, markets which were historically distinct, in this case complemented by competition between platforms.[4]

User priorities and experience

Consumers, of course, fall into many different groups, and different types of consumers have different priorities. This leads to substantial market segmentation, two examples of which are described below.

Residential consumers make most use of voice telephony and (depending on their income and location) private internet access. Business consumers, however, have a different set of priorities and different service needs. Some businesses are highly dependent on high-quality data communications: banks, for example, rely on telecommunications networks to operate their ATMs and validate debit and credit card transactions. Larger business customers generally lease private circuits from network operators, i.e. they buy capacity from them which they can use as they require rather than paying for

4 Some telecoms businesses offer their customers IP telephony in competition with their own PSTN services.

individual communications transactions at the point and time of use.

Business and private users of telecommunications use the same networks and service providers, though not necessarily all of the same services. The commercial viability of telecoms businesses usually depends on a mix of both types of customer (although there are also niche service providers that solely target business users). High value is, however, attached by operators to high-usage business customers, and many second operators entering a market that has been monopolistic have focused on serving them rather than the wider residential market (a business strategy known as "cream skimming"). The interaction between business and residential markets, and between other market segments, plays an important part in business strategy and market dynamics.

Another instance of market segmentation which is significant today concerns the opposite end of the telecoms market from large businesses: customers in what the economist C. K. Prahalad has called "the bottom of the pyramid" or "BoP".[5] BoP customers are the very poor, who are unable to afford to subscribe to telephone services or own mobile handsets but who nevertheless have communications needs which they wish to meet. These needs have historically been addressed by public access facilities such as payphones, and by non-ICT services such as letters and messengers. The advent of mobile networks has greatly extended public access options by enabling access to be provided by small-scale freelance entrepreneurs (kiosk operators, street-corner airtime resellers) as well as operating companies. What public access facilities like these do, in market terms, is aggregate the small (and unprofitable) units of demand generated by those with low incomes on a scale which makes non-subscribers commercially viable for network and service providers. In doing so, they have developed another telecommunications market segment – one that is of particular interest to those concerned with access for the poor, such as APC. ■

5 See his study *The Fortune at the Bottom of the Pyramid* (Philadelphia: Wharton School Publishing, 2005)

Chapter 16
TELECOMS POLICY AND REGULATION

Lead author ***David Souter***

As described in Chapter 15, the responsibility for managing the telecommunications sector has been transformed during the past twenty years.

Until twenty years ago, in most countries, telecoms services were provided by state-owned monopolies. Government departments were therefore responsible for both policy concerning telecommunications and for its implementation, for the management of networks and the delivery of services. Usually, these departments were responsible for postal services as well as telecommunications. Often, but not always, there was some separation of responsibilities, with network management and service delivery devolved to a parastatal entity, and postal services were often separated from telecommunications in the run-up to the telecoms restructuring discussed in Chapter 15.[1]

The situation is very different in a market that is largely liberalised and privatised. In today's markets, there is a clear separation between policy making for the ICT sector – which is the responsibility of ministries of communications, or of information technology – and the operation of telecommunications networks – which is a matter for (mostly private) operators. Even where the state still owns all or part of a network operator, this is often managed by a private sector investor or management contractor. In between policy and operations, in almost every country, stands a regulatory authority which is responsible for overseeing market development and behaviour. In most countries, liberalisation of the market was accompanied by the establishment of a sector-specific telecommunications regulator. In recent years, a number of governments have brought together telecommunications, broadcasting and other communications regulation into a single entity, usually called a "converged regulatory authority".

The relationships between these three tiers of telecoms sector management and service delivery can be described as follows:

- Government – in the form of a communications ministry – takes responsibility for deciding policy.
- The regulatory authority has responsibility for implementing policy and for applying established regulatory and competition principles.
- Operators have responsibility for providing service to customers on terms permitted by law and regulation.

There are two critical relationships in this chain of authority: that between ministry and regulator (policy and regulation) and that between regulator and operator (regulation and operations).

The relationship between policy and regulation is a complex one, and the boundaries between the two responsibilities can be blurred.

Policy has been defined in the online encyclopaedia Wikipedia as "a deliberate plan of action to guide decisions and achieve rational outcomes. The term," it adds, "may apply to government, private sector organisations and groups, and individuals. Policy differs from rules or law. While law can compel or prohibit behaviours, policy merely guides actions toward those that are most likely to achieve a desired outcome."[2] Nevertheless, policy is generally put into practice through legislation which provides a framework for regulating the conduct of citizens, businesses and other actors in society.

Regulation, by contrast, is essentially instrumental, focused on translating the objectives of policy decisions into practical measures which achieve their purpose. Where policy making is primarily a matter of political decision making, regulation is much more technocratic, concerned with identifying the most effective ways of achieving the objectives which policy makers have agreed. This is done primarily through rules and regulations, and by decisions about specific circumstances which arise in which those rules and regulations must be interpreted.

The relationship between policy making and regulation is illustrated in Table 16.1.

The primary interface between policy making and regulation occurs at the level of strategic design – the translation of policy into regulation. However, ownership of different spaces in the policy and regulation process is often contested between ministries and regulators. This tension can be constructive or destructive. Where there are persistent differences of view between ministries and regulators, these can destabilise the regulatory process and undermine the confidence of investors, network and service providers, and consumers.

1 This chapter includes material drawn from the author's lectures for Strathclyde University and elsewhere.

2 Wikipedia "Policy" accessed 24 October 2009 en.wikipedia.org/wiki/Policy

Table 16.1: **Policy making and regulation**	
Policy making	**Regulation**
Primarily political	*Primarily technocratic*
Objectives – what is to be achieved Priorities – what can be achieved in practice Overall strategy – how it is to be achieved	
… leading to legislation which …	*… is implemented through regulation …*
	Detailed strategy – how it is to be achieved Implementation – how it is delivered

Purposes of regulation

Regulation can be described as intervention by government in a market in order to adjust the terms on which that market works. This intervention may be to prevent the natural development of a competitive market (as with state-imposed monopoly), to facilitate the creation and maintenance of a competitive market (as with liberalisation and much competition regulation), or to ensure that the competitive market delivers products and services to consumers in particular ways (as with regulation for universal access).

Regulation of some kind is to be found in many (probably most) markets in most countries. It takes three basic forms:

- Technical standardisation, which establishes a common and legally enforceable platform for all businesses within a sector or across the whole of business – for example, the rules governing electrical power supply or company accounting.
- Public policy regulation, which seeks to achieve objectives because they are believed to be in the public interest – for example, legislation which controls the supply of particular goods and services, such as alcohol, pornography and gambling.
- Competition regulation, which seeks to create and maintain fair competitive relationships between businesses, and between businesses and consumers.

Telecommunications regulation includes all three of these purposes. Technical standardisation is managed at a number of levels – global, regional and national – often through separate standards agencies (and with increasingly powerful influence from manufacturing companies). Public policy regulation includes issues such as universal service/access provision, which requires businesses to do things that they would not choose to do in normal market conditions. However, the term "telecommunications regulation" is often used primarily to refer to competition regulation.

In most industries in most countries, the promotion and maintenance of competition is legislated through Competition Acts and is managed by general competition regulators. (Some countries do not have general competition legislation but have incorporated standard competition provisions in their telecommunications acts.)

In telecoms, almost every country has chosen to establish a separate regulator with specific responsibility for telecoms rather than relying on the general competition law authority to regulate the sector. There are two main reasons for this.

- One is that some aspects of telecoms are highly specialised – for example, the allocation and management of the frequency spectrum, and the oversight of interconnection between telecommunications networks.
- The other, which is more important, is the legacy of monopoly. Competition law and competition regulators aim to maintain competition where it already exists, through rules and regulations which are designed to create a "level playing field". Telecoms, however, has historically been provided by monopolies. It would be very easy for a former monopoly company (often called an "incumbent") to prevent market entrants from gaining a foothold in the market, for example, by denying them interconnection or by charging unreasonably high prices for it. When the telecoms market is liberalised, therefore, i.e. when competition is first permitted, regulators need to take active steps to control incumbents and support market entrants, rather than relying on a "level playing field".

As a result, the experience of telecoms regulation can be divided into two distinct phases:

- In what might be called the "liberalisation phase", the main role of the regulator is to promote competition and bring the market to the point where competition has become established. In this phase, regulators actively promote market entry and exercise strong controls over incumbents and other companies with a dominant position in the market (see the section on market dominance below).
- Later, once competition is generally established, the main role of the regulator becomes much more like that of a general competition law authority, using competition principles to maintain competition and focusing attention on residual areas of "market failure" where competition has not yet come into play. This is sometimes referred to in this handbook as the "competition phase".

The WTO Reference Paper on Regulation

The World Trade Organisation's Agreement on Basic Telecommunications Services (the BTA) establishes rules for competition in international and national telecoms

and promotes open (international) investment in telecommunications markets. Governments make commitments to attain specified levels of liberalisation within particular timeframes. The great majority of global telecoms traffic takes place within or between countries that have signed the Agreement.

The Agreement includes a Reference Paper on Regulation which sets out basic rules or guidelines for telecoms regulation. Although the Reference Paper formally applies only to countries which have signed the BTA, it has in practice become an industry-standard set of minimum requirements for regulation. Its rules or guidelines represent, therefore, global consensus on aspects of telecoms regulation. They require adherence to six basic principles, which are all considered later in this chapter. These six principles are that:

- There should be a regulatory body independent of operating companies.
- There should be safeguards to prevent anti-competitive behaviour.
- Licensing criteria should be publicly available and transparent.
- Regulation should provide for interconnection between major operators.
- It should apply any universal access obligations which are agreed in a way which is transparent and neutral between operators.
- It should allocate scarce resources (such as numbers and spectrum) fairly between operators.

Regulatory governance

The WTO Reference Paper specifies that telecoms regulators should be "independent" of operating companies. The reason for this is simple enough. Regulators must manage the terms of competition between regulated companies. Competitors are unlikely to think that they do so fairly if they are accountable to one particular communications business.

The WTO Reference Paper does not say that regulators should be "independent" of governments, but many people in the industry think that it is also better for them to be as separate as possible from ministries and other official government agencies. There are two main reasons for this:

- In many countries, the government still owns part or all of at least one telecommunications company.
- Consistent regulation is needed in order to achieve the confidence of investors, operators and consumers. Ministries are less knowledgeable about the market, and their involvement in regulatory decisions can undermine the authority of regulators and therefore confidence in markets.

In most countries nowadays, regulatory authorities are made up of commissions, in which a number of people – usually non-executives appointed by the government – make decisions on the basis of recommendations put to them by the regulatory agency's chief executive and permanent staff. Some countries include representatives of consumer groups within regulatory commissions, while others have established consumer committees to provide advice and monitor the impact of decisions. Many, however, do not have any direct consumer or civil society involvement.

Achieving the right balance between policy makers/ministries and regulators has proved difficult in many countries. The aim has usually been to ensure that ministers set the overall framework for the communications industry, the targets that are to be achieved and guidelines for regulatory action. The powers and authority of regulators are set out in legislation. Regulatory bodies are expected to use the powers granted to them in this legislation to achieve the objectives that have been set for them by ministers. Their decisions may take the form of published regulations or be based on interpretations of the rights and obligations companies have within their licences.

In some countries, however, difficulties have arisen over this separation of powers, particularly where regulators take decisions with which ministers disagree. The uncertainty that results from this can be a disincentive to operating companies and potential investors, who value the consistency and predictability of regulation highly when making investment decisions. Similar difficulties can arise if it is relatively easy for operating companies to challenge regulators' decisions through the courts.

Competition regulation

The following sections of this chapter look in turn at the most important issues which are dealt with by telecommunications regulators today. The chapter then concludes with a section on new issues arising as a result of convergence. Some specific issues which concern regulators, such as universal access and the relationship between the internet and telecoms networks, are covered in separate chapters.

Competition regulation is principally concerned with the establishment and maintenance of competition. The underlying premise – which is more generally accepted in telecoms than in other network utilities such as power and water – is that competition is strongly beneficial to consumers. Experience in telecoms shows that it has generally led to lower prices and to improved quality and variety of service.

As noted earlier, the role of regulators changes as markets become more competitive. In the "liberalisation phase", described above, it is most concerned with opening up the market, which often requires regulators to impose much tighter controls on "incumbent operators"

than on market entrants. This is known as "asymmetric regulation". Once a market becomes competitive, the regulator's role focuses on the maintenance of fair competition, as in other business markets.

Competition in telecoms is complex, however, including not just competition between service providers to provide service to end-users, but also competition at different stages within the supply chain, both amongst and between network operators and service providers. The need for networks to be interoperable and to interconnect also means that relations between businesses in the market are often both competitive and cooperative.

Market dominance

A key concept in deciding whether competition has become established is that of "market dominance" or "strategic market power".

A company is considered to have dominance in a market if it is able to determine the outcome of competition irrespective of how its competitors behave. A company in this position is able to play the market to its own advantage, and to put its competitors out of business, unless regulated to prevent it doing so.

Market dominance can be achieved through market share: a company which has, say, a 40% share of any market is very likely to have dominance, certainly so if none of its competitors has a market share of more than 10%. All incumbent telecoms operators have market dominance at the time of liberalisation because, at that point, they have 100% of the available market.

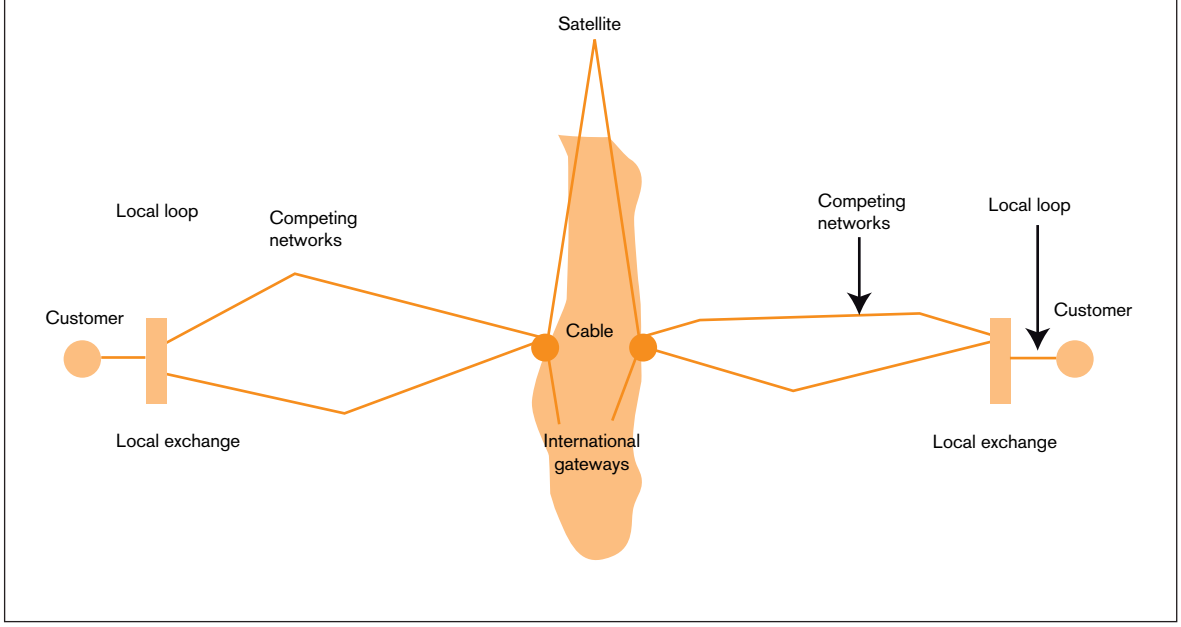
Market dominance can also be achieved through control of critical or essential facilities, for example, particular points within the supply chain required to provide customers with what they want. Figure 16.1 illustrates a typical international telephone call.

In this case, there are two places where a single business controls essential facilities: the point of entry into and exit from the national telecoms market (the "international gateway"); and ownership of the subscriber's access to competing national infrastructures (the "last mile" or "local loop"). The company or companies controlling these "bottlenecks" can dictate terms to the rest of the supply chain. Incumbents tend to retain control of these essential facilities even while the rest of the supply chain becomes competitive – in the case of the local loop because of the high costs of establishing alternative infrastructure; in the case of international gateways because they have often been given extended monopoly rights over them by governments and regulators.

Regulators have used two main approaches in dealing with market dominance.

In general, they have made use of stronger powers when dealing with dominant companies than with their competitors. In particular, they have used what are known as *ex ante* powers, i.e. powers to prevent dominant companies in advance from behaving in particular ways (as opposed to *ex post* powers which punish companies for infringements after the event).[3] *Ex ante* powers are

Figure 16.1: **A typical international telephone call**



3 *Ex ante* is Latin for "beforehand"; *ex post* for "afterwards".

necessary where companies are dominant because they are able to act in ways which can quickly destroy their competitors' businesses.

Some regulators have addressed the local loop bottleneck by requiring dominant operators to "unbundle" the local loop, i.e. to allow their competitors physical access to their local loop networks and the opportunity to market their own services directly to consumers over them. A simple analogy might be that of competing train companies running services over track which is also owned by one of them.

Licensing

In almost all countries, companies require licences to operate telecommunications networks or to provide telecommunications services. These licences specify what "facilities" (i.e. networks and equipment) they can deploy, what services they can offer customers, and how they must interact with other businesses within the market. Licences may also specify their access to scarce resources such as spectrum and telephone numbers. Companies pay fees for licences, which may include both upfront fees, when a licence is awarded, and annual payments. Major licences usually have termination dates, before the end of which they and their conditions should be reviewed.

Licences have historically been allocated for different sub-markets within the overall telecoms market – for example, to operate a fixed telephone network, or to build and operate a mobile wireless network, or to provide particular services such as paging, payphones or the internet. These licences differentiate between different technologies and services.

Recent technological developments, however, mean that there has been a good deal of convergence and that different technology platforms can now deliver a wider range of services. As a result, some regulators – including those in the European Union, in India and in Tanzania – have moved towards technology- and service-neutral licensing. Technology-neutral licences, for example, may permit a company to provide a telephone service without specifying that it has to use a fixed network or to use a particular wireless technology to do so: that choice is left up to the company. (Even here, however, spectrum does need to be allocated through agreements such as licences, in order to ensure that it is properly distributed and that there is no interference between spectrum users.)

There are two main types of licence that are awarded:

- Individual operator licences
- Class licences (or general authorisations).

Individual operator licences are specific to one operator or company. They are used primarily where the number of licences in the particular market is limited, where there is likely to be market dominance, or where specific resources need to be allocated – for example, in the mobile cellular sector, where typically there are no more than five operators in a country, each making use of radio spectrum. Class licences or general authorisations set out identical terms of operation for all businesses operating in a particular market segment, for example, internet service providers (ISPs), without attaching those licences to a specific company.

There is a trend now in favour of replacing individual operator licences with general authorisations wherever possible, as this simplifies regulation, helps to ensure a level playing field, and is more flexible in handling technological and market change. This principle is fundamental, for example, to the new framework for communications regulation which the European Union agreed in 2003.

Different countries have also used different approaches to choosing who should have a licence. In the case of general authorisations, it is not usually necessary to choose: licences can be granted to any business that wants one, with market competition deciding how many companies will survive. This is often the case, for example, with ISPs. Where the number of licences is limited – for example, in the mobile sector – they are usually awarded through a competitive tendering process. This may take account of both the amount of money that bidders offer and their investment plans (for example, the extent to which they will roll out services to rural areas).

Scarce resources

There are two main scarce resources in telecommunications: spectrum and numbers.

Spectrum is the radio frequency required to provide services through wireless technologies (see Chapter 9 for a description of spectrum). Spectrum is not just required by telecommunications companies. Radio and television broadcasters also use spectrum, as do the police and military authorities. The allocation and management of spectrum therefore reach well beyond the telecom regulator's own responsibilities. In many countries the security services play an important role in dictating spectrum use; or there may be a separate spectrum regulatory authority. The International Telecommunication Union (ITU) also manages the rules governing the international allocation of spectrum, which are intended to maximise its use while minimising cross-border interference.

Spectrum can be allocated in many ways. In some cases high fees have been charged for spectrum, while in others it has been allocated at little or no cost in order to encourage new investment. Some countries allocate spectrum through an auction, or allow it to be traded by those to whom it has been allocated. In other countries, much more rigid rules apply. The key competition principle where spectrum is concerned is that, however it

is allocated, every competing operator that could make use of it to provide a particular service should be able to take part in the allocation process on equal terms.

Numbers are the other scarce resource in telecommunications. At first sight this may seem strange, since there is an infinite number of numbers. However, only a limited number of these can readily be used, for two reasons. People can only hold a limited number of digits – ten or so – in their short-term memories when dialling. More importantly, numbers have to be allocated in blocks which indicate what type of number they are – for example, local numbers, international numbers, mobile cellular numbers, premium rate numbers – and so what charges users can expect to incur by using them. There are international norms for numbering just as there are international rules for spectrum.

The number of numbers required is constantly growing, because of the wider range of services that are being offered. Every country needs a numbering plan that is capable of managing this number growth over a significant period of time.

Numbering raises two main issues from the point of view of competition regulation:

- Firstly, numbers need to be available to all competitors on equal terms, just like spectrum. Managing the numbering system can be very advantageous to an incumbent, and regulators have taken this responsibility away from them.
- Secondly, more and more regulators are recognising that leaving the ownership of numbers in the hands of operators inhibits competition. If a subscriber – for example, a small business – has to change its telephone number when it changes service provider, it can incur significant transaction costs: businesses, for example, must advise all their suppliers and customers, change their headed paper, repaint their vans, etc., and even then are likely to lose business because some of their customers will not notice. Regulators can deal with this by introducing number portability, i.e. making the subscriber rather than the operating company the owner of a number, so that the subscriber can "port" (take) the number from one service provider to another. Number portability is increasingly regarded by regulators as an important mechanism for making telecommunications markets work effectively for the consumer.

Interconnection and its implications

Interconnection is essential in competitive communications markets. Many regulators think that it also poses the most difficult regulatory challenges.

It would be possible to have competing telecommunications businesses without interconnection. However, this would be far from optimal. Without interconnection, customers of company A would only be able to talk to customers of company A, not those of companies B, C and D. In practice, in such circumstances, most people would need to have several telephone lines in order to be able to communicate with all those that are important to them. An incumbent operator that refused to interconnect could prevent market entrants getting established in the market – at least in markets that already have a lot of subscribers.

The core principle of interconnection is that everyone should be able to communicate with everyone else, irrespective of which network they subscribe to. There are two main requirements for achieving this:

- Competing networks must be interoperable, i.e. the equipment in all networks must be capable of working together, preferably so well that customers are unable to tell if any interconnection between networks is taking place. This is largely a matter of technical standards.
- Accounting arrangements must be in place to enable companies to pay one another for access to each others' "facilities" (infrastructure). In order to be fair, these accounting arrangements should be based on the costs incurred in using those facilities. Ideally, they should ensure that the owner of the facilities concerned charges its competitors the same "wholesale" rate for their use as it charges its own "downstream" or "retail" business. This is particularly important in the early days of competition, because at that time interconnection charges are likely to make up the majority of a market entrant's costs.

Regulators also need to ensure that competitors can gain access to facilities on the same non-financial terms as their owner provides them to its own retail arm – for example, to ensure that interconnection is not unduly delayed.

These principles of interoperability and accounting apply not just within national telecommunications markets, but also between national and international networks – for example, between national operators and the operators of submarine cables and international satellites.

The technical and accounting arrangements involved in interconnection need to be included in contractual agreements. Most regulators prefer interconnection agreements to be negotiated directly between operating companies, and to intervene only when necessary. However, it is very difficult to get accurate costs and to ensure that fair rates are being charged. Regulators therefore often have to intervene in interconnection disputes in order to ensure fair market outcomes.

Enabling fair interconnection is one of the most difficult challenges facing regulators. Many have found it necessary to use substantial powers to require detailed ac-

counting information from incumbent or dominant companies. The most important issue here concerns the calculation of the costs which are appropriate. Incumbent operators usually prefer to calculate these on the basis of historic costs, i.e. what it cost them to put the existing network in place. However, new technology has made network deployment much cheaper than it used to be. Most regulators would prefer to use "long-run incremental costs", which are based on the costs which would be incurred if the network were built today, using the most efficient available technology. These are the costs which interconnecting operators would incur if they chose to build their own infrastructure, and so provide the most appropriate market signals to such operators as they contemplate investments.

Many regulators have felt it necessary to require structural changes in the way that incumbent and market-dominant companies account for their activities or organise their business. Such businesses have often been required to introduce "accounting separation" for different parts of their telecommunications business, in particular to account separately for wholesale business (i.e. transactions with other telecommunications networks and service providers) and retail business (i.e. the provision of service to end-users). This enables regulators to examine whether a dominant operator is favouring its own retail business over its competitors. Accounting separation is also often required between different types of service provision, for example, between fixed and mobile services, telephony and ISP business, and regarding niche markets such as private circuits leased to business customers. In extreme cases, regulators may choose to impose "structural separation", i.e. to require businesses to break up into entirely separate companies responsible for fixed and mobile or for wholesale networks and retail service provision.

Open access

The term "open access" is used to describe the provision of non-discriminatory access by all competing operators (network owners and service providers) to infrastructure that is owned by one of them (or by an independent infrastructure owner). Non-discrimination in this case means that all participants in the market should be able to obtain infrastructure capacity on the same terms and at the same prices as one another, including any "downstream" business owned by the infrastructure owner. The latter, in this case, is sometimes described as acting as a "common carrier".

APC and other organisations have argued for the application of open access principles to submarine cables serving Africa, in order to ensure that the cost reductions resulting from cable deployment are passed on to end-users through competition between the different telephone companies operating in national markets.

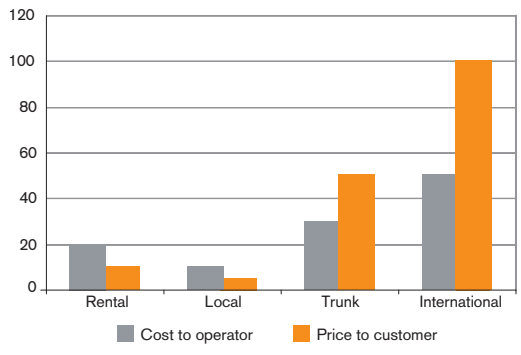
Regulating prices

In the monopoly period, governments often sought to control the prices of telecommunications services. As a result, by the time they began to liberalise telecoms markets, the price structure for telecoms services bore little relationship to costs. Typically, high prices for national long-distance and international calls subsidised low prices for telephone connection and subscription and for local calls, as illustrated in Figure 16.2.

This monopoly era pricing model was sometimes justified by the argument that international calls could subsidise local infrastructure development. In practice, however, this rarely happened. In most developing countries, national infrastructure was not extended into rural areas while, because so few people owned their own telephones, low subscription charges benefited businesses and those rich enough to afford a line rather than the poor who could not do so.

Cross-subsidies like those in Figure 16.2 are not sustainable in a competitive market. If they are maintained, market entrants will target high-profit market segments (long-distance and international calls) and undermine the viability of incumbent businesses. Cross-subsidies therefore have to be removed through a process known as "rebalancing". In practice, the introduction of competition and the rapid development of new and cheaper technology have meant that most costs have fallen substantially as a result of liberalisation, and so rebalancing has not necessarily led to price increases. In addition, because almost all new subscriptions in developing countries are for mobile lines, rising costs for fixed-line subscriptions have had little impact on the costs incurred by ordinary citizens.

Figure 16.2: **Monopoly era cross-subsidies**



Telecoms regulators do not generally wish to regulate prices. Their aim is to achieve enough competition for the market to set price levels which are broadly related to the costs that businesses incur in running networks and providing services. These prices to consumers are known as "retail prices". Regulators have been more concerned to regulate "wholesale prices", i.e. the prices which network operators charge to other companies for access to their networks (see the section on interconnection above).

There are, however, cases in which retail competition does not arise, either because there are too few people to sustain a competitive market or because market entrants are finding it difficult to become established. In these cases, regulators may intervene to cap prices to consumers or to bring them down to a level like that which might arise if competition were fully established. Some regulators have done this by requiring any tariff changes to be approved by them in advance. Others have introduced a "price cap" approach, in which they require companies to make reductions in real (i.e. post-inflation) prices every year. The aim of these forms of price regulation is, in essence, to reduce prices to the level which would arise in a competitive market, i.e. to act as a surrogate for competition.

Regulating competition

As discussed earlier, the main purpose of regulation during the liberalisation phase is to promote market entry so that competition becomes established in as many areas of the telecommunications market as possible. Sector-specific regulation to promote market entry is only required so long as markets are monopolistic. Once they become competitive, telecoms regulators are able to use the general principles of competition law which apply to other business sectors in countries that have full competition legislation. Sector-specific regulation is then only required in areas of the market that are not yet properly competitive, or where there are sector-specific aspects of the market (like spectrum, numbering and interconnection) to be taken into account. The introduction of the new communications regulatory framework in the European Union in 2003 is a good example of this transition in practice.

The principles of competition law are built around ensuring fair competition between different participants in the market. Although almost all communications markets can become competitive, especially as new operators meet suppressed demand for services, some will probably always have only a few competing operators. This is likely to happen either because demand is low (e.g. in remoter, rural areas with low populations), because of high capital costs (e.g. in fixed network infrastructure), or because of technical limitations (such as available spectrum). Markets with few operators are called "oligopolies", and may exhibit some monopoly characteristics which still require regulatory intervention. Regulators will be particularly careful, as in all competitive markets, to prevent operators forming "cartels", i.e. agreements to fix prices against the consumer interest. (This kind of regulation is known as "anti-trust" in the United States.)

More generally, in applying competition law, regulators are especially concerned to prevent businesses with substantial market power from exploiting this in order to gain an unfair competitive advantage over smaller rivals – for example, by predatory pricing (pricing goods below cost, in order to make it impossible for other companies to stay in business). Therefore, even when competition becomes established, regulators need to continue to monitor strategic market power and intervene when it is used against the consumer interest.

Convergence

Convergence has altered communications markets in many ways, particularly by adding new types of horizontal business integration to the vertical integration of networks and services which has always played a part in telecoms markets. For example, convergence enables service providers to bundle groups of services together for business or residential customers – as in the "triple play" provision of telephony, internet and cable television, and raises the possibility of horizontally integrated businesses cross-subsidising entry in one market from profits in another (e.g. using an established position in telephony to leverage entry into the ISP market). In some countries, companies which have historically been uninvolved in communications – such as other utilities and supermarket chains – have established telephony and internet businesses. They, too, can potentially leverage their position in one market in order to benefit their position in another, posing further regulatory challenges which require cooperation between communications regulators, those responsible for other utilities and general competition law authorities.

An increasing number of governments are addressing the challenges of convergence by establishing converged regulators, responsible for the communications sector as a whole, rather than just for telecommunications or for broadcasting. In some cases, such as the United Kingdom and South Africa, these new regulators draw together into one authority the personnel and powers that were previously vested in separate agencies for telecommunications, broadcasting and spectrum management. In others, notably in Malaysia and Singapore, an entirely new regulatory agency has been created, supported by new legislation which is concerned with the information technology sector as a whole.

New arrangements for converged regulation are particularly appropriate where there has been a move towards technology- and service-neutral regulation, and/or where

the aim is to achieve a market in which any consumer can use any platform, service and network to access any content (as in the European Union). However, there remain substantial differences in concept and practice between, on the one hand, economic and technical regulation, which has been the main purpose of telecommunications regulation, and, on the other, content regulation, which has been much more prominent where broadcasting is concerned. Few people within regulatory agencies have expertise in both economic and content regulation, and so these issues usually continue to be handled separately.

A few small countries, like many of the individual United States, have long had "public utility commissions", which regulate both communications and utilities such as power and transport. This saves some administrative costs, and enables some sharing of expertise in areas like the cost of capital, but the distinctiveness of the communications sector means that it has not been newly adopted in the new communications environment. ■

Chapter 17
UNIVERSAL ACCESS

Lead author ***David Souter***

The word "access" is used to describe two different issues in telecommunications:

- Firstly, it is used to describe access by service providers to the infrastructure owned by network operators, including their competitors. This is the sense, for example, in which it is used in the term "open access" (see Chapter 16).
- Secondly, it is used to describe access by end-users to networks and services. It is this sense which applies to the term "universal access" and which is discussed in this chapter.

Universal service and universal access

The terms "universal service" and "universal access" are used to describe policies which seek to ensure that affordable communications services are available to everyone within a country, throughout its territory and at all income levels. Achieving them therefore requires both network availability and affordability.

The distinction between the two terms is as follows:

- "Universal service" refers to the availability of affordable communications services for all citizens on a personal basis (within the home or through personal ownership).
- "Universal access" refers to the availability of affordable communications services for all citizens within the community in which they live but not necessarily on an individual basis.

A comparable difference is that between ownership of a vehicle (for example, a car or bicycle) and access to public transport.

Most frequently, the terms "universal service" and "universal access" refer to the availability of voice telephony. "Universal service" therefore implies (the right to and affordability of) a telephone in every home or for every individual, while "universal access" implies the availability and affordability of a telephone in every street or every village. However, the terms can also be applied to other communications services – either other platforms (like television), other services (like the internet) or higher standards of service (such as broadband). It is important to be clear which service or range of services is intended when the terms are used.

Trends in access

Near-universal access to telephones was first achieved in the United States in the 1950s, when teledensity reached over 75% (see the box below on measuring access for a cautionary note on teledensity). Western Europe reached similar rates in the 1980s. Until the late 1990s, however, teledensity rates in developing countries remained low, with those in the lowest-income countries rarely exceeding 1%.

These low access rates in developing countries reflected two things:

- The high cost of telephone services in relation to household income
- The fact that fixed telephone networks rarely reached beyond urban areas and the corridors between them, leaving much of national territory unserved.

Most people could not afford to own telephones or subscribe to telephone networks, and most rural areas were in any case beyond their reach.

Measuring access

The most common way of measuring access has been "teledensity", i.e. the number of telephone lines per 100 citizens. This has been adapted to measure other communications resources, such as computers and the internet.

Teledensity and similar measures are crude approximations because they really measure ownership of equipment (such as telephones and computers) rather than access to them. In developing countries, many people still access telephones through public facilities (such as payphones or street kiosks). Teledensity therefore measures ownership rather than use of telephones; and ownership of telephones, like that of other consumer goods, is highly dependent on income. Even where ownership is concerned, teledensity and similar measures are affected by factors such as household size. They therefore need to be used with caution.

The biggest change in telecommunications access has resulted from the introduction of mobile cellular networks – in the 1980s in Europe but particularly in the 1990s in Asia and since the late 1990s in Africa. Three factors have enabled mobile networks to transform the access context in developing countries:

- Mobile networks are much cheaper to deploy and so it has been possible to extend them on a commercial basis into rural, even remote rural areas.
- Mobile phones are much more flexible than fixed phones, and have made it much easier for small entrepreneurs to set up business as access resellers, formal and informal.
- Mobile phone companies have introduced more user-friendly payment options, particularly prepaid tariffs which make it much easier for those on low incomes to manage their telephone expenditure.

The impact on teledensity rates in developing countries has been dramatic, typically raising those in Africa from around 1% to around 25% in the decade from 1997 to 2007.

The large majority of people worldwide now make use of either privately owned or public access telephones, including the majority in remote and rural areas and low-income communities. However, there are still some areas in which telephone access is not yet available, and these may be the subject of universal access policies and funds (see below).

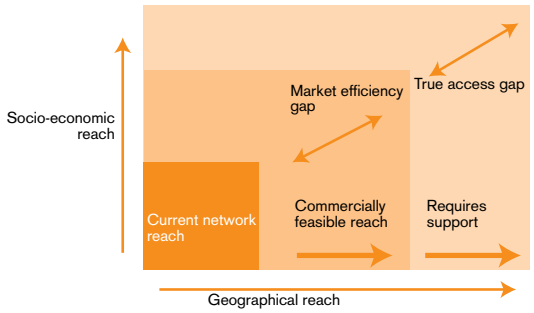
It should be noted that the rapid growth in telecoms use is not always recognised quickly enough by commentators. One figure that is still sometimes quoted, even in 2007, suggests that "there are more telephones in New York than in Africa." This was probably true in 1995, when it was first cited, but has long been wholly incorrect. In this rapidly changing area, it is crucially important to keep statistics up to date.

As telephone ownership has become widespread and telephone use near universal, the debate about universal access has moved on to other services and higher qualities of service. In particular, much discussion now centres on achieving universal access to the internet and on the extension of broadband facilities throughout national territories. At present, mobile networks do not offer the same level of access to the internet that can be offered by fixed networks. However, new wireless technologies are constantly being developed and, as the first decade of the 21st century draws to a close, there is increasing belief within many telecommunications businesses in Africa that mobile networks will provide the main means of access to the internet on that continent in the medium term. The potential of new mobile technologies is discussed in Chapter 14.

The access model

A simple model is often used to describe the development of communications access. Although this model is usually used for voice telephony, it is equally appropriate for considering access to the internet or broadband. The model centres on the diagram in Figure 17.1.[1]

Figure 17.1: **The access model**



In this diagram, the horizontal axis represents the territory which is covered by telecommunications networks, while the vertical axis represents the population which can afford to make use of telephone services. The space within the diagram is made up of three areas. In the bottom left hand corner is the area of high population density and higher-income citizens which has historically been well served by telecommunications companies. Beyond this lie two areas which are unserved:

- The "market efficiency gap" covers the area which is still unserved, but in which services would be profitable (and in which capital costs could be recovered) if networks were extended to them.
- The "true access gap" covers the area in which services cannot be provided profitably, and in which subsidies will therefore be required if access is to become available.

At the top right-hand corner of the diagram lie those furthest from telephone access and most difficult to reach: the poorest people living in the most remote locations.

In the past decade, two developments have moved the boundaries between these three areas of access and potential access. Wireless technologies have made it cheaper to deploy networks and so moved the horizontal axis boundaries towards the right of the diagram. Competition has lowered prices and so moved the vertical axis boundaries towards the top of the diagram. As a result, telephone service is now available in many

1 Variations on this diagram have been used by the World Bank (this example), the ITU and other agencies.

more geographical areas and affordable to many more people, and the area covered by the "real access gap" is much smaller than it used to be. It is this "real access gap" which is addressed by universal access policies and funds.

Telephone usage patterns

How do people use telephones and how much do they spend on them?

Spending on telecoms falls into two main categories:

- That which has a high return value, either financially (because it saves on other costs such as transport, or because it facilitates access to financial help such as remittances) or socially (because it maintains family contact or provides essential information).
- That which has a low return value, which might be considered luxury expenditure.

Research suggests that, when telephones first become available in low-income communities, people use them most for gaining help at times of crisis and for maintaining contact with family members living elsewhere. Only the more prosperous and more educated use them significantly for business purposes or for communications with a lower return value. However, this may change over time, and there is at present too little research about the way in which the usage patterns of low-income subscribers and public access users change as people become more accustomed to the availability of telephones.

SMS (texting) services increase the potential value of mobile telephony by offering another, cheaper mode of communication, which can be used both as a substitute for voice telephony and as a means for mass distribution of information to subscribers (in effect, a substitute for broadcasting certain types of content). In some countries, a very high proportion of mobile telephone traffic consists of text messages, although this level of preponderance remains exceptional.

Research has suggested that people tend to spend around 5% of household income on telecommunications where telephones are available. This figure tends to be lower in high-income countries, where telephone (and internet) costs are low in relation to incomes. In the poorest communities, figures as high as 10% and more have been recorded. However, these high levels probably reflect the high value which can be obtained from telephone use (in saving costs and maintaining family contact). When assessing telephone use, especially among the poor, it is important to remember that what is being bought, when a telephone is used, is often not telephone use as such but access to something else (such as family news) which would otherwise incur different transaction costs (for example, transport).

The "bottom of the pyramid"

A lot of attention has been paid recently to "bottom of the pyramid" or "BoP" markets – a term coined by the Indian economist C. K. Prahalad. BoP markets are those serving the very poor, who are unable to spend significant sums of money and who have often been considered commercially unviable by large companies, including telephone companies.

The key to reaching BoP markets lies in enabling the poor to buy very small amounts of a product or service and aggregating these very small amounts in a way that makes them commercially viable. The poor have always been served in this way by street traders breaking down the quantities in which products are commercially sold – for example, selling individual cigarettes.

Mobile phone networks have been able to reach BoP markets in a number of ways that previous telephone networks could not achieve:

- Street traders in most developing countries offer people the opportunity to buy telephone access in small units when and where they want it. Access does not depend on telephone ownership and people can make their own decisions about how much or how little they want to spend at any time. The practice known as "beeping" or "flashing" is also widespread. This happens when someone rings another person's number but hangs up before the correspondent replies, implying that s/he should call back. People in poor communities in rural areas often use this to ensure that telephone charges are met by better-off relatives living in town.
- Some telephone companies have established their own public assess networks or built franchise systems based on kiosks and others selling airtime. At the more substantial end of the spectrum, this includes various types of "telecentre" (see below), as well as streetside airtime vendors. One of the best known public access networks aimed at BoP markets is Grameen Telecom's Village Phone programme in Bangladesh, an initiative of the commercial mobile phone company Grameen Telecom, which is partly owned by the microcredit Grameen Bank. This provides microcredit to existing Bank customers, mostly women, enabling them to establish airtime resale businesses in their villages.[2]

Universal access policies and funds

Universal access regulation differs from most communications regulation because it aims to meet a public policy objective rather than to promote competitive markets. Its public policy objective is to enable all citizens to have

2 See poverty2.forumone.com/files/14648_Grameen-web.pdf

affordable access to specified telecommunications services. This objective is pursued because governments believe that communications access empowers people and enables them to access greater knowledge and opportunity. Governments also believe that widespread communications facilitate higher levels of economic activity and so stimulate national economic growth.

Universal access targets have often been included in operating company licences. These targets may be based on teledensity (the number of telephone lines per 100 people) or on geographical reach (for example, the number and type of communities that have telephone access, or the distance that must be travelled to reach a telephone). However, teledensity targets can often be reached without significant network deployment in rural areas. The rapid growth of mobile phone use also means that such targets have not proved very challenging in practice.

Universal access funds are funds established to finance the extension of communications networks into areas which are not commercially viable – the "real access gap" in the diagram above. Quite a number of countries have now established universal access funds and collected money for them, often through levies charged on the turnover of telephone companies. The main challenge in distributing these funds lies in ensuring that they are used only in areas where there is a genuine need for subsidy. This requires careful analysis of the balance between capital (or network deployment) and operational costs (only the former usually require subsidy) and of changes in demand (areas which require subsidy at low levels of demand may not require it if demand rises above expectations).

Some countries have sought to use competitive processes to select the providers of universal access networks. One method – which was pioneered in Chile and other Latin American countries in the 1990s – is to use what are known as "reverse auctions" or "reverse subsidies". In these processes, the government or regulator divides areas which are not served by telephone networks into lots; identifies the maximum subsidy which it is prepared to provide to support network deployment in those areas; and then invites competitive bids from telephone operators to deploy networks at a lower level of subsidy than the sum identified. The main advantage is that this requires bidding companies to make commercial decisions about the level of subsidy required, and so tends to produce more access for less subsidy. Reverse auction processes have been considered successful where there has been sufficient competition between operators, but may not be so appropriate where only one or two companies might be able to take part in bidding.

There has been criticism recently that some countries have not made effective use of universal access funds, allowing large sums to accumulate unused in government bank accounts. One reason for this is probably that the territorial range of commercially viable mobile network deployment has proved to be far greater than was envisaged when universal access funds were first established. This has led to suggestions that the funds should be used to support access to the internet or broadband networks rather than to basic voice telephony.

In recent years, some alternative approaches to infrastructure deployment have been proposed. The traditional model of universal access development has reached out from areas which have established networks to areas where networks are not available – from the bottom left hand corner of the access diagram above to its top right hand corner. This model assumes that access provision depends on extending networks outwards from areas that are already served, and on large-scale business models. There are now a few examples of an alternative approach, in which local or community access networks are built around local communications demand and then reach out to establish connectivity with established national networks.[3] These examples usually combine communications with other infrastructure needs, and draw on development funds or revenue streams other than those from communications alone. More research is needed on where they are likely to be most effective.

Access to the internet

Access to the internet is achieved through the telecommunications network, and affordable telecoms access is therefore also a fundamental requirement for internet access. However, there are a number of additional factors involved in enabling internet access. These include individual capabilities and social and economic factors as well as factors which are inherent to communications networks.

Internet access can be provided through both fixed and mobile networks. However, the quality of internet access – in particular, access to more sophisticated websites and internet services, and the speed at which they can be accessed – depends on the amount of available bandwidth. This is principally affected by four major elements of infrastructure:

- The capacity of available international networks to deliver bandwidth to the local subscriber network
- The capacity of the local backbone network
- The capacity of the local access network
- The capacity of the subscriber terminal itself.

3 See Section 2 of Amy Mahan and William F. Melody, eds. *Diversifying Participation in Network Development* (Lyngby: LIRNE.NET, 2007) www.regulateonline.org/content/view/1044/63

Internet access is therefore substantially dependent on the communications infrastructure that is available and the terminal devices which it can support. This importance of infrastructure gives impetus to efforts which are now being made by many governments and regulators to extend broadband access throughout geographical territories and to facilitate access to it by end-users. This includes regulatory measures to encourage private sector investment in broadband backbone networks and local loop upgrading, and, in some cases, direct investment by governments themselves in national fibre backbones.

Most internet users in industrial countries now have access to high-speed broadband networks, offering a minimum speed of 512 kbps and usually much more, while subscribers in developing countries typically rely on dial-up internet access with speeds of up to 64 kbps (depending on the extent to which access is shared). The difference in quality of internet access resulting from this discrepancy is much greater than the difference in quality of voice telephony between industrial and developing countries. In addition, the overall subscriber costs for any significant level of internet use are substantially lower for broadband users in industrial countries than they are for dial-up users in developing countries.

Wireless networks provide an alternative means of providing internet access to mass market. Mobile networks provide the majority of telecommunications access in both rural and urban areas of most developing countries. Although first and second generation mobile networks and devices were capable of delivering internet access, their capacity and speed were much more limited than fixed networks could provide. The screen size of wireless devices was another limiting factor.

However, two factors have led to substantial rethinking about future internet access during 2008, particularly in telecoms businesses in Africa, where fixed networks are least effective. These are, firstly, the advent of third generation (3G) and HSPDA[4] mobile networks, which offer much higher speeds for internet access; and, secondly, the increasingly widespread design of web content for delivery on diverse platforms including mobile handsets.

It seems clear that broadband-capable phones and other wireless devices will be widely available in Africa long before fixed networks can offer broadband services. In societies where mobile phones are now commonplace but computers rare, many African telecoms businesses now assume that most Africans will experience significant internet use firstly by mobile devices rather than PCs, and see this as a potential major growth market. By the end of 2008, considerable effort was being put into the development of wireless internet applications around the world. Some within the industry were talking about the potential for wireless internet in low-income countries as being comparable with the experience of growth in mobile telephony over the previous decade; and even about mass internet use in such markets bypassing the use of computers altogether.

Meaningful access to the internet is also much more dependent on user- and locality-specific factors than voice telephony. Two main factors are important here for the individual:

- Internet use requires more skills than voice telephony. Firstly, almost all internet use – including email and web browsing – requires literacy, which is not required for telephony. Secondly, as the majority of internet content is in a small number of European and Asian languages (particularly English and Mandarin), much of the content which is available requires literacy in those languages. Thirdly – and the importance of this is often underestimated when the potential of internet access is discussed – it requires usage skills (research and interpretation skills) which enable users to locate relevant content, assess its reliability and interpret its meaning for their own purposes.
- Internet use requires more financial resources than voice telephony. Firstly, it requires access to a terminal device capable of delivering internet access and use in an appropriate form – most usually, to date, a computer. Money is also required for access itself (subscription to an internet service provider or access to a telecentre with internet access), and for the use of the telephone line over which access is available (subscription charge and, in the case of dial-up and telecentre access, usage charge). Usage charges rapidly grow with the complexity of internet use: "browsing the web" is much more expensive than sending a quick email or briefly accessing a single website.

These factors make internet access inherently more unequal than access to telephony, with a much more substantial "digital divide" between the rich and better educated, on the one hand, and the poor and poorly educated, on the other. These individual access questions are not necessarily susceptible to communications sector interventions. The skills required to increase the value of internet access are primarily gained through education, not communications – although experience and training are important, particularly for services specifically targeted towards the poor. The costs of internet access can be reduced through changes in policy and regulation and through improvements in infrastructure, but affordability for the individual will always depend ultimately on income and on individual or household expenditure priorities.

At a community level, the two key issues here are concerned with access and content. Issues to do with content are discussed in Section 5 and in Chapter 32 of this handbook. The following paragraphs are concerned with access in communities.

4 High-speed downlink packet access, an enhanced 3G protocol.

Cybercafés and telecentres

Public access facilities are important for telephony in developing countries, but even more important for the internet because it is more expensive to use and requires the use of more expensive terminal equipment. The majority of people in the United States and the majority of internet users in Western Europe now use the internet from home. In developing countries, however, a high proportion of internet users access the internet from work (or places such as universities), or from public access facilities such as cybercafés and telecentres.

The terms "cybercafé" and "telecentre" are inexact. "Telecentre", in particular, is used to refer to quite a wide range of types of facility, from basic telephone kiosks to multi-purpose locations offering a wide range of ICT services, including e-government and e-business services. However, in general, the term "cybercafé" or "internet café" is more usually used to refer to a private sector public access facility, run by an entrepreneur on a commercial basis; while the term "telecentre" is more usually used to refer to a facility which is subsidised by government or a development agency, and which often has a developmental as well as (or instead of) a commercial focus. That is the distinction used within this handbook.

Entrepreneurial cybercafés have become widespread within urban areas in almost all developing countries over the last five years, and along major transport routes, but are not yet widespread in rural areas. Their business model is dependent on fairly high levels of demand, although many cybercafés also offer other services (such as selling prepaid mobile phone vouchers) within a broader business portfolio. The rate of growth of cybercafés suggests that they are proving significantly profitable in more areas than originally anticipated.

Cybercafés are generally opened in the expectation of meeting latent demand. Telecentres are more often opened in the expectation of stimulating demand. Experience with them has therefore, not surprisingly, been more mixed. They are strongly supported by some – such as the Canadian International Development Research Centre (IDRC) – as, in effect, the cutting edge of ICT4D; while others have been more critical, in particular of the fact that many have failed to achieve sustainability without continued subsidy.

The impact of cybercafés and telecentres on local communities has not yet been adequately assessed. Most studies which are available have focused on their users rather than on the communities in which they are located as a whole. These studies tend to confirm that certain social groups – the young, the more educated, entrepreneurs – are more represented amongst users than others, particularly the poor and marginalised. The location and ambience of facilities can be important here, particularly where access for women is concerned. As well as these social groups, many cybercafés and telecentres gain a good deal of custom from business travellers, tourists and expatriates.

The extent to which cybercafés and telecentres reach into the general population is a matter of debate. At present, the evidence suggests that many are predominantly used by a relatively small percentage of the local community. Even high levels of use by individuals can coexist with low levels of use within the surrounding community, and more evidence is needed concerning the use of cybercafés and telecentres by the general population in their hinterlands. What evidence there is suggests that stimulating use of such facilities requires more than simply providing access, and that training and induction could also make a substantial difference to both use and impact. ■

Section 5

The internet

Chapter 18
INTERNET TECHNOLOGY AND NETWORKS

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Introduction

This chapter briefly describes some of the most important issues in internet technology and network management. It is concerned principally with how the internet works, including how it differs from telecommunications networks, and with some of the technical issues that arise in discussions of internet services and governance. The structure of the internet – i.e. the relationships between different actors in the internet supply chain – and the services it offers to end-users are discussed in Chapter 19. Issues of internet management and governance are discussed in Chapters 20 and 21.

Two things crucially distinguish the internet from other communications media.

- Firstly, it is a packet-based network. In a packet-based network, data for transmission are divided into a number of blocks, known as packets, which can be sent separately from one another and reassembled by the recipients' equipment. The way in which a packet-based network transmits information between users is, therefore, focused on the data that are distributed rather than on the connections between users. In particular, unlike traditional telephone connections, the links between internet users do not require a dedicated channel between users to be set up before communication begins, or to be continuously open while communication continues.
- Secondly, the packet-based nature of the internet enables it to function as a network of more or less independent networks. The internet is defined by the principles as well as the technology that hold these disparate networks together into a common global network.

Technical descriptions of the internet often focus on the specifics of technology, such as its multilayer stacked architecture, the interfaces between these layers, technical protocols, and the bits and bytes that define how the protocols work at a detailed level. Some of these issues are discussed in this chapter and/or elsewhere in this handbook.

While detailed technical discussion is useful in an introduction to network technology, it does not sufficiently explain the entities that hold the various networks together in a single internet and which are crucial to understanding internet policy. This chapter is therefore most concerned to describe the logical constructs that make the network work.

The underlying logical structure comes in two varieties: design principles and organisational constructs. The chapter describes the constructs briefly, and also gives a basic overview of the roles of code, protocols and standards. Firstly, however, it describes the Internet Protocol suite, commonly referred to as TCP/IP, and the fundamental layered architecture of the internet (although this architecture is often followed more in the breach than in actuality).

Basic viewpoint

At a very high level, the mechanics of the internet are quite simple. Computer systems and other networking entities (including telephones, Play Station 3 systems and some household appliances, even refrigerators) can all be connected to the internet. Each of these named entities can be found at an endpoint that sits at some location in the network. When they are connected, each must have an identity (name/number) which is globally unique. Specialised systems manage the movement of messages/data from one named entity to another by following routes that are usually discovered and selected by the network itself. In short, there are things with names that live at addresses and which send messages to one another along routes.

This works because the network is based on certain principles and uses code based on protocols that have been standardised. The fundamental protocols are included in a suite which is known as TCP/IP. Before describing them in more detail, it is useful to clarify the role of protocols, standards and codes within the internet.

Protocols, standards and code

The rules which govern the organisation of the internet are set out in protocols, standards and codes.

- The term "standard" is used in a wide range of industries, to identify technical interfaces and specifications with which the designers of new products and services must comply. Standardisation has been particularly important in telecommunications

networks, especially in enabling the interoperability of different networks, technologies and equipment. It gives formal or de facto authority to agreed approaches to technology development.

- Within the internet, the details of addressing, naming and routing are standardised in what are known as protocols. A protocol is the set of rules that determines the format and transmission of data. A protocol defines a generally loosely ordered set of instructions and defines the meaning and position of all of data within a message.
- Code is the symbolic arrangement of data or instructions in a computer programme, or the set of such instructions that constitutes instantiation of a protocol. In short it is code that gives substance to a protocol and makes it a part of the internet; and it is code that makes physical hardware interoperate.

There are many protocols used within the internet. Two sets of protocols are most prominent: the TCP/IP suite of protocols which enable packet forwarding and data delivery and are maintained by the Internet Engineering Task Force (IETF); and the HTTP, HTML and other protocols which underpin the World Wide Web and which are maintained by the World Wide Web Consortium (W3C).

There are many different ways in which protocols and standards can be created. While there is no rule that says that all internet protocols and standards are created in exactly the same way, a common process has often been followed.[1] Consensus – the achievement of broad agreement with the absence of strong disagreement – plays a major part in setting internet standards.

In the IETF process involved in the TCP/IP suite of protocols, most often a need becomes apparent – whether technical-, service- or business-related – for which there is no existing protocol, or for which existing protocols are insufficient. Although this was not always so, a requirements or framework document is often written before a new protocol is developed to meet the need. Often a specification for a protocol is written and distributed through a set of public documents, called Internet Drafts, to any other person who is interested in a new protocol. If there is widespread interest in it, especially in a commercial environment, a decision may be taken to form a working group to work on the protocol and to move it in the direction of standardisation. Though a working group is not necessary, one is often set up.

Once a protocol has been developed it is tested before it can begin moving towards standardisation. In this case, testing means that several independent instances of the protocol must be created and tested against one another to demonstrate that they can interoperate. If they can do so, this is taken to mean that the description of the protocol is sufficiently clear for unambiguous implementation. If not, then further clarification is required before the protocol proceeds towards standardisation.

Since standards are meant to indicate that code implemented in accordance with a standard will work with other code implemented in accordance with that standard, this step – the writing and testing of code – has become one of the most important in the IETF process. As a standard and its protocol mature through public use it can progress from being a Proposed Standard to a Draft Standard and finally to Internet Standard status. These stages of standard reflect the degree of deployment and testing the protocol receives in the internet. However, in practice, not all standards that are in use within the internet go through this full process; many of those which are widely used are still, formally, Proposed Standards.

TCP/IP

The term often used to refer to the protocol suite used in the internet, TCP/IP protocols, is a historical reference as well as a reflection of current usage today. TCP, the Transmission Control Protocol (RFC 793, Std 007), and IP, the Internet Protocol (RFC 791, Std 005), were two of the first three protocols introduced as the new internet developed in 1980/1981. The third original protocol was the User Datagram Protocol (UDP, RFC 768, Std 006). IP, specifically IPv4 (IP version 4), and TCP still (at the time of writing, mid-2009) handle most of the network traffic. IPv4 effectively handles over 99.99% of the traffic at the internet layer. While use of IPv6 (IP version 6) was still negligible in the internet at this time, it did figure in some research networks such as CERNET2, which is 100% IPv6. TCP handles somewhere between 90% and 95% of traffic in the transport layer, depending on where it is measured, with UDP handling somewhere between 6% and 9% of traffic. There are also other transport protocols, but these have little usage proportionally.

IP provides the central datagram functionality of the internet. The basic principles involved are both simple and highly flexible. This is generally felt to have contributed substantially to the internet's ability to absorb new technological opportunities and to innovate in the provision of services. IP basically encapsulates the datagram, or packet, with the source and destination addresses as well as information such as type of service, which gives an indication of how a packet is to be treated in terms of priority and queuing, total length of the datagram, "time to live" of the packet (i.e. how many hops it can take through the network before it should be discarded), a checksum for confirming that the information in the header has not been tampered with or accidentally changed, and a

1 This is the model followed by the IETF, which is responsible for most of the standards that make up the lower layers of the internet. A full explanation can be found in *The Internet Standards Process - Revision 3* (1996) www.ietf.org/rfc/rfc2026.txt The World Wide Web Consortium (W3C) uses a different standardisation process.

protocol identifier that tells the system the identity of the next encapsulation, most often the value 6 for TCP. There is also a flags field that gives indications of details such as whether a datagram can be fragmented into smaller packets if one of the networks transited requires it, and whether the packet has been fragmented.

The TCP header and protocol are much more complicated than IP or UPD, and it is still an active object of research study today. As indicated it is the most common transport encapsulation. While IP is responsible for the datagram, hop-by-hop nature of the internet, TCP is responsible for establishing connections between two endpoints. UDP, on the other hand, only provides a minimal encapsulation for those upper layer protocols that do not require a connection between the endpoints. TCP is also critical in helping to control congestion in the network by modulating the sending rate based on conditions picked up from the connection it establishes.

Both the TCP and UDP encapsulation headers include information about the source and destination ports. Ports are internal endpoints that identify the next level encapsulation of the packet, most often an application protocol. Each protocol has its own defined port, which is defined by the Internet Assigned Number Authority (IANA),[2] as are all protocol parameters. Additionally, TCP contains information necessary for initiating a connection (sometimes called a data stream), SYN and ACK indicators, as well as the window size, an indicator of how much data the receiver is willing to have sent before the sender must wait for an acknowledgement that the receiver is willing to receive more data. This mechanism provides much of the congestion control mentioned above. The TCP header also includes sequence numbers so that the receiver can determine if it received all of the packets that belong to the stream. Packets can arrive in TCP out of order since the nature of the IP datagram layer is to send each packet on as best it can without any consideration of the other packets in a stream – IP has no indication of the stream or non-stream nature of the data it forwards. The TCP receiver is responsible for ordering these packets on receipt before passing them on to the next layer.

Layered architecture

In the basic explanation of TCP and IP above, reference is made several times to "layers". The basic notion of layers involves the idea that a particular sort of task is dealt with by one protocol in an ordered set of protocols called a protocol suite. In contrast to the OSI 7 layer model, the internet is sometimes discussed as having four essential layers above the hardware:

- An application layer that includes network control protocols such as DHCP, DNS, NNTP, NTP; internet telephony protocols such as SIP or MGCP; web protocols such HTTP and SOAP; email protocols such as IMAP4, POP3 and SMTP; management protocols such as SNMP; security protocols such as SSH, SSL and TLS; middlebox control protocols such as STUN; and the routing protocols such as BGP and RIP.
- A transport layer that includes TCP, UDP, DCCP and SCTP.
- A network protocol layer that includes IPv4, IPv6 and ICMP.
- Link layer protocols that allow access to the underlying physical layer such as Ethernet, Wi-Fi and DSL.

The services provided by the internet rely on these protocols and the mechanisms provided by the layered architecture for progressive encapsulation of data received from the higher layer protocols.

In addition to the layered structure, several recent developments have made the actual internet less structured in practice. There are many occasions where a protocol like GMPLS, used to control optical networks using an IP-based control mechanism, is overlaid by IP, which in turn is overlaid by MPLS (used to create virtual private networks or VPNs), which is in turn overlaid by the rest of the TCP/IP stack. Such layer inversion and layer stacking become more prominent as the complexity of the interconnect increases. Protocols like MPLS and IPSec (IP security protocols) create tunnels through the internet that make many of its traditional elements based on strict layers inoperable.

These inverted and tunnel structures have been necessitated by some of the services required by users. The services delivered through the internet, and the role of internet service providers, are discussed in Chapter 19.

Routing

Routing is a complicated and esoteric field of network engineering. It is also crucial to the function of the packet/datagram-oriented internet. Without routing of some sort, packets could not travel from their source to their destination.

Using some rules, some preset knowledge and a variety of methods, devices known as routers transfer packets from one part of the internet to another, one hop at a time. They do this by building tables that identify the direction a packet should take in order to reach another network, computer or person, very much like the road signs found at crossroads. To describe it simply, every time a packet enters a router, the router's programming checks its destination address against the table and sends that packet onward on a route that will most effectively move it towards its destination. After a packet is despatched by one router, it is received by another. The process repeats until such time as one of the routers passes the packet to its final destination.

2 IANA is responsible for all names and numbers used in the internet. While dealing with domain names, it is answerable to ICANN, while in terms of protocol numbers it is answerable to the Internet Architecture Board (IAB) (see Chapter 20).

Routing has been affected by the use of GMLS and MPLS and is involved in creating the map needed for the use of these protocols. Internet service providers and carriers are responsible for deploying and maintaining the routing infrastructure.

Design principles

Having looked at some of the details of the internet protocols, we can now return to the theoretical constructs that have allowed this complex network to come into existence.

Design principles are engineering constructs that are used to guide system designers – in the case of the internet, network system architects and protocol designers – in their work.

Much of the work involved in engineering, of all kinds, requires specialists to consider several possible solutions to a problem and select that which best satisfies a set of aims while meeting relevant constraints. Many factors affect this choice, including cost, ease of deployment and political sensitivities as well as technical feasibility. In order to achieve coherence, it is critically important that the principles that guide decisions are consistent throughout a system, regardless of who designs particular components or when those components are designed. The technology that constitutes today's internet has been in development since 1980 (although some of the earliest relevant work was done as early as the 1960s, in the ARPANET, or even earlier – see Chapter 20). The TPC/IP-based internet itself has been undergoing continuous evolution and development since the 1980s and is still subject to very rapid change today.

Four design principles are particularly worth bearing in mind when thinking about how the internet evolves:

- Packet-based networking
- The end-to-end principle
- The "hourglass" model
- The so-called Postel robustness principle.

These are described in the following paragraphs.

Packet-based networking

The possibility of packet switching as a network technology was first discussed by Paul Baran and Leonard Kleinrock[3] in the 1960s, as part of the ARPANET project to build a network that could survive catastrophic destruction of environments. It differs fundamentally in concept and structure from traditional communications networks such as those in telephony and broadcasting.

The public switched telephone network (PSTN) networks that have provided the basis for telecommunications networks in the past (and still provide it for most today) require a centralised service to create and track the connections that are made between subscribers/users. In a packet-based network, by contrast, no continuously open physical connections are made between source and destination subscribers by a centralised switching system. Instead, the information that is being transmitted is broken up into discrete chunks called packets or datagrams and is routed across the network using the best paths that are available at that instant, by hopping from one network connection point to another ("hop-by-hop routing"). Selection of routes is not predetermined, but done as and when a packet is transmitted. Instead of continuously open channels, the internet therefore makes use of opportunistic routing. This makes it much more robust than the PSTN because it can continue to transmit information when any particular link goes down.[4]

Packet switching also allows for the network to be built up in various areas as an emerging network. There is no need to conceive of a whole network being completed before any part of it is used. Rather, each group that is interested in building a network can build one and then find ways of connecting to others who are also building a network. While it is sometimes hard to see this original characteristic in today's global and commercial internet, it did start as a collection of independent networks that were interconnected with one another, and this principle remains essentially true today.

The end-to-end principle

The end-to-end principle was first described in 1980 and has, to a large extent, also remained central to the architecture of the internet. It is frequently cited in political arguments about the future direction of the internet. Many use the end-to-end principle to support their views, though sometimes with different interpretations that do not necessarily reflect the original principle or its meaning.

In its simplest form, the principle suggests that the only elements that belong in the deepest layers of the network are those that are useful to all other parts of the

3 There are competing claims as to who first conceived the notions that are the foundation of the internet. Generally, though, there is agreement that Baran's work on packet switching and Kleinrock's research on queuing theory were instrumental in the creation of the ARPANET, which was a precursor to today's internet.

4 It should be understood that packet-based networks can support the creation of connections at higher levels of the system. Also, connection-oriented packets can support packet-based services – in fact, many segments of the internet run over connection-oriented telecommunications networks. Additionally, there are several technologies today, such as MPLS, that use the packet-based network to create path-oriented networks that bear a remarkable resemblance to connection-oriented networks.

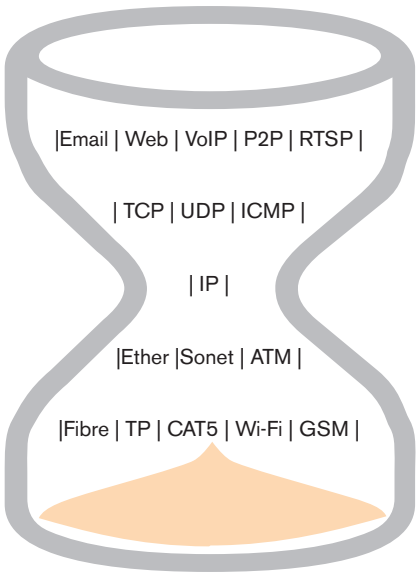
network.[5] This has often been interpreted to mean that the specific functionality an application needs should be as close to the user as possible, in other words "at the edge or end of the network" – provided, of course, that this function is not also needed by other applications.

Another way in which this is sometimes expressed is the proposition that, in the internet, "intelligence" is or should be "at the edges of the network". However, some internet commentators would say that this misunderstands the principle, which they say focuses on placing functionality at *the most appropriate place* in the network. If the function is most easily placed in the core and is useful to most or all of the network, then, they argue, it is not an infraction of the end-to-end principle to put it there rather than at the edge. For example, the intelligence needed to route messages from one network to another is placed in the core of the network without this being an infringement of the end-to-end principle.

The hourglass model

While rarely described as a principle, the "hourglass model" has been another central tenet in the design of internet protocols (see above). Simply put, this is the design decision that places the Internet Protocol, IP, at the centre of an hourglass, as illustrated in Figure 18.1.

Figure 18.1: **The hourglass model**



5 The original article on the end-to-end design principle can be found at web.mit.edu/Saltzer/www/publications/endtoend/endtoend.txt

According to this principle, all of the internet's higher layer protocols converge into this one protocol, and all of the lower layer protocols fan out from it. The idea behind this is to have a common point in the protocol stack that allows for the addition of new connection technologies – such as Wi-Fi and WiMAX – and new applications – such as voice over IP (VoIP) and IP television – without needing to change the basic network layer which guarantees the distributed connectivity of the internet.

Many commentators argue that the hourglass model has been a critical enabler of innovation in new applications and services for users through the internet. One implication of the introduction of IPv6 (see below) is that it has widened the waist of the hourglass, such that now applications and link technologies need to have awareness of more than one network protocol, i.e. of both IPv4 and IPv6. This effect is compounded by the addition of multicast and quality of service functionality at the network layer.

Many writers have also suggested that the original hourglass principle is threatened by layer inversion such as layering MPLS over IP over GMPLS, and by the proliferation of tunnelling technologies in the core of the internet (see above).

The Postel robustness principle

This principle, originating with the internet standards pioneer Jon Postel, can be summarised as follows: "Be conservative in what you send and liberal in what you accept."[6] In the network sense it means that the utmost effort must be made to allow messages to continue their way across the system. By being as strict as possible in what a system sends, it attempts to be clear in its instructions and not give another system ambiguous information. On the other hand, it also accepts that even when some other system is not as careful in the strictness of its messages, if there is any way to comply with the request within the security and stability constraints set by the system, the message should be processed.

While the robustness principle originated in the description of TCP, it has been applied to most of the protocols in the TCP/IP suite.

Organisational constructs

Having considered basic design principles, the following sections of the chapter look in turn at three fundamental organisational constructs of the internet:

- Naming
- Addressing
- Routing.

6 The principle was first stated in RFC793, Transmission Control Protocol (the TCP of TCP/IP).

Naming

Every system or network participating in the internet has a name. These names are currently defined in a single distributed global naming framework called the domain name system (DNS).

The domain name system is a directory system that provides mapping between the name of a system or a service and the IP number by which and at which that named entity can be found. By referencing the DNS system with a name, the system gets back the number it needs to send datagrams of packets to the target system.

Management of the domain name system is the responsibility of the Internet Corporation for Assigned Names and Numbers (ICANN), together with regional and national internet governance bodies. Governance mechanisms for the domain name system are described in Chapter 20. The following paragraphs describe a few technical issues associated with the DNS.

The DNS is a distributed address database available to all systems participating in the internet. Its hierarchical structure is very similar to that of the file hierarchy within a computer operating system such as Mac OS X, Linux or Microsoft Windows.

Each level of a domain name defines another level in the hierarchy of a name. For example, in the name www.apc.org (that of the Association for Progressive Communications):

- .org is the top level domain (TLD) name, designating the registry responsible for the root of this domain name.
- .apc is a second level domain name, designating the registered person or institution to whom this branch of the tree is assigned.
- www. is a third level name, identifying the location of the World Wide Web server in this network.

Specific pages within a website are located through additional strings of characters attached to this domain name. The unique web location address for a webpage or document is called its unique resource locator (URL). For example, this handbook can be found on the APC website at the URL handbook.apc.org.

There are three varieties of TLDs:

- Generic TLDs (gTLDs) such as .com, which are under the control of ICANN.
- Country code TLDs (ccTLDs) such as .za (South Africa), which are mostly defined according to the ISO 3166 standard, and which are independent of ICANN but may have a voluntary agreement with it.
- TLDs such as .mil, .gov and .edu which are under US government direct control.[7]

At time of writing (mid-2009), there were sixteen generic TLDs governed by ICANN: .aero, .asia, .biz, .cat, .com, .coop, .info, .jobs, .mobi, .museum, .names, .net, .org, .pro, .tel and .travel. There were also 252 ccTLDs, of which over 90 participated in ICANN. Work was underway to open applications for the creation of more ICANN generic TLDs (see also Chapters 20 and 21).

The domain name system enables end-users of the internet to access websites and other internet resources using names (which are descriptive and easier to remember) rather than numbers (which are much more difficult for people to recall). In practice, however, protocols translate domain names into numbers in order to address resources on the internet.

Whenever someone accesses a domain such as www.apc.org, her/his computer uses the internet to request a translation from that name to its associated numerical IP address. To do this – unless the name is already known and cached on the computer or close to it on a network – it submits a request to one of thirteen named "root servers".[8] The root servers act as directories for top level domains (such as .org) and point to other servers at other levels within the domain name hierarchy in order to help find the IP address required. In the case of the Luleå University of Technology, for example, whose World Wide Web domain name is www.ltu.se, the root server will first find out the address of the .se name server, which is the registry database that has definitive information and references on all the second level domain names registered under the domain .se (the country code top level domain for Sweden). Once this is obtained, the address for the definitive server for ltu.se is requested. Once the address of the name server for www.ltu.se is obtained, then the numerical address for www.ltu.se is returned to the user's system, and allows connection to the university server to be made. This numerical address takes a form such as 130.240.42.55 in IPv4.

The DNS does not appear limited in the number of names that can be stored. It has been limited, however, in that it has been capable only of handling names stored in a subset of Latin characters called LDH. This comprises the letters a to z in lowercase form, the digits 0 to 9 and the simple hyphen (-). Moving towards a more international domain name structure, including more characters and more alphabets, has been an important issue in internet governance, and a method has been developed for handling more names in other character sets. This is referred to as internationalising domain names in applications (IDNA).

7 The TLD .int is reserved for international treaty organisations.

8 There are thirteen named root servers serving the world. These thirteen root servers are replicated in order to distribute the load and bring it closer to the users of the internet. While the number of replicated servers is constantly increasing, there are currently 144 root servers worldwide. More information can be found at www.root-servers.org

IDNA[9] is defined in a series of standards and informational documents which set out how a character string typed in the script of a non-LDH-based alphabet can be transformed into a unique LDH string called punycode. In order to distinguish these internationalised domain names (IDNs) in the DNS, the punycode contains a prefix: a tag beginning xn--. Using this, any system can identify and differentiate between conventional LDH domain names and IDNs. An example may help: the Hebrew word for "master", לעב, could be used as part of a domain name. In this case the DNS entry for that name would be xn--5dbwr.[10]

While IDNs were not yet generally available for top level domain names at the time of writing (mid-2009), they had been in use for some time for second level domain names, and it was expected that ICANN would make IDN TLDs available in the near future.[11] Work was continuing on both the policy issues and the technology required to make more non-Latin scripts available for domain names.

Addressing

Internet addresses come in three basic forms: IP version 4 (IPv4) addresses, IP version 6 (IPv6) addresses, and autonomous system (AS) numbers.[12] Based on the information contained in these numbers, as well as other information that may or may not be used, a message is sent from one system to another system along a route determined by rules set in the routing system of the internet. Most debates in this policy area revolve around the two varieties of IP address, though occasionally AS numbers will also be raised in non-technical discussions.

Depending on how you look at it, an IP address points either to a single object, a network or a multitude of networks. As described above, every system on the internet has at least one IP address. Normally the address for a particular system takes a four-number form separated by stops, i.e. a form such as 223.68.100.1. This address, however, can also be expressed as 223.68.100.1/16.[13] The /16 at the end of the address means that the first 16 bits, in this case 223.68, designate the address of the network where the system can be found. This means that routers use only the 223.68 part of the numerical string when looking up this address until the message arrives at the network designated by 223.68, at which point it looks up 223.68.100.1 within that network.

When IPv4 addresses were first created, the engineers who designed the system believed that it would provide more than enough addresses to meet any future requirements. After 30 years, however, addresses were already in restricted supply. This was due to the very rapid expansion of the internet's user base and to the very considerable increase in the number of devices which can be connected to the internet and may require a separate IP address (computers, telephones, even domestic appliances).[14] While there are still many individual addresses left, these are no longer available in large number blocks. Two technical solutions have been offered for increasing the availability of addresses. One technical solution, which is widespread, is network address translation (NAT). The other solution is IPv6. Additionally, efforts are underway to recover lost IPv4 addresses and discussions are ongoing about methods of allowing a market to develop in IPv4 addresses.

Network address translation (NAT)

For many years, several ranges of private addresses have been used by corporate networks and home networks. These addresses can only be used in one sub-network and may not be routed beyond this. Many readers, for example, will be familiar with an address like 192.68.100.1, which is the default address found in most of the home routers sold on the open market.

While a very successful technology for allowing the internet to grow in the face of IP address distribution problems, NAT has raised several challenges of its own. One of the most frequent complaints against NAT networks is that they interfere with the end-to-end nature of the network, because the system at the edge of a private network is responsible for translating the private

9 Internationalizing Domain Names in Applications (IDNA) www.ietf.org/rfc/rfc3490.txt The protocol actually consists of several documents. In addition to this RFC (a class of IETF documents) which defines the protocol, the set also includes RFC3454, Preparations of Internationalized String: also called Stringprep; RFC 3491, Nameprep: A Stringprep Profice for Internationalized Domain Names; and RFC 3492, Punycode: A Bootstring encoding of Unicode for use with Internationalized Domain Names in Applications. The current IDNA is limited to strings that were encoded in Unicode 3.1. Unicode has continued to add scripts for new alphabets since then, and work is currently underway on Unicode 5.2. The IETF is working on an update of IDNA, called IDNAbis, which will be able to support current and future versions of Unicode.

10 A tool for translating non-Latin-based words into punycode can be found at www.nameisp.com/puny.asp

11 In some language groups, various techniques have been used to give the users the appearance of IDN TLDs, but these are mostly based on an ability in the applications to provide aliasing.

12 AS numbers are used by the core routers in the internet to describe the paths between networks. These numbers are not discussed in this article and are listed here for the sake of completeness.

13 This form of addressing was first defined in An Architecture for IP Address Allocation with CIDR (www.ietf.org/rfc/rfc1518.txt) and is still the fundamental organising structure for IPv4 addresses.

14 While it is possible to assign an address to every possible object, the wisdom of doing so is being questioned by many internet technical specialists. For example, in a home, is it important that every device be globally addressed? Or is it preferable that the control module be globally addressable with the devices themselves hidden from the outside network?

address into a public globally unique address. As a result, many protocols have embedded these IP addresses in their messages, in itself possibly a breach of the end-to-end principle. On the other hand, NAT technology has allowed the internet to grow and can be said to keep translation at an edge as close as possible to the user.

However, NAT alone cannot solve the need for large countries with rapidly expanding internet customer bases – such as Brazil, China, India and Russia – to have access to very much larger blocks of IP address numbers. This has created impetus for the deployment of IPv6.

IPv4 and IPv6

IPv6 will increase the number of addresses available and allow greater flexibility in their use. IPv6 addresses are longer and have a slightly different internal structure from those in IPv4. Because its addresses are longer, the IPv6 addressing system can be used to facilitate a greater number of systems without needing the NAT local addressing techniques necessary in IPv4. There is concerted effort among the internet policy community and some parts of the technical community to foster a transition to IPv6.

A final point on addressing

The meaning of IP addresses has historically been complex. They signify both the identification of the system and its location, referred to as overloading. In the days of the fixed internet this was not much of an issue, as the IP identity of a machine could easily be associated with its location, though it did create some problems for the routing architecture in terms of multi-homed systems. With the advent of the mobile internet, where systems/devices move location, this has become much more of a problem. When a system/device moves from one location in the network to another or even from one network to another, it should not have to change its IP identity simply because it has moved to a different location. Research is underway on how to achieve decoupling of identity and location to suit this new environment.

Routing

The rudimentary principles of routing data through the internet were described earlier in this chapter. Routing can either be static or dynamic:

- In static routing, the identity and location of every other router is configured into the system, allowing the router to produce a map of the network overall.
- In dynamic routing, protocols are used by the systems to discover paths through the network.

While there are many types of dynamic routing protocol, two types currently predominate: distance/cost vector protocols and link state protocols. Distance vector protocols are most often used to connect one independent network, known as an autonomous system, with another. They involve each of a pair of neighbouring routers informing the other about all the interconnections in the network of which it is aware. Border Gateway Protocol (BGP-4) is the variant of this type of protocol used on the internet today. In link state protocols, most often used to describe the internal map of an autonomous system, each router in the network or sub-network informs every other system in that network or sub-network what it knows about all its neighbours.

Conclusion

All of the explanations in this chapter have been simplified in order to keep the content brief. The internet is a rich and dynamic system that is constantly growing and changing. Due to the design principles and the organisational constructs described above, many people with varied interests can work on the network and produce results that can be used by others. The technologies that tie the network together – naming, addressing and routing – are dynamic, but they also form the core of what has enabled a collection of independent networks to become the internet we know today. It is the standards that define these technologies that have enabled the loose association that is the internet to hold together and provide the rich diversity of services with which internet users have become familiar. ■

Chapter 19
INTERNET SERVICES

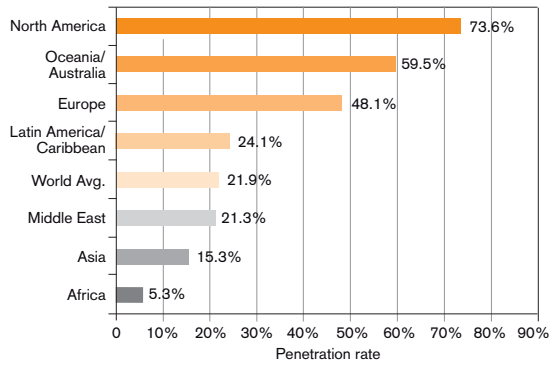
Lead author ***David Souter***

The range of services available through the internet has expanded continuously during the period since the internet became widely used in business and by individual citizens in the 1990s. This chapter discusses the arrangements which connect users to the internet in different societies, and then briefly describes the most important services which are available and their implications for public policy.

Accessing the internet

At the time of writing (mid-2008), approximately 1.5 billion people in the world were estimated to have access to the internet, about 25% of the total world population.[1] Participation rates in the internet were, however, highly skewed towards industrial countries, as shown in Figure 19.1.

Figure 19.1: **World internet penetration rates, 2008**



Penetration rates are based on a world population of 6,676,120,288 for mid-year 2008 and 1,463,632,361 estimated internet users.
Source: Internet World Stats www.internetworldststs.com/stats.htm

The internet is accessed by these end-users in a variety of different ways:

- In some industrial countries, nowadays, the majority of citizens have internet access at home, using personal computers and, in some cases, other devices. This may be dial-up access (at relatively slow speeds), but is increasingly often broadband access (at much higher speeds).
- Many people, again particularly in industrial countries, use the internet at work and gain access through workplace computers.
- School and university students often use computers at their educational institutions to gain access.
- In developing countries, however, internet users who do not enjoy workplace access often access the internet at cybercafés or telecentres. In most cases, particularly in urban areas, these are privately owned businesses which often provide internet access alongside other services (including telephony and office services). In some cases, particularly in rural areas, they are subsidised by government departments or development agencies.
- Wireless devices, such as mobile phones, are beginning to be used significantly for internet access in some contexts, and are increasingly thought likely to provide the main initial platform for internet expansion in low-income developing countries where wireless infrastructure is much more pervasive than fixed networks. This is already the case for most users in China and some other countries.

The underlying technological aspects of the internet, including the ways in which internet data are routed through communications networks, are discussed in Chapter 18 of this handbook, while policy issues related to internet access are discussed in Chapters 20 and 21.

The next section of this chapter is concerned with technical issues of internet access. For simplicity, it looks at this primarily from the perspective of the individual subscriber, i.e. the individual who subscribes to the internet from home. However, the principles concerned are much the same for businesses and, in many ways, for those who make use of public internet facilities.

Access requirements

In order to access the internet, a potential user has four main technical requirements:

- Equipment – particularly a computer (or other device that can connect with the internet and display internet content) and either a modem (for dial-up access) or a router (for broadband access). The

1 It should be remembered that 17% of the world population is aged fifteen or under, and that the figure for developing countries (excluding China) is 34%. Population Reference Bureau *2007 World Population Data Sheet* www.prb.org/pdf07/07WPDS_Eng.pdf

modem or router (as appropriate) translates data received over communications links into readable form.

- Internet access software on a computer or other access device, in particular a web browser to access the World Wide Web.
- Connectivity – usually a telephone line, but sometimes an alternative communications line such as one provided by a cable television company.
- Subscription to an internet service provider – i.e. a business which provides internet access over the communications lines which are available to end-users – either individually or through an intermediary such as a workplace or telecentre.

In addition to these technical requirements, end-users have a number of other requirements in order to make effective use of access. These include:

- Money to pay for subscription to an internet service provider and for communications line connectivity.
- Skills, including literacy in relevant languages, keyboard skills, knowledge of relevant software programmes, and research skills which enable them to make effective use of the information resources to which the internet gives access.

The balance of costs for internet access varies between different types of access:

- Dial-up access (which is slower) usually involves two sets of charges: subscription charges for an internet service provider, and subscription and usage charges for a telephone line. In the case of dial-up access, telephone usage charges are usually incurred for every unit of time (second, minute) during which a computer is connected to the internet.
- Broadband access (which is faster) also involves two sets of charges. Subscription charges for internet service provision are usually considerably higher than those for dial-up access. With broadband access, the internet connection usually remains open at all times for a flat fee, so that no usage charges are incurred for the telecommunications line. (However, there remain subscription charges for telephone access. These are often bundled with internet access into a single subscription charge.)

The net effect of this balance of costs is that, while broadband subscription charges are usually higher, the overall costs for broadband internet access are often lower than those for dial-up access. This is usually the case in industrial countries – where broadband provision is competitive and broadband charges are usually low – unless the extent of internet access over a particular communications line is very modest. The greater speed of broadband access also means that content (including web pages) can be downloaded much more quickly than with dial-up access, so increasing efficiency for the user. However, broadband access is not widely available in many developing countries, and this is one of the factors that causes internet access in developing countries to be more costly than is typical in industrial countries.

Internet service providers

From the users' point of view, the most important businesses are those which provide them with access to the internet. In the case of public facilities, these are the owners/managers of the cybercafés, telecentres or educational facilities they use. For business and individual subscribers, however, the most important businesses are their internet service providers or ISPs.

There are a number of different types or tiers of ISP, distinguished primarily by scale and by the financial arrangements which they have with other ISPs. Wikipedia succinctly defines these as follows:

Tier 1: A network that can reach every other network on the internet without purchasing IP transit or paying settlements.

Tier 2: A network that peers with some networks, but still purchases IP transit or pays settlements to reach at least some portion of the internet.

Tier 3: A network that solely purchases transit from other networks to reach the internet.[2]

"Peering", in this context, refers to arrangements for the exchange of internet traffic between ISPs. Peering arrangements between larger ISPs usually do not involve the exchange of money, but this is less common among smaller ISPs.

Internet users usually purchase internet access through subscription to an ISP. This may be an international business such as AOL or Yahoo; a telecommunications business such as BT or Telkom South Africa; a specialist ISP business, large or small, international, national or local; or even a general retail business, such as the supermarket chain Tesco in the United Kingdom. Users have contracts with ISPs, which usually last for a stated period of time, and these contracts may offer different levels of access – for example, the speed of broadband available or limits to the amount of data which can be downloaded each month.

Internet services

The remaining sections of this chapter describe some of the main services which are available to users of the internet today (mid-2008), and relate these to other communications services. This is not a comprehensive

2 Wikipedia "Tier 1 network" accessed 24 October 2009 en.wikipedia.org/wiki/Tier_1_network

list of internet services, nor does it refer back to those services which were commonly used before the World Wide Web and mass market internet.

Electronic mail

Electronic mail, or email, was the first "mass market" service to become available through the internet, initially within small scientific and academic user communities in the 1970s. During the 1980s and 1990s, it became the principal internet service for the majority of internet users. While it may now have been eclipsed by web browsing in industrial countries, it remains the principal use of internet for many in developing countries, particularly where limited bandwidth and slow download speeds make web browsing a frustrating experience. Today, email addresses and services are provided directly by ISPs, as part of their normal internet service, though many users prefer to use "webmail" services, such as Hotmail, which are hosted by major internet content providers.

Email replicates the service provided by traditional postal services, i.e. it provides direct person-to-person written communications (including communications between individuals and organisations), with the additional capacity to include ("attach") digitised text, audio and video content (comparable to parcel services). Email has a number of significant advantages over traditional postal services, however. In particular:

- It enables written communications to be exchanged almost instantaneously (comparable with telephony), and so with a high degree of interactivity (not quite comparable with telephony).
- This can be achieved at much lower cost than by using traditional postal services, and often at zero marginal cost (for example, over broadband connections which are paid for on a subscription rather than usage basis).
- It can be received through a computer or other device (including mobile phone) at a location convenient to the recipient rather than a specific delivery point.
- It allows the same message to be sent to large numbers of correspondents simultaneously with very little effort.

Postal services retain some advantages over email. They are more universal, in most countries, although this is becoming much less so in industrial countries. They can convey physical goods (i.e. goods which cannot be digitised or which are required in physical form), which cannot be achieved through email. Indeed, the use of parcel services has been increased in some countries as online purchasing of goods has grown. Email also has some disadvantages over physical mail in certain legal and contractual contexts, where legislation has not been enacted to give electronic documents the same legal status as their physically signed equivalents.

The most significant public policy issue concerning email is its abuse in the form of "spam", i.e. unsolicited email. In its most innocuous form, spam is equivalent to direct mail advertising of the kind carried by traditional postal services. The majority of spam, however, is at best on the fringes of legality (advertising pornography, potentially dangerous pharmaceuticals, etc.) and much is malicious (e.g. "phishing" and "419" emails which solicit financial details to be used in fraud and identity theft; dissemination of viruses and other malicious programmes, including programmes that enable hacking or use recipients' PCs as spam engines or "trojans"). By early 2008, spam accounted for over 90% of email traffic worldwide, with significant negative impact on bandwidth availability in lower-income countries. It is discussed further in Chapter 21.

Another important issue where email is concerned is privacy. Internet service providers can retain email records indefinitely, and some governments have sought to require them to do so in order to facilitate possible future criminal or terrorist investigations. In some countries, governments also wish to use email records for purposes of political repression. These issues are discussed in Chapter 31.

Bulletin boards, listservs and other user groups

Since its earliest days as a communications medium for specialist groups of scientists and academics, the internet has enabled distribution networks for information and opinion. In the early days of the internet, these were often called bulletin boards, and did much to build a sense of corporate identity amongst internet users. Bulletin boards were usually closed user groups, accessed through peer group consent. However, an open access equivalent known as newsgroups, which uses a protocol called Usenet, was (and continues to be) used for a wide variety of purposes: for example, on the one hand, as a forum for highly specialised discussion about internet technology issues, and, on the other, as a distribution channel for internet pornography.

Listservs and their equivalents are now widely used by civil society organisations and others to share information on restricted, automated email lists. ("Listserv" was the name of the first automated email application, initially distributed as "freeware" in 1986.) Alongside more recent developments such as instant messaging and internet telephony (see below), they have provided ways for networks of people with common interests to share views, argue and develop common platforms and activities. Many civil society organisations have therefore seen them as an empowering tool, enabling non-governmental bodies to coordinate in ways that were previously not open to them.

Most recently, some organisations have used "wiki" technology to facilitate online collaboration, including online content development. Wiki technology is most notably used to develop content for the online encyclopaedia Wikipedia.

Instant messaging

Closely related to email are the instant messaging or "chat" services maintained by a number of internet businesses, including Microsoft (MSN), Yahoo (Yahoo Messenger) and Skype (Skype Chat). Like email, these allow instantaneous written communications between remote correspondents, and can transmit document, audio and video attachments.

The main difference between email and instant messaging services is that, while the former replicate postal services, with messages being transmitted between correspondents at different points in time, instant messaging provides a live one-to-one connection between correspondents, comparable to that provided by telephony (although with written text). This live connection can be extended to multiple correspondents, so allowing text-based conferencing. Some civil society organisations, including APC, make extensive use of instant messaging in order to enable them to work internationally without requiring office premises.

More recent versions of the operating software for instant messaging also allow video transmission between computers with attached cameras ("webcams"), so effectively providing a video- and audio- (rather than text-) based alternative to telephony, including primitive video-conferencing. During 2008/2009, the short-message instant messaging service Twitter, which is in many ways a mass-audience instant messaging variant of SMS texting on mobile phones, also became widely popular.

Internet telephony

A distinction should be drawn between the terms "voice over Internet Protocol" (VoIP) and "internet telephony".

- "Voice over Internet Protocol" refers to the use of packet-switched Internet Protocol (IP) networks (and so IP, the Internet Protocol) to transmit telephone traffic. IP networks are now extensively used by telecommunications operating companies in place of traditional public switched telephone networks (PSTNs) and are the basis for "next generation networks" (see Section 4 on telecommunications). VoIP is therefore, for the most part, undertaken within mainstream telecommunications, where it provides an opportunity for substantial cost and tariff reductions to be made by telecommunications network and service providers.
- "Internet telephony" services such as Skype, by contrast, provide an opportunity for internet users to bypass the traditional telecommunications networks, using their own internet connection to make telephone calls via their ISP and internet telephony provider. Such calls can be made from computer to computer (usually free) or from computer to telephone (usually at a charge per minute well below that for conventional telephony, at least for international calls). Internet telephony handsets can also be used to make the experience more like that of conventional telephony. (Some conventional telephone operating companies, such as Britain's BT, now also offer their broadband customers the opportunity to use their own internet telephony service rather than their PSTN network.)

The low prices charged for internet telephony have made it particularly attractive for internet users in locations with high international telephony charges, especially if they have broadband connections. By the end of 2008, Skype, for instance, had over 150 million registered users worldwide. However, internet telephony services compete for the delivery of voice traffic with telephone operating companies – particularly fixed network operators which, in some countries, have exclusive rights to deliver telephone traffic. Where this is so, the use of internet telephony services may be unlawful. This has been a significant issue in deregulation, notably in Africa.

Another public policy issue that sometimes arises with internet telephony concerns consumer expectations. For example, the quality of internet telephony is generally (but not always) lower than that of PSTN connections. In addition, some of the supplementary services which consumers associate with telephony are not available with internet telephony, most notably access to emergency services numbers (fire, police and ambulance). This has raised concerns about maintaining the universality of emergency services.

World Wide Web

The World Wide Web is, alongside email, the most widely used internet service today, and is probably more widely used than email in industrial countries.

"The Web", as it is known for short, was first developed by the British computer scientist Tim Berners-Lee and colleagues at the European Organisation for Nuclear Research (CERN) in Switzerland at the beginning of the 1990s. It revolutionised internet content in two main ways:

- It provided an automated and easy-to-use way of moving from one location/computer on the internet to another – and so from content held on one computer to content held on another. This process relies

on what are known as "hyperlinks", which contain the URL (unique resource locator) for a website or page and instruct the user's web browser to access that site and page.

- The Web also provided a standardised graphically based means of presenting content over the internet, built around simple design and programming protocols. The most notable of these, HMTL (hypertext markup language), enables pages to be designed and to incorporate not only straightforward text material but also images, tables and interactive forms. It greatly simplified the presentation of information on the internet and made it attractive and pleasant to use, rather in the way that graphical user interfaces transformed the experience of using computer programmes (see Chapter 8).

Since the early 1990s, the World Wide Web has become the most important single information resource in the world, enabling vast quantities of information to be accessed by internet users almost anywhere in the world. In early 2007, it was estimated that there were over 100 million separate websites and some 30 billion web pages available.[3] The opportunity to access information on the Web is therefore enormously greater than could be provided in the past by even the largest libraries (the Library of Congress, for example, holds around 130 million items including some 30 million books; the British Library around the same, increasing at about three million items a year). The Web's interactivity has also led to it becoming a major locus for transactions, enabling people to buy goods and services that were previously inaccessible to them (see below).

The availability of an enormously increased range of content to people located anywhere in the world is widely regarded as one of the most important enhancements of human potential resulting from ICTs. It has, however, also raised a number of problems. These arise partly from the universality of the internet – especially the fact that content located in one jurisdiction can be readily accessed in another. Not all of those who post content on the internet are concerned with the advancement of human rights, the welfare of their fellow citizens or the accuracy of what they say, nor do they necessarily respect the intellectual property rights of others. As well as extending access to reliable and socially valuable information, therefore, the World Wide Web has also been extensively used to bypass legal constraints and moral norms. One of the most dramatic changes arising from this, which is discussed in Chapter 21, is an unprecedented expansion in the distribution of both softcore and hardcore pornography.

The internet has also enabled new types of information service to become available, including services whose content is generated by user communities rather than professionals. The best-known example of this broadening of content provision is the online encyclopaedia Wikipedia, named after "wiki" technology which enables collaborative content development (see above). Wikipedia articles – over ten million by mid-2008 – are written by individuals around the world and open for editing by others within the "Wikipedia community". The range of content generated by this open editing process has enabled Wikipedia to become the most used encyclopaedia in the world. However, it is also open to abuse, and many professionals and academics criticise the variable quality and reliability of Wikipedia content. Beneath this debate, for some participants, lies a deeper philosophical argument about the nature of objectivity and expertise.

The expansion of information on the internet may also be altering the ways in which people access and make use of information. Most people have historically accessed most of the information which they use from intermediaries, particularly trusted intermediaries such as successful peers, teachers, health workers, newspapers and radio stations. Information, in other words, has reached them through a process of selection by others choosing what they believe is most likely to be valuable to provide or broadcast. On the one hand, this selection of information weeds out much that is not useful or helpful and so increases the ease of access to information that is valuable to its recipients. On the other hand, selection can be used to restrict access to information which people would genuinely find useful or which would enable them to challenge those in positions of authority.

Search engines

The independent access to information which the World Wide Web has made available challenges this historic information intermediation in many ways. The use of information requires more than simple access, but also research and interpretative skills. Much information on the internet, for example, is out of date. Much of the content provided on web pages is inaccurate, either deliberately or unintentionally. Publication on the internet does not imply truth: it is as open to propaganda and libel as it is to carefully nuanced research and analysis. To make effective use of the wealth of new information available on the internet, users need to know how to find what they are looking for and how to discriminate between what is useful/true and what is not.

The importance of research and analytical skills, alongside access, is a challenge in many development contexts. The World Wide Web, for example, enables the publication of data on factors such as soil fertility and rainfall patterns in local communities in ways that were previously not possible. Farmers, however, have usually

3 See www.boutell.com/newfaq/misc/sizeofweb.html

lacked the scientific knowledge needed to make effective use of such data, and have relied on advice from agricultural extension workers, suppliers and other intermediaries to guide them on the interpretation of such data, particularly where their own farms are concerned. The evidence suggests that, while publication of data on the internet is useful, it does not reduce the need for professional advice services along these lines or the desire of farmers to have access to them.

Some of the biggest businesses on the internet today are or began as search engines, i.e. as web-based services whose purpose is to trawl available internet sites in response to queries by end-users and provide them with URLs that most closely match their need. In the mid-1990s, there were a number of competing search engines including such companies as Yahoo! and AltaVista. Since the turn of the century, Google has become the pre-eminent search engine, with an estimated 65% share of search enquiries made by internet users, and more than 90% market share in many countries. This makes it (and its national variants) the most used internet site in the world, and it has also become one of the world's largest companies by value.

Search engines potentially wield enormous power because they are able to direct internet users towards particular content. This power is also extremely valuable: a company whose products appear first on a search engine's response page is likely to achieve a much higher market share of the demand expressed in relevant searches than one whose products appear fifth or, worse still, not on the first page of "hits" revealed. There has therefore been much controversy over the criteria used to determine the order in which results appear on search engine pages, and also to clarify which, if any, results have contributed advertising revenue to the search engine company involved.

Web design and hosting

The increasing importance of the World Wide Web has led more and more organisations and individuals to develop their own websites, either using specialist web design firms or personal web design software marketed by Microsoft and other companies. While basic sites can often be developed by individuals using commercial HTML software, most businesses have preferred to use professional web designers to create more complex sites. Some sites are also now developed using blogging software.

Web hosts are companies which make space available for rent on large servers, on which individuals and businesses can locate their own websites and make these available to web users. Some web hosting services are provided by ISPs and by email/messaging providers, with small sites often hosted free. Other web hosting firms specialise in areas like e-commerce.

Internet transactions

As internet use became more widespread, in the early 1990s, it became increasingly attractive as a marketing environment for commercial businesses. At the highest level, large businesses had been using the internet for some time to manage supply chains and provide services to one another (see Chapter 27). The accessibility and ease of use of the web, however, enabled the internet to become an interface for transactions between businesses and end-users, including individual customers. This potential has been exploited by both existing and new firms, often competing against one another.

There are significant differences between the ways in which the internet can be used to market different types of goods and services:

- The most easily tradable goods and services on the internet are those which can be traded in digital form, i.e. where no physical product is involved or where a virtual download can substitute for a physical product. These goods and services include computer software, text and image (including digitised books), music, video, and travel and entertainment services which can be delivered by "e-tickets".
- A second group of goods and services is readily tradable by combining internet purchasing with mail order delivery. These are physical goods where the quality is either irrelevant or guaranteed by standardisation of the product (e.g. books, CDs and electronic equipment), or where the supplier has a high reputation for delivering goods of high quality (e.g. some clothes suppliers). In practice, internet retailing has revitalised the market for mail order goods, which was previously based around catalogues of goods and services. In some countries, the use of local delivery vans has also extended internet retailing of this kind into perishable goods, including food.
- Some goods are less readily tradable over the internet. These include many perishable goods and goods whose quality can only be judged by personal inspection, such as original artworks, or where quality is highly variable and customers are unfamiliar with suppliers.

Many established international and national businesses now retail extensively over the internet, and even those which do not do so illustrate their products online for potential customers to "Windows-shop". Some new businesses have gained very high market shares by retailing goods and services over the internet – notably Amazon.com, which began as an online bookseller but now sells a wide range of goods, and Apple's iTunes, which is the best-known retailer of music in digital form. Some traditional high-street businesses, however, have been

badly hit by digital competition, particularly CD shops and travel agents.

The nature of internet transactions has also opened up new areas of business activity:

- Goods which were previously only sold (or even legal) within certain jurisdictions are now being sold (legally or otherwise) across national boundaries, with complications for customs and fiscal regimes. The nature of gambling, for example, has been substantially changed by the internet, with internet gambling websites taking business from conventional gambling outlets and also enabling people to gamble directly against one another rather than through traditional bookmakers and casinos.
- Internet businesses like Amazon.com provide marketplaces for other vendors to sell the same goods as it sells itself alongside and in competition with itself.
- Auction sites like eBay offer individuals and businesses the opportunity to sell goods directly to many more customers than they could have done in the past, creating an internet equivalent to the classified advertisements found in many newspapers and magazines.

The security of financial transactions is, naturally, critical to the viability of internet e-commerce. Purchases need to be made by credit or debit card, often across international borders. The capacity and willingness of banks to handle such transactions is therefore important (and some banks in developing countries have been slow to recognise this shift in purchasing behaviour). Most important, however, is the need for customers to have confidence in the security of their card data. Fears about the security of internet transactions are generally believed to have held back their spread. However, the use of secure encrypted transaction processes is now widespread. Where it is available, it may well provide a higher level of security than physical card transactions in retail shops. It is not, however, universal, and not all vendors on the internet are honest, efficient or secure.

File sharing

The internet allows the exchange of goods with or without transactions. This is particularly easy where goods can be transferred in digital form as, for example, with software, music and video.

The sharing of music beyond the limits permitted by intellectual property rules has been commonplace since the audio cassette became widely available in the early 1970s. The internet has greatly expanded the scope for copyright bypass, however, because it no longer requires physical contact, and because music and video files can be distributed online.

This has provided scope for two forms of intellectual property bypass:

- Some web businesses have exploited differences in intellectual property regimes – notably in Russia – to sell digital music outside normal intellectual property rules and at much lower prices.
- Other websites have provided peer-to-peer file-sharing environments whose users transfer files between themselves using software which simultaneously uploads and downloads content.

Sites of both kinds have been targeted by the music industry, which is seeking to maintain intellectual property rights in an increasingly uncontrolled market for music distribution. Music industry sources suggest that only a minority of music downloads are now paid for and comply with intellectual property rights.

The video content site YouTube combines some of the characteristics of file sharing with social networking (see below). YouTube enables individual internet users to upload videos for global viewing. While intended for distribution of personal materials, it has also become widely used to distribute copyright material, resulting in legal disputes with copyright owners comparable with those concerning music-sharing sites.

Web 2.0

The internet is often described as a forum in which anyone can say anything (and can do so, if they wish, anonymously). Forums such as Usenet newsgroups have provided open spaces for free expression (and for the distribution of illegal material such as child pornography) since the internet first became publicly available. Recent years, however, have seen increasing use of the internet to express personal views and identities, and to create new opportunities for collaboration. This is sometimes described as "Web 2.0" (although some internet experts question the term as the capabilities inherent in Web 2.0 have always been part of the internet). Two new internet services – blogging and social networking – have been particularly important in this development.

Blogs

"Blogs" – the term is short for "web logs" – originated as, in effect, online diaries: websites which were maintained by individuals to record their lives and to express their views or personalities, though in a rather more public way than the private format of a written diary. Blogs also offer opportunities for comment by their readers.

Some bloggers have used this opportunity to participate in political or other public activity, either as "citizen journalists", recording life in the communities in which they live, or as partisan activists. Citizen journalist bloggers

have become significant sources of information for news media, particularly for dissenting views in countries subject to repression. Other people have used blogs to distribute content which they think of value to a wider community – for example, to distribute music by musicians who are not signed to any label. Many blogs, however, are highly personal accounts of life which may be of interest only to the blogger's intimates.

Social networking

Since its early days, the internet has also provided opportunities to create social networks with greater reach than was previously possible when contact had to be maintained through meetings or by post. Listservs and Usenet newsgroups, for example, supported social or professional networks of this kind. Sites based around "lost" social groups, such as Friends Reunited in the UK and Classmates in the United States became popular in the late 1990s.

A new kind of social networking website emerged, however, in the middle years of the first decade of this century. These sites – including MySpace, Facebook and Bebo – enable individuals to create online identities for themselves (which may or may not reflect their real personalities); create and manage groups of "friends" who share some common interest (who may or may not be their real friends); upload content which they feel reflects their personalities or which they wish to share with others; and establish, join and withdraw from interest groups ranging from political activism to fan clubs and social bullying. The mass audience instant messaging service Twitter joined this mix of services in 2008/2009. Social networking sites have also been used for marketing purposes, notably by unsigned musicians – some of whom have become major stars following exposure on them.

Social networking sites are particularly popular among the young in industrial countries, and have begun to supplant the use of email and other internet services in some cases. By late 2006, MySpace had over 100 million users and was gaining about 230,000 new subscribers each day. By the same time, YouTube users were accessing more than a million videos a day. While popular, these sites have also raised concerns – particularly about bullying, about the vulnerability of personal data, and about potential paedophile abuse.

Conclusion

This chapter has briefly discussed some of the most important services which are available on the internet. It is not, and is not intended to be, comprehensive. The experimental character of the internet provides a space in which new services continually appear. Some of these are successful, while others disappear rapidly. Many are difficult to predict: few in the internet community, for example, predicted the rise of social networking sites. What is clear is that the internet will continue to provide a space for experimentation and innovation – particularly in areas where it can enable services that are not otherwise available because they are economically or technically unfeasible, or because they are prevented by legal barriers and social norms. ■

Chapter 20
INTERNET DEVELOPMENT AND GOVERNANCE

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The internet has grown rapidly during the final quarter of the 20th century and the first decade of the 21st century. By March 2008, World Internet Statistics reported that there were almost 1.5 billion internet users worldwide, with internet density rates (number of users per 100 population) of around 50% or more in three continents: Europe, North America and Oceania. The number of users had grown by almost 300% worldwide in the period from 2000 to 2008, with the highest growth rates (over 1,000%) in Africa and Asia, reflecting their relatively low density levels in 2000. Usage levels are illustrated in Chapter 19.

The implications of the growth of the internet for society and the economy are profound and widespread. Some argue that it provides the basis for transition from an industrial global economy, based on the production of manufactured goods, to a knowledge economy, based on the exchange of information. It is important to remember, however, that the internet's very rapid development is taking place alongside other major changes in global politics, economics and society, including the globalisation of agriculture, manufacturing and business; the growth in the international economic and political power held in China, India and some other rapidly growing lower-income countries; the challenges of climate change and environmental sustainability, of energy and food production; and continuing contests between rights, freedoms and political and religious ideologies.

Internet policy and governance have become important and controversial areas of ICT policy since the turn of the century. Internet governance, in particular, dominated the second phase of the World Summit on the Information Society (2003-2005), which in turn led to the establishment of an annual Internet Governance Forum. Yet there is still a good deal of confusion about the meaning of the term, its scope and the range of institutions that are involved. This chapter seeks to place internet governance in its historical perspective, and briefly describes the main internet governance bodies and debates. A range of internet policy issues is discussed in Chapter 21.

The development of the internet

The internet has developed rapidly, through a number of different phases, since the notion of a global network of computers was raised by the computer scientist J.C.R. Licklider in the early 1960s. His concept – summarised as "a network of [computers], connected to one another by wide-band communication lines" which would offer the functionality of libraries "together with anticipated advances in information storage and retrieval"[1] – describes the core functionality of an internet.

The 1960s, of course, pre-dated the distributed computing environment we know today. At that time, computing was based around very few, very large mainframe computers in government, business and academic institutions (see Chapter 8). Very few people anticipated the rapid and widespread distribution of desktop and laptop computers that represents most computing today. The origins of the internet therefore lie in the work of computer scientists, and it took many years for its social and economic implications to be fully understood by policy makers.

The capacity to network computers was of particular interest to the US defence establishment because of the opportunity it provided to make command-and-control systems less vulnerable to catastrophic failure in the event of war. It was, as a result, in the United States' Defense Advanced Research Projects Agency (DARPA) that much of the initial work on computer networking was undertaken; and it was this agency which developed and implemented the early ancestor of the internet, known as ARPANET, in the late 1960s.

As well as new developments in computing, the late 1960s and early 1970s also saw crucial developments in communications architecture which facilitated the arrival of the internet. These included the development of packet switching, i.e. the technique of dividing information streams into small packets of data which could be transmitted over communications networks, including the existing telecommunications network, and reassembled at the receiving end of a connection; and, in the early 1970s, the design of the TCP/IP protocols which enabled effective interconnection of disparate networks.

Technical aspects of internet developments are described in Chapter 18. Their practical impact was to enable interconnection between the ARPANET and other computing centres, including universities. Developing the nascent internet became an important area of activity for computer scientists. It was at this stage, too, that

1 Wikipedia "History of the Internet" accessed 24 October 2009 en.wikipedia.org/wiki/History_of_the_Internet

applications were developed to facilitate the practical use of the interconnectivity that had become newly available. The most important of these, electronic mail, was introduced in 1972. Other applications introduced in the 1970s included bulletin board systems, file transfer protocols (FTP) and Usenet newsgroups.

Computing in general and these early internet applications continued to spread during the 1980s, particularly within the academic and scientific communities. With the possible exception of email, however, they were difficult to use, and they did not begin to spread into the wider community, even into large business use, until two developments in the later 1980s: the introduction of the personal computer and the invention of the World Wide Web. This initial concentration of internet design and development within the computer science community meant that many crucial decisions that still affect the internet today were taken by computer scientists without the engagement of public policy decision makers: an important factor in current debates about internet governance.

As discussed in Chapter 8, the introduction of personal computers in the 1970s has had a transforming effect on the relationship between computing and society. Before PCs, computing was expensive and could only realistically be deployed within organisations of substantial size. PCs enabled individuals to own and use their own computers. Although originally the province of hobbyists, in the 1980s ease of use improved sufficiently for PCs to begin to be quite widely owned by professionals in industrial countries. At the same time, it became cheaper and more efficient for large organisations to replace mainframe computers with networks of interconnected PCs, distributing control over the use of computers within the organisation away from specialist IT personnel towards end-users.

The most important single factor making computing easy to use, for the first time, was the development of the graphical user interface or GUI, firstly in the Apple Macintosh and subsequently in Microsoft's Windows operating system (see Chapter 8). PC usability was dramatically enhanced by GUIs, allowing the PC to become a flexible tool which could be used by many people for a variety of purposes, both professional and personal. This provided an important platform for the subsequent growth of the internet.

The internet equivalent of the GUI – in terms of making a dramatic enhancement in usability, sufficient to enable widespread use by non-specialists as well as specialists – was the invention of the World Wide Web. This was first developed at the end of the 1980s by Tim Berners-Lee at the European Organisation for Nuclear Research (CERN) in Geneva, and released for public use in 1992. Before the Web, content on remote computers could be accessed through programmes such as FTP, but the process was difficult for users to understand and unattractive to use. The World Wide Web enabled the sharing of information through simple procedures (hyperlinks) and visually attractive media (web pages viewed through browsers).

Most internet observers would agree that the Web has been one of the two most important drivers of internet use since the early 1990s – the other being the introduction of higher-speed (including broadband) communications networks which have allowed much larger data files to be shared between ordinary users at affordable prices (at least in industrial countries). The World Wide Web provides the principal platform for the wide range of new services which have become available in recent years – including electronic commerce, e-government services, peer-to-peer file sharing and social networking. These services are described in Chapter 19.

As well as new services, the period since the introduction of the World Wide Web has seen major changes in the principal users of the internet. The internet is now far removed from the tool that computer scientists and academic researchers created for their own use in the 1970s. In industrial countries, it has become a central feature of both social and economic life. Email has taken over many of the historic functions of conventional mail and telephony. Goods are widely bought online, and many people manage their bank accounts and complete their tax returns over the internet. The World Wide Web has become a source of information which far exceeds the potential of past libraries, newspapers and other information resources. Crime, too, has spread across the internet – with the World Wide Web and other internet services offering new ways for citizens to bypass constraints on pornography, gambling and pharmaceuticals; while criminals have also been able to exploit weaknesses in internet security through hacking, spam, online fraud and a range of new criminal techniques.

The most important structural change, however, may be the transition which has occurred from an internet led by computer scientists, up to the period of rapid adoption of the World Wide Web; and the period since, in which the private sector – in particular, its increasing use of the internet as a platform for transactions and for managing relationships between business and consumers – has become predominant. The transformation of the internet from a technical tool for the few to a commercial tool for business and a social tool for citizens has profound implications for internet governance, which are discussed later in this chapter.

Internet governance

The internet is perhaps unique, as a social and economic phenomenon, in having developed to the point where it is pervasive in many societies without

substantial involvement by governments or intergovernmental organisations.[2]

The architecture of the internet, the protocols and structures which enable it to work, the services it delivers and the overall ethos of internet development were all led, in the internet's early days, by computer scientists whose focus lay on designing technical rather than political solutions. Internet standards have been developed in relatively informal internet-specific standards bodies, notably the Internet Engineering Task Force (IETF) and, more recently, the World Wide Web Consortium (W3C), rather than in formal standards bodies like those for telecommunications (such as ITU-T, see Chapter 28). Public policy considerations played little part in internet design, although a good many of those involved shared a libertarian ethos, seeing the internet as a space for individual empowerment that should be exempt from government intrusion. An extreme expression of this libertarian ethos can be found in the one-time Grateful Dead lyricist Jean Perry Barlow's "Declaration of the Independence of Cyberspace".[3]

As internet use has become widespread, the range of those involved in the design and development of internet standards, protocols and services has become more diverse, including not just individual scientists but also organisations and, in particular, large businesses.

Internet access is provided through a hierarchy of internet service providers (ISPs, see Chapter 19), which make use of (and are sometimes owned by) telecommunications network operators. The markets for internet access tools (in particular web browsers and search engines) have become highly lucrative and the major players in these markets (particularly Microsoft and Google) are among the world's largest businesses. Many companies, large and small, are involved in the development and provision of internet services, either for internet users in general (e.g. Skype, eBay) or for marketing goods directly to consumers (e.g. Amazon.com, lastminute.com). Some of these companies have developed within the internet, others have built internet businesses alongside established traditional business models. As a result of their involvement, the private sector has been responsible for much of the dynamic growth and new service provision within the internet in the 1990s and 2000s, both technical and economic.

The increasing range and reach of internet services has also meant that it intersects more and more with other areas of public policy. For example, the use of the internet for trade across international borders – whether by individuals or by businesses – cuts across national fiscal regimes (customs and excise duties, sales taxes). The ease with which digital files can be transferred over the internet, openly or anonymously, challenges the enforcement of copyright and other intellectual property rights (see Chapter 33). The opportunity which the global internet provides to bypass national legislation has been widely used – both by citizens seeking to avoid political censorship and by those seeking to access services or content which are banned or restricted in their home markets (such as pornography and gambling). The internet has provided many new ways in which individual citizens can express their views, organise or seek to influence public opinion – some of which have been welcomed as new opportunities by civil society, while others (the dissemination of racist and extremist ideologies, organisation of criminal and terrorist activity) are seen as threats by many governments and citizens. Criminals have also made extensive use of the internet, often taking advantage of its openness or of gaps in its security – ranging from networks of child pornographers to the distribution of spam, to "phishing", "419 scams" (both of which seek to obtain financial information by deception), and other forms of fraud.

The internet, in short, might be said to have been developed initially as a tool within the computer science and academic communities, but to have evolved, very rapidly, into a medium which is used, by every part of those societies in which it has become widespread, to improve opportunities and to achieve objectives. It is important to governments and businesses, to civil society groups and to criminals, to citizens old and young, rich and poor. Initially designed by technical specialists, it is now driven by commercial interests and by user demand. In such circumstances, it is not surprising that the design and governance paradigms of the internet's early days have been challenged by governments and governance institutions dealing with wider issues of public policy, so that governance of the internet has become controversial. Before looking at some of the debates surrounding internet governance at WSIS and since, the following paragraphs seek to provide a basic structure for understanding internet governance as it stands today.

The architecture of internet governance

The meaning of the term "internet governance" is itself contested. The two broad approaches to understanding what it includes are as follows:

- A "narrow" definition of internet governance includes only those areas of governance which are explicitly concerned with the internet itself – i.e. with the physical architecture of the internet, the

2 It should be noted, though, that there was significant US government research funding in its very early days.

3 Accessible at homes.eff.org/~barlow/Declaration-Final.html It famously begins: "Governments of the Industrial World, you weary giants of flesh and steel, I come from Cyberspace, the new home of Mind. On behalf of the future, I ask you of the past to leave us alone. You are not welcome among us. You have no sovereignty where we gather."

"Government" and "governance"

The terms "government" and "governance" have distinct meanings, but are sometimes used as if they were interchangeable. This has caused confusion, and is a particular problem when the texts of legal or international agreements are translated. The following definitions are used in this handbook.

The term "government" refers to the exercise of decision making and enforcement powers by a constituted administrative authority, at national or local level, through the determination and implementation of policy, making use of legislation, regulations and other legally enforceable mechanisms. Government may, of course, be democratic or non-democratic in character.

The term "governance" refers to the establishment of rules, regulations, conventions and norms that manage the way in which organisations conduct themselves, both internally and externally, and the principles and processes underlying such instruments. Governance mechanisms exist in most organisations and structures – for example, technical standards set by government agencies, international organisations and private sector bodies; "corporate governance" in business; constitutional rules within trade unions; the norms governing behaviour within civil society groups – and are not confined to relations between governments and other social actors.

In many areas of life, there is considerable overlap between government and governance. In the early days of the internet, there was relatively little overlap as there was very little government involvement, but the extent of overlap has grown as the internet has become more important in other social and economic policy areas.

protocols and standards which enable it to function, and the technical and financial interfaces between actors in the internet space, including businesses and citizens. It excludes all issues that are generally known as "public policy". Internet governance in this narrow sense is largely undertaken by bodies which are wholly or very largely concerned with the internet alone. It is sometimes referred to as governance "of" the internet.

- A "broad" interpretation of internet governance – sometimes referred to as governance "on" the internet – also includes those areas in which the internet intersects with other areas of public policy, which have their own established governance arrangements and institutions. This includes:
  - Some technical issues which are not confined to the internet, such as the standards which interface between the internet and telecommunications networks.
  - Public policy issues which are concerned primarily with the internet and its generic role within society, such as access to the internet, bandwidth pricing and the internet's availability in diverse languages.
  - Issues which are concerned primarily with matters of public policy that lie (usually mostly) outside as well as within the internet, such as crime, security and pornography.

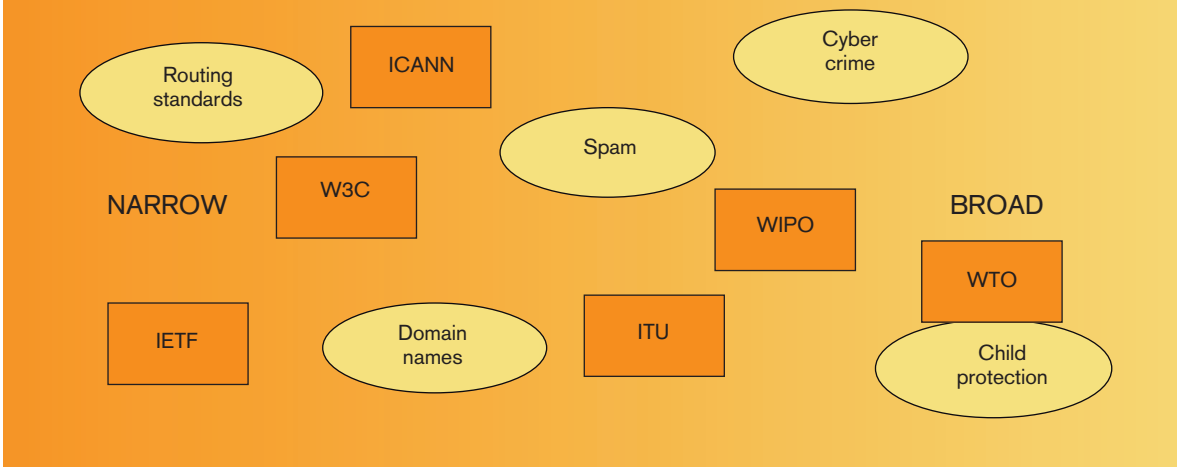
Some of these issues as such are discussed in Chapter 21. Our concern in this chapter is with the structure of governance.

"Narrow" and "broad" definitions of internet governance are, of course, not firmly demarcated. There is a continuum between them, with some areas of governance, some issues and some governance institutions located more towards the "narrow" or "internet-specific" end of the spectrum and some more towards the "broad" or "internet-related" end. This continuum is illustrated, together with some internet governance bodies and issues, in Figure 20.1.

Within this continuum, it is also important to understand that the architecture of internet governance is highly distributed, i.e. that a great many different entities play some part in governing aspects of the internet, often without much in the way of coordination:

- Some of the organisations involved are highly technical or specialist (such as the World Wide Web Consortium, W3C), while others have a wide range of concerns (such as the Internet Society, ISOC).
- Some are based wholly within the internet space (such as the Internet Corporation for Assigned Names and Numbers, ICANN), while others are primarily concerned with non-internet activities but also deal with areas on which the internet impinges or where it changes the character of their principal concerns (such as the World Intellectual Property Organisation, WIPO).
- Some, like the Telecommunications Standardisation Bureau of the International Telecommunication Union (ITU-T), are concerned with standards including those at the interface between the internet and other communications technologies and media.

Figure 20.1: **The internet governance continuum**



- Some, like ITU-T and WIPO, have considerable governmental involvement, but many – particularly those which have developed from the early days of the internet – have been built around the engagement of interested individuals and organisations or businesses, with little or no direct government involvement.

There is considerable diversity in the types of governance instruments agreed through internet governance bodies. These range from very strict and enforceable regulations (such as those necessary to ensure that domain names and numbers are unique), through standards (which set an agreed framework on which innovation in technology and service provision can proceed), to broad policy agreements and statements of principle, and to behavioural norms.

Most internet-specific governance bodies build their decision-making processes around consensus. Consensus decision making – best known in the process of "rough consensus and running code" developed in the IETF – requires both broad agreement between those involved in the decision-making process *and* the absence of strong opposition from anyone within the group to a particular course of action. A number of different stages where consensus must be achieved are usually involved, with widening circles of participation (starting with those directly involved in developing a standard or policy and ending with the broad community of participants in the governance body concerned). Where consensus cannot be reached, proposed standards or policies are either rejected or referred back to their originating parties for further work.

This process differs from majoritarian or democratic conventions in which the will of the majority may (and often does) override strong objections by minorities. It adds a significant cautionary element to the broadly experimental character of internet technical development, but has also been adopted in policy-making processes, for example, by the Regional Internet Registries (RIRs). However, its appropriateness in policy decisions – where differences are likely to arise from ideological convictions rather than judgements of technical effectiveness, and where choices between incompatible options are more likely to be necessary and immediate – can be difficult and contentious.

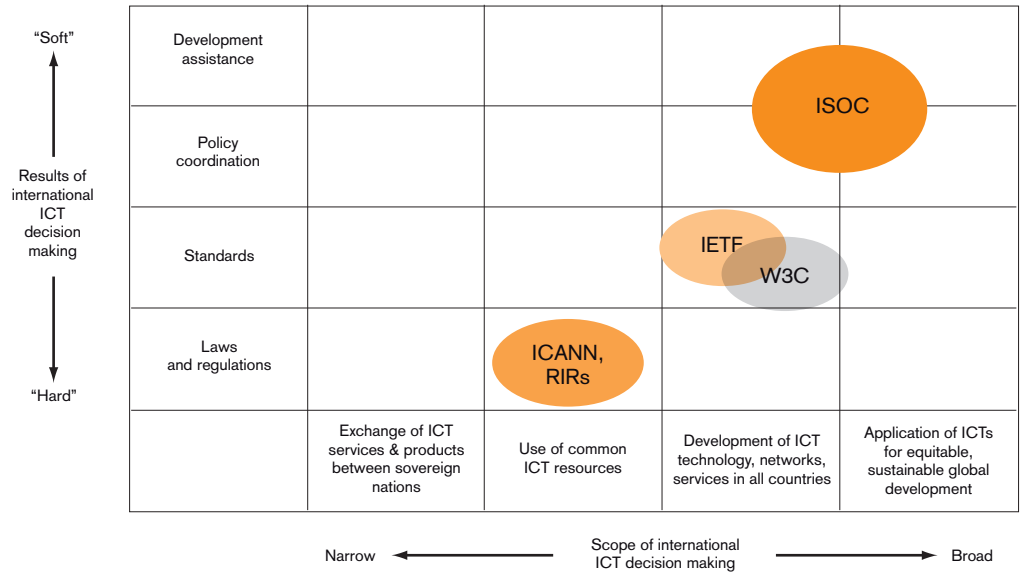
Participation in internet-specific governance bodies is usually quite open. The IETF, for example, has no membership structure and anyone can participate in any of its work. Most other internet governance bodies – for example, W3C and the RIRs – have some form of membership structure, but allow anyone who has an interest in a standard- or decision-making process to participate irrespective of their membership status. ITU-T, however, is more restrictive, confining participation in its standard-setting work to governments and sector members of the ITU Standardisation Bureau.[4]

Internet governance entities

At the time of writing (mid-2008), no one had completed a comprehensive map of entities engaged in internet governance. However, the diagram in Figure 20.2 positions a number of the most important internet governance

4 The chapter author has undertaken work on information and participation arrangements in internet governance bodies for APC, the Council of Europe and UNECE. The report of this work can be found at www.apc.org/en/node/9443

Figure 20.2: **Internet governance issues and organisations**



agencies within a framework or matrix of governance, which is also used in Chapter 28 to illustrate the roles of a wider range of international telecommunications agencies.[5] The following paragraphs then briefly describe the roles of these particular bodies – though it should be remembered that they are only the most important of very many entities that have a role to play.

Names and numbers entities

Internet Corporation for Assigned Names and Numbers (ICANN)

ICANN is a non-profit private sector corporation which has responsibility, at a global level, for managing the Internet Protocol (IP) addressing system which enables access to the internet (i.e. the domain name system and the numbering system which underlies this). ICANN was created in 1998, establishing greater distance between the domain name system and the government of the United States which had previously overseen it. Its status as a corporation registered in the United States – and so, potentially, in the eyes of some, susceptible to US government intervention – remains controversial, and the Joint Project Agreement between it and the US Department of Commerce, a key instrument of ICANN governance, was under highly contentious review at the time of writing (mid-2009). ICANN has a Board of Directors representing different stakeholders, and a highly complex set of arrangements for the involvement of different constituencies and interests. A Government Advisory Committee (GAC) provides input from governments.

ICANN manages the Internet Assigned Numbers Authority (IANA), which oversees global IP address allocation, root zone management for the domain name system (DNS) and other aspects of IP management.

Regional Internet Registries (RIRs) and Number Resource Organisation (NRO)

RIRs are the organisations which oversee the allocation of IP numbers (delegated to them by IANA, see above) at a regional level. There are five RIRs: AfriNIC (Africa), APNIC (Asia-Pacific) ARIN (North America and part of the Caribbean), LACNIC (Latin America and part of the Caribbean) and RIPE NCC (Europe, Middle East and Central Asia).

The NRO is the association of RIRs.

Standards bodies

Internet Engineering Task Force (IETF)

The IETF describes itself as an "international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet." It has no membership arrangements. Anyone who wishes to participate in the IETF's work, particularly standard setting,

5 The diagram is developed from work originally undertaken by Don MacLean, David Souter *et al.* for the G8 DOT Force report *Louder Voices*, available at www.panos.org.uk/?lid=324
It was developed for the internet by Don MacLean in an article entitled "Herding Schrödinger's Cats", which can be found at www.unicttaskforce.org/perl/documents.pl?id=1321

may do so, through groups which work both online and in regular meetings (the latter being seen as part of work that is primarily organised online). Although many participants work for governments or businesses, they participate in the IETF as individual experts. Standards are developed through a process known as "rough consensus and running code" (see above).

World Wide Web Consortium (W3C)

W3C, which was founded by the World Wide Web's designer Tim Berners-Lee, emerged from the IETF in 1994 as "an industry consortium dedicated to building consensus around Web technologies," and so to developing vendor-neutral standards for the World Wide Web. Its role is comparable in many ways to that of the IETF, but it is structured around formal organisational membership arrangements and full-time technical staff.

Policy forums

The Internet Society (ISOC)

ISOC is a non-profit organisation which was set up in 1992 "to provide leadership in internet related standards, education, and policy." It is a membership organisation, which has local membership chapters in many countries; a clearinghouse for information, education and capacity building; and a forum for discussion of internet policy and technical issues. It provides an organisational home for the Internet Engineering Task Force (see above) and the Internet Architecture Board.

Some other international organisations concerned with interactions between the internet and public policy are discussed in other chapters of this handbook, particularly those concerned with rights and development issues. The Internet Governance Forum is described later in this chapter.

Internet governance at WSIS

Internet governance was a largely specialist concern until the first phase of the World Summit on the Information Society (WSIS), which began in 2002 and led up to the first (Geneva) WSIS summit at the end of 2003.[6] During that period, however, internet governance became a major issue of debate within WSIS, and it was subsequently the predominant issue during the second WSIS phase (2004/2005, leading to the second summit in Tunis in November 2005). At the time of writing (mid-2009), many of the arguments that arose in that debate were still unresolved.

Two main tensions concerning internet governance emerged during the first phase of WSIS. These are sometimes confused, but it is important to recognise the differences between them, which remain important today.

Firstly, some governments – including the majority of developing country governments – challenged the role of the United States in relation to the internet, in particular the location of the majority of root servers (the core of the system for directing requests for particular domains) in the United States and the status of ICANN as a non-profit corporation subject to US jurisdiction.

These governments argued that this gave the government of the United States the ability to control the internet – even, if it wished, to cut off internet service to a particular country. They therefore sought the establishment of an international governance body to oversee the internet, or at least the root server and domain name systems. Some civil society organisations sympathised with these governments' concern about the US role within the internet.

Their position was opposed, however, by the majority of industrial country governments and by most private sector internet bodies, which argued that the present arrangements did not in practice threaten the internet's development or accessibility and that an international – for example, a United Nations – body would be cumbersome and hinder internet development.

There was in this debate some confusion over the role of ICANN, to which some participants attributed more power over the internet than its relatively narrow role in the domain name system. On the other side of the debate, some participants feared that ICANN's opponents wished to transfer powers over the internet to the ITU, whose requirements for intergovernmental agreement and formal standardisation they believed would stifle innovation.

Secondly, some governments – again including many developing country governments – believed that the internet was too "ungoverned" and felt that it should be brought within the conventional governance structures of nation-states and intergovernmental cooperation. This was a more general argument about the relationship between the internet and the state, rather than a specific argument about the relationship between the internet and the United States.

This argument was also opposed by the majority of industrial country governments, as well as by most of the private sector and the internet technical community. Its opponents argued that a lack of government control had been fundamental to the rapid, innovative and experimental nature of the internet and that this innovative ethos would be lost if it were managed – at national or international level – like telecommunications or any other business sector. They also pointed to the intrinsic

6 WSIS is described in detail in Chapter 29.

difficulty of managing a global communications medium through national legislation.

Civil society organisations also generally opposed the argument for greater government control. They were concerned in particular that greater government control would stifle the internet's ability to empower citizens and civil society organisations, would facilitate censorship and access controls, and would allow governments to snoop on citizens' and organisations' internet use.

However, it was widely recognised in this debate that the internet's increasing importance in social and economic life brought internet governance into more and more frequent juxtaposition, and sometimes conflict, with conventional governance – particularly in areas such as intellectual property, crime and commerce. This implied at least the need to integrate rules, regulations and governance norms, and therefore some rethinking of governance approaches in both internet and conventional governance communities.

These arguments were not resolved during the first phase of WSIS, which invited the United Nations Secretary-General to set up a Working Group on Internet Governance, which could make recommendations to WSIS' second phase. The Working Group (WGIG, for short) comprised 40 individuals with diverse experience of the internet – from governments and international organisations, business, civil society and the internet technical community. Uniquely for a United Nations forum, these participants were asked to work as individuals rather than representatives of particular interest groups. WGIG is therefore regarded by many, particularly in civil society, as a model for multi-stakeholder engagement with the internet.

WGIG agreed a definition of internet governance which was subsequently adopted by WSIS, and which can therefore be taken as a definition which has international consent. This definition is as follows:

> Internet governance is the development and application by governments, the private sector and civil society, in their respective roles, of shared principles, norms, rules, decision-making procedures, and programmes that shape the evolution and use of the Internet.[7]

The second phase of WSIS was overwhelmingly concerned with internet governance issues, and almost broke down because of failure to reach agreement on these. The final outcomes of WSIS, so far as internet governance was concerned, were threefold.

Firstly, WSIS agreed a set of basic principles, sometimes called the "WSIS principles", relating to participation in internet governance debate. This text has formed the basis for much subsequent discussion about multi-stakeholder participation in internet governance. Its principal paragraph reads as follows:

> The international management of the Internet should be multilateral, transparent and democratic, with the full involvement of governments, the private sector, civil society and international organisations. It should ensure an equitable distribution of resources, facilitate access for all and ensure a stable and secure functioning of the Internet, taking into account multilingualism.[8]

Secondly, compromise text was agreed which called on the United Nations to promote "enhanced cooperation… to enable governments, on an equal footing, to carry out their roles and responsibilities, in international public policy issues pertaining to the Internet, but not in the day-to-day technical and operational matters, that do not impact on international public policy issues."[9] This text allowed a consensus to be reached between those who wanted to maintain the status quo regarding what had become known as "critical internet resources" (the root server and domain name systems) and those who wanted to bring about changes in the role of ICANN, the location of root servers, etc. This effectively postponed the issue. In practice, however, by the time of writing (mid-2009), little or nothing had resulted from this WSIS outcome.

Thirdly, WSIS asked the UN Secretary-General to establish an Internet Governance Forum – a "multilateral, multi-stakeholder, democratic and transparent" forum which would "build on the existing structures of Internet governance, with special emphasis on the complementarity between all stakeholders involved in this process – governments, business entities, civil society and intergovernmental organisations."

This Forum – which had been suggested by WGIG – would have no decision-making powers, but would provide a space for the discussion of the internet and internet-related issues for all who were interested in participating. It has become a forum of significant engagement for APC.

The Internet Governance Forum (IGF)

The first three meetings of the IGF were held in Athens (2006), Rio de Janeiro (2007) and Hyderabad (2008), with further meetings scheduled for Egypt (2009) and Lithuania (2010), pending a decision, to be taken through the UN General Assembly, on whether the Forum's initial five-year mandate should be extended. These have been organised by a small secretariat and a Multi-stakeholder Advisory Group (MAG) appointed (following nominations) by the UN Secretary-General.

7 Tunis Agenda for the Information Society, para. 34

8 Geneva Declaration of Principles, para. 48; this text is reiterated in the Tunis Agenda for the Information Society, para. 29

9 T*unis Agenda for the Information Society,* para. 69

The Forum's mandate includes a wide range of issues for discussion (see box below), but, as noted above, without decision-making powers.

Discussions at the IGF have been organised around plenary sessions which have addressed a number of thematic areas – initially "access", "diversity", "openness" and "security", with attention also paid to the broad cross-cutting themes of "capacity building" and "development". Workshops, organised by multi-stakeholder partnerships of interested organisations, have been held around the plenary sessions and provided an opportunity for more focused debate.

Fourteen multi-stakeholder "dynamic coalitions" had also been formed by 2008, providing an opportunity for those interested in particular issues to work together between IGF sessions. The issues addressed by these coalitions ranged from spam to freedom of expression, and from child protection to climate change.

The first IGF was generally regarded as successful and valuable in stimulating discussion across traditional stakeholder boundaries. The second attracted more criticism on the grounds that it did not move discussion forward as much as many participants had hoped.

Some have argued that the IGF should move towards a more definitive or decision-making role. However, this is strongly resisted by many in industrial countries and the private sector, and by many in the internet technical community where detailed governance decisions are made. The future of the IGF will be reviewed before its fifth scheduled meeting in 2010 and may well depend on its ability to bridge the divide between those who believe it is most valuable as a space for debate and those who wish it to play a more dynamic role. ■

The mandate of the Internet Governance Forum

The mandate of the Forum is to:

- Discuss public policy issues related to key elements of Internet governance in order to foster the sustainability, robustness, security, stability and development of the Internet.
- Facilitate discourse between bodies dealing with different cross-cutting international public policies regarding the Internet and discuss issues that do not fall within the scope of any existing body.
- Interface with appropriate intergovernmental organizations and other institutions on matters under their purview.
- Facilitate the exchange of information and best practices, and in this regard make full use of the expertise of the academic, scientific and technical communities.
- Advise all stakeholders in proposing ways and means to accelerate the availability and affordability of the Internet in the developing world.
- Strengthen and enhance the engagement of stakeholders in existing and/or future Internet governance mechanisms, particularly those from developing countries.
- Identify emerging issues, bring them to the attention of the relevant bodies and the general public, and, where appropriate, make recommendations.
- Contribute to capacity building for Internet governance in developing countries, drawing fully on local sources of knowledge and expertise.
- Promote and assess, on an ongoing basis, the embodiment of WSIS principles in Internet governance processes.
- Discuss, inter alia, issues relating to critical Internet resources.
- Help to find solutions to the issues arising from the use and misuse of the Internet, of particular concern to everyday users.
- Publish its proceedings.

Source: Tunis Agenda for the Information Society, para. 72.

Chapter 21
INTERNET POLICY ISSUES

Lead author ***David Souter***

Introduction

The internet has become a major force in society within a very short period of time. Although the ARPANET, generally considered the starting point for today's internet, was first developed by computer scientists and used by academics at the end of the 1960s, it was not until the mid-1990s, following the introduction of the World Wide Web, that it began to reach a mass market in industrial countries. Since then, however, it has grown both in scale and scope:

- The estimated number of internet users worldwide has grown from about 360 million at the end of 2000 to around 1.5 billion by the end of 2008. Estimates of internet users reach as high as 85% of the population in Canada and 73% in the United States, although they remain low in other countries, with penetration rates below 1% estimated in some sub-Saharan African countries in mid-2008.[10]
- The use of the internet has diversified from the scientific and academic communities in which it originated, not just into mass markets, but also in government and business, with many government functions now performed and many commercial transactions now conducted online.

This very rapid development has raised a number of important policy issues, for three main reasons:

- The diversification of internet use has meant that it has increasingly impinged upon and intersected with areas of social and economic life – and policy concerning these – which were not relevant in its early days and which were therefore not considered by early internet designers and policy makers. When the internet was a medium for dialogue within narrow specialist communities, it could be largely self-contained and self-regulated. Now that it is a major forum for government and business, norms and rules that govern the internet need to be consistent with those governing the rest of social and economic life. These intersections between the internet and what might be called "mainstream" policy areas lie at the heart of many internet governance debates.
- Governments and intergovernmental organisations have played very little direct part in the development of the internet. By the time it had come to play a significant role in social and economic life, therefore, towards the end of the 1990s, they were poorly placed to influence its direction or to integrate internet standards and behaviour into national and international law. For some governments, this is primarily a matter of political authority. Other governments are concerned not so much about authority (indeed many industrial country governments are keen to maintain private sector leadership within the internet), but about the need to ensure consistency between the judicial, commercial and other rules governing internet and non-internet behaviour. Most businesses and civil society organisations share this latter concern, although some libertarians have argued that the internet should become, in effect, a government-free space.
- Historically, most transactions and interactions have taken place within national boundaries, making them liable to national laws and norms. International interactions – such as international trade and telecoms links – were, in effect, treated in the past as exceptional circumstances and governed by international treaties and agreements (for example, by the international trade rules within GATT and more recently the WTO, by international intellectual property agreements managed by WIPO, and by international standardisation processes such as those managed by the ITU or the Universal Postal Union). "Cyberspace", however, is essentially global rather than national. That is, although partly organised at a national level (e.g. through national domains or ccTLDs), internet content – and the interactions and transactions it enables – take place in a global rather than national context (goods can be bought and sold across traditional frontiers, and people can use internet services to bypass national legal constraints and prohibitions). This globalisation poses substantial problems for traditional models of governance and law.

Institutional aspects of the governance challenges raised by these factors are discussed in Chapter 20. This chapter looks briefly at some of the main policy issues under discussion within internet governance. It is not intended to be comprehensive, but to provide a basic introduction

10 Figures from www.worldinternetstats.com, December 2008

to some of the more important issues. Many of these issues are complex, and this chapter can offer only a brief introduction to them, and to issues which are of particular interest to APC. More information can be found in sources cited in the "Further Reading" section of the handbook.

Narrow and broad interpretations of internet policy

Internet policy issues can be divided in a number of ways, and several of these are discussed at different points within this chapter. As noted in Chapter 20, however, a fundamental distinction is often drawn between "narrow" and "broad" policy questions. This distinction has become important in discussions about internet governance in general, with some participants advocating a narrow interpretation of internet governance over policy issues and others wishing to extend discussion of governance more broadly.

The fundamental distinction is as follows:

- Narrow issues of internet policy are those concerned with the internet itself – i.e. with the way internet architecture and standards are developed, with the way domain names and numbers are managed, and with the way that users interface with the technology and management functions of the internet.
- Broad issues of internet policy are concerned with interfaces between the internet and other areas of social and economic life and policy, i.e. with the ways in which the internet enables changes in the ways that other things are done within society – for example, the ways in which businesses interact with consumers; in which governments deliver services; in which criminals exploit their victims; and in which citizens relate to the state and other citizens.

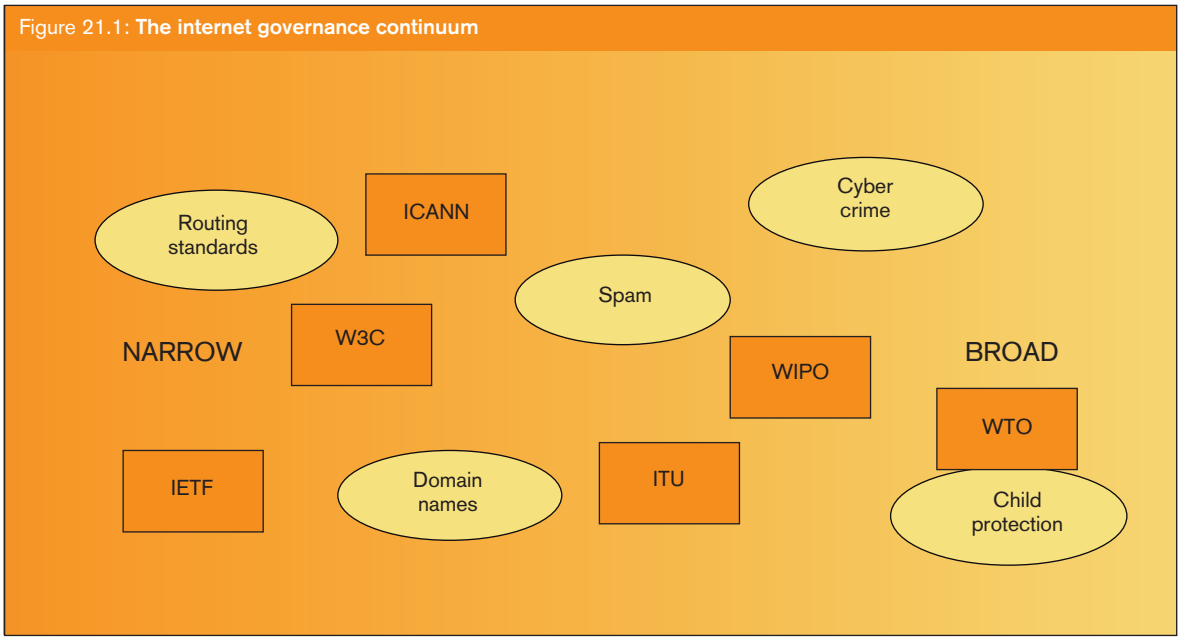
The boundary between narrow and broad policy issues is not always clear, as illustrated by Figure 21.1, which also appears in Chapter 20.

Spam, for example, is in some ways a narrow, technical challenge for the internet: a matter of how protocols and other technical facets of the internet can be developed in order to reduce the waste of internet resources (including bandwidth) involved in spam distribution. But spam also affects people and organisations in ways that extend beyond the narrow confines of the internet – by wasting people's time, by enabling fraud, by wasting energy resources, etc.

Quite a number of areas of internet policy, like spam, have both narrow technical and broad socioeconomic causes and consequences, and require input both from internet specialists and those primarily concerned with wider social and economic developments if they are to be resolved. As indicated in Chapter 20, there have often been paradigm gaps between internet specialists. Some members of the internet technical community are reluctant to open up discussion of technical issues to policy considerations – arguing, for example, that the internet should be developed on the best technical basis for the internet itself, without looking at impacts outside the technical field. Others, usually from a more policy-focused background, have argued that all technical decisions have policy implications, and that technical and policy fields cannot and should not be divorced from one another, even that the distinction is a spurious one. Much internet governance debate is concerned with findings ways of bridging the gaps between technical and public policy fields.

Nevertheless, the distinction between narrow, or internet-specific, issues and broader socioeconomic implications/impacts is a useful one. The next section of this chapter is primarily concerned with the former; later sections discuss some of the broader policy issues.

Figure 21.1: **The internet governance continuum**



Internet-specific ("narrow governance") issues

Although the texts of the World Summit on the Information Society (WSIS) praised the potential of the internet in many social and economic fields, discussion about the internet in the summit's meetings focused on a small number of relatively narrow issues of internet governance, especially those concerned with how the domain name and root server systems should be organised.

The principal issues here – the relative lack of government involvement in internet governance, and the perceived predominance of the United States where domain names and root servers are concerned – are discussed in Chapter 20. As well as establishing the Internet Governance Forum as a debating chamber on the future of the internet, the WSIS outcome documents also called for "enhanced cooperation… to enable governments, on an equal footing, to carry out their roles and responsibilities in international public policy issues pertaining to the Internet, but not in the day-to-day technical and operational matters that do not impact on international public policy issues."[11] In practice, however, little had been achieved along these lines by the end of 2008.

In the meantime, existing internet governance bodies – standards bodies such as the Internet Engineering Task Force (IETF) and the World Wide Web Consortium (W3C); and administrative bodies such as ICANN, the Regional Internet Registries and national registries – have continued to deal with emerging technical issues. Among those which have proved particularly significant in the middle of the first decade of the 21st century have been the following:

- **The transition from IPv4 to IPv6, i.e. from one version of the Internet Protocol to its successor:** IP version 4 has been the dominant version of the Internet Protocol since the early 1980s. However, the number of IP addresses which it can provide is limited (to a little over 2^{32} or 4 billion), and this has begun to constrain internet growth because of the need to organise numbers into rational blocks which can be used by different actors. IP version 6 can support 2^{128} internet addresses, more than ten billion billion billion times as many as version 4 – though it is not so much the number of addresses that is important here as the capacity for systematic, hierarchical structuring of addresses. Internet community entities such as the IETF were determining, during the first decade of the 21st century, how best to migrate the internet as a whole from IPv4 to IPv6, although progress had been slower than anticipated and migration was posing some challenges for developing countries.
- **Expanding the domain name hierarchy:** Originally, there were very few top level domains – .com, .edu, .gov, .int, .org, .net – used at a global level. Together with national domain names or country code top level domains (ccTLDs) – such as .uk (United Kingdom), .de (Germany) and .za (South Africa) – these were the only top level domains that could be made available to users. A limited expansion in the number of top level domains – including, for example, .biz and .info – took place in 2001. Fierce debate has surrounded questions such as whether a .xxx domain should be created for pornographic sites; about whether ccTLDs should be complemented by domain names based on cities, regions, etc.; and about the relationship between domain names and trade marks. An ICANN meeting in 2008 approved a relaxation of the rules governing domain names which would enable public and private entities to register new strings of letters as top level domains.
- **ccTLD management:** In the early days of the internet, when it was significant for few people, the management of ccTLDs was granted to a wide variety of different types of organisation in different countries. Some of these were government departments, but it was common for the national registry role to be held by private businesses, non-profit organisations, universities or even private individuals. In some cases, the national registry was managed by an individual or organisation outside the national territory concerned. As the internet has become more important, some governments have been concerned that something which they see as a national resource is owned and managed by a private sector or non-governmental body rather than by a government agency, and have sought to "nationalise" ccTLD management. This has led to a number of significant disputes. Other governments have preferred to see domain name management remain a private sector service.
- **Domain name disputes:** As the internet has become more widespread and more commercially significant, so the potential value of domain names has increased.[12] Companies regard domain names that signify (or appear to signify) their identities or brands as a form of intellectual property and this has led to disputes of several kinds. In some cases, for example, individuals or organisations have registered domain names which appear to be those of well-known brands, in order to sell those names to the brands concerned. The practice of registering but not using domain names is known as "cyber squatting". In other cases, individuals with a grievance against an organisation have registered a domain name in order to use it as a forum for hostility to the organisation concerned – or perhaps to deceive browsers. Cases

11 Tunis Agenda for the Information Society, para. 69

12 The U in URL, of course, stands for "unique", and domain names have historically been allocated to first-comers. Thus, for example, www.bbc.org is the website not of the British Broadcasting Corporation, but of a computer club in the Canadian city of Victoria; www.igf.org is not, as might be expected, the website of the Internet Governance Forum, but of the Royal Society for the Relief of Indigent Gentlewomen of Scotland.

such as these can be political as well as commercial in character.

A process for resolving top level domain name disputes of this kind, known as the Uniform Domain Name Resolution Policy, has been agreed between ICANN and the World Intellectual Property Organisation (WIPO). Disputes at national level are dealt with by national registries.

- **Spam and malware:** Spam is unsolicited bulk email. By 2008, it accounted for over 90% of all email, and was regarded by many as one of the most serious problems on the internet. Although most internet service providers (ISPs) and users deploy some spam filter software in their email systems, and so do not see the majority of spam emails that they receive, the high volume of spam makes unnecessary use of bandwidth and so significantly slows the internet in locations – such as developing countries – where bandwidth is scarce.

  The distribution of spam is closely associated with organised crime. Much of it is generated by "botnets", i.e. networks of ordinary personal and business computers which have been infected by malicious software which uses them as "spam engines". Much of it also facilitates various forms of online fraud. It is therefore not just a technical problem, but also an important problem of internet and financial security, and is considered further, in this context, below.

  Spam is also associated with the distribution of various other forms of "malware" – i.e. malicious software – which can enable outsiders to monitor computer use and/or obtain information from infected computers, for example, by stealing data held on local computers or by using keystroke logging to identify credit card numbers and other sensitive data.

  The vulnerability of internet-connected computers to malicious programmes results from the very openness which gives the internet its value, in particular the ability to access material, including programmes, from remote computers and to control what one computer does from another which is not directly connected with it. The latter half of the first decade of the 21st century saw increasing debate about whether the internet would be able to sustain its historic levels of "generativity"[13] in the face of continuing onslaught by spam engines, viruses and malware.[14] The continued rapid expansion of access also notably provides continuing new opportunities for those seeking to exploit the internet for malicious purposes.

- **Net neutrality:** The concept of "net neutrality" is based on the principle that all internet traffic should be treated equally, i.e. that there should be no discrimination between different types of traffic according to the nature of that traffic. This principle underpinned the early development of the internet, and is strongly advocated by many internet pioneers and many members of the internet technical community. At its heart lies the perception of the internet as a neutral vehicle for content, the value of which content is determined by end-users rather than by intermediaries.

  The following statement, from leading advocates, presents the case for net neutrality in its simplest form:

  > Net neutrality means simply that all like Internet content must be treated alike and move at the same speed over the network. The owners of the Internet's wires cannot discriminate. This is the simple but brilliant "end-to-end" design of the Internet that has made it such a powerful force for economic and social good.[15]

  The principle of net neutrality has become more controversial as the internet has expanded its reach and provided a vehicle for more bandwidth-hungry services, some of which (such as video streaming and voice telephony over the internet) require continuity of transmission in ways that are not required by more traditional applications such as email, file transfer or general web browsing. The popularity of video-sharing sites such as YouTube and of peer-to-peer file exchange has raised attention to the issue, including the risk that high-bandwidth services used by a minority may jeopardise quality of access for the majority, particularly where bandwidth is in short supply. Opponents of net neutrality, including some significant internet business figures, argue that it is preferable to allow internet businesses to offer varied tiers of internet service to customers, including traffic prioritisation. Some argue that movement away from net neutrality is also necessary to maintain the attractiveness of future internet investment.

Broad internet policy issues

The internet is now so significant and pervasive in industrial countries that its use intersects with almost every area of public policy. Although it is not so pervasive in developing countries, its use is growing rapidly and it has the same potential impact there as it already has in industrial countries. The governments and citizens of all countries, therefore, face challenges associated with interactions between the internet and established policies, laws and rules, and with the ways in which government, business and personal relationships are conducted.

13 "The ability of a self-contained system to provide an independent ability to create, generate or produce content without any input from the originators of the system." Wikipedia "Generativity" accessed 24 October 2009 en.wikipedia.org/wiki/Generativity

14 On this debate, see for example Jonathan Zittrain, *The Future of the Internet – And How to Stop It* New Haven: Yale University Press, 2008 futureoftheinternet.org/download

15 Lawrence Lessig and Robert McChesney in the *Washington Post*, 8 June 2006, cited at en.wikipedia.org/wiki/Network_neutrality#Definitions_of_network_neutrality

These interactions between the internet and society/economy can be divided up in different ways. The following paragraphs describe two ways of dividing them which readers of this handbook may encounter.

The diplomatic training agency Diplo, in its widely used manual on internet governance,[16] divides the issues dealt with in internet governance into five broad "baskets", as follows:

- Infrastructure and standardisation – including the basic architecture and structure of the internet (for example, the domain name and root server systems) and some technical issues which more directly affect users (such as spam, security and encryption). (These are mostly "narrow" issues, as defined above.)
- A legal "basket" – which is concerned with ways in which the internet intersects with legal frameworks in areas such as intellectual property, crime, privacy and data protection.
- An economic "basket" – including issues such as electronic commerce, consumer protection and taxation.
- A development "basket" – including access, the "digital divide" and the use of the internet to overcome developmental barriers.
- A socio-cultural "basket" – including issues of content, diversity and human rights.

From its inception, the Internet Governance Forum (IGF) adopted a more abstract thematic division of issues, into four main categories:

- Access
- Diversity
- Openness
- Security

with overarching themes of "development" and "capacity building". These four thematic terms were used to structure debate in both plenary and workshop sessions at the first and second meetings of the IGF. The third meeting of the IGF, in 2008, focused on the following main themes during its plenary sessions:

- "Reaching the next billion"
- "Promoting cyber security and trust"
- "Managing critical internet resources"
- "Emerging issues – the internet of tomorrow".

The final section of this chapter briefly describes a selection of the policy issues that have been raised in these debates. Before doing so, however, it is worth noting an underlying question about internet governance and its relationship with other areas of governance.

16 Jovan Kurbalija and Eduardo Gelbstein *Internet Governance: Issues, Actors and Divides* (Malta: Diplo Foundation, 2005) www.diplomacy.edu/ISL/IG

The legal framework

It has been noted elsewhere in this handbook that some within the internet community have seen the internet as a potential "government-free" space, in which governments would not be able to enforce legal or social norms on users. This libertarian or anarchist conception of the internet was quite widely held among internet pioneers, but has become much less prevalent as the internet has become more and more important in social and economic life. Certainly, many users exploit the internet's capacity to bypass legal and normative constraints – most obviously in accessing pornography and bypassing intellectual property rules on audio and video files. However, no governments, very few businesses and few consumers now envisage the internet developing into a parallel social and economic environment which is exempt from government and legal jurisdiction.

The central challenge here for policy makers lies in finding ways of integrating the internet and its modalities with the outcomes of policy making and legislation that were developed in pre-internet economies and societies. A particular concern is consistency: how to make the handling of copyright on the internet consistent with that in non-internet media, for example; how to make the management of internet and non-internet transactions consistent, for example, with regard to taxation and consumer rights; how to ensure that internet fraud is prosecuted consistently with more traditional fraud. At the same time, governments and businesses are concerned to avoid imposing restrictions on the internet that will prevent it maximising its value to them and to end-users.

This raises a critical question about legal mechanisms – in essence, a question about whether internet circumstances require:

- Different legislation which is specific to the internet.
- Adaptation of existing legislation to meet new requirements.
- No new legislation at all but merely the application of existing law (perhaps with some interpretation of new circumstances).

An example of this question is that of whether pre-internet copyright law is sufficient to handle internet copyright issues, or whether new copyright law needs to be written in order to deal with them.

Central to discussion of this question has been the extent to which the internet makes a difference to social or economic behaviour and the degree to which it changes that behaviour. This question is important in many different areas of internet activity, and different jurisdictions have taken different views in different areas of policy, although there has been an increasing preference to apply and adapt existing law rather than to develop new law for the internet as such.

Selected issues

The following paragraphs look briefly at some of the broader policy issues raised within discussions in the Internet Governance Forum. These paragraphs are not intended to be comprehensive or detailed, but to identify and illustrate some of the issues under consideration. They therefore represent only a sample of the issues in debate. Additional material on issues of current importance will be incorporated in this handbook as they become significant to the work of APC and its partners.

Access

Access to the internet is considered by most commentators to be a positive good within society, and of importance to all social groups in all countries – in particular, to rich and poor, and to men and women. However, access is constrained my many factors which are discussed elsewhere in this handbook – in particular by the availability of infrastructure, including communications networks and computers (more available in industrial than developing countries, and in urban than rural areas); by the cost of computers, connectivity and internet access (likewise); and by the availability of relevant skills, including literacy (more available to the rich than to the poor). Some of the issues raised within the access debate are discussed in other chapters of this handbook.

The status of communications infrastructure

There has been some debate in recent years about whether internet infrastructure should be treated as a "public good", where this term is interpreted to mean something that is of such value that it should be equally available to all. (In economic terms, "public goods" are also expected to be "non-rival", i.e. undiminished in value by the number of actual users, which is not the case with internet infrastructure.) APC has been among those organisations advancing this position. The issue raises a number of debates, including the relationship between private and public provision of infrastructure, the viability of competitive infrastructure provision, and the relative value to citizens of communications and other infrastructures which may or may not be treated as public goods (e.g. power and water infrastructures, health and educational resources).

International bandwidth availability and costs

The international bandwidth available in a particular country determines the quality of access which internet users can enjoy when trying to access websites outside the country (and also within the country if it has no IXP, see below). A country/ISP with a great deal of available international bandwidth will be able to offer its citizens/customers internet access which is both faster and cheaper than one in a country where a much lower level of bandwidth has to be shared between consumers. In practice, as a result, internet users in industrial countries generally benefit from much faster and cheaper internet access than users in most developing countries. The shortage of international bandwidth is particularly acute in sub-Saharan Africa.

Many commentators argue that the accounting arrangements between global internet businesses and communications businesses in developing countries exacerbate this problem. The volume of data sent between industrial countries (particularly the United States and Europe) and developing countries (particularly in Africa) is asymmetric: internet users in, say, Malawi are much more likely to make use of websites in the United States than vice versa. As a result, developing country communications businesses effectively pay for transit of such internet traffic in both directions. Many believe that this substantially increases the cost of internet access for end-users, although this impact has been disputed.

National bandwidth costs and IXPs

Internet traffic in almost all countries is generated by a number of different ISPs. Some of this traffic can be contained within the country, because it is concerned only with local email addresses or with the use of local websites. Unless local ISPs have made arrangements between themselves, however, it is likely to be routed through major international hubs, adding to international transit costs (see above). A national internet exchange point (IXP) reduces these costs by ensuring that traffic between internet users/websites within a country does not transit and so incur costs beyond national boundaries. Cost savings from this can be considerable. IXPs can also be implemented at a regional as well as national level.

Diversity and language

Issues of diversity are essentially about inclusiveness, i.e. of making internet access (and also the opportunity to use the internet to express opinions and seize opportunities) meaningful as well as available to all. This depends on factors which go beyond the availability of physical infrastructure, including a number of social, economic and cultural issues.

One of the most prominent of these issues is language. From its early days, the majority of content on the internet was in English, and English today remains the dominant language on the Web. The predominance of English is partly a result of historic and cultural factors, in particular that the internet was first developed in the United States and that English has become the predominant language

of international discourse. As well as these socio-cultural factors, however, it was exacerbated by the linguistic norms of the early internet, which relied on a subset of the Latin alphabet in such areas as the internet address space. Considerable effort has been made by internet engineers in recent years to design and incorporate non-Latin alphabets into internet addresses, and these continue. Other internet commentators and activists focus on the development of more diverse – including linguistically diverse – content and on access to the internet for those with disabilities.

Openness and rights

Discussions about openness, too, are particularly concerned with issues of content – of who can generate content or access it, under what terms, with what constraints and within what jurisdiction. As well as being concerned with opportunity, the openness agenda strongly connects with concerns about human rights and freedom of expression. Since the foundation of the IGF, there has been considerable debate within it about the relationship between established social and economic rights and rights on the internet. These have included suggestions about the possibility of moving towards an "internet bill of rights", which have proved controversial amongst rights activists, some of whom are concerned that any new rights agreement may be more restrictive than existing rights conventions. More on these topics can be found in Chapter 5.

Political censorship

The internet opens up new spaces for both political information and engagement. In societies where access to political information is restricted, external news sources can add considerably to people's understanding of what is happening in their own country. The internet also provides channels for unofficial news gathering and communication, and for political organisation, through independent websites, blogs, bulletin boards and social networking services.

Censorship of the internet is not simple, because of the immense diversity of content, though it is easier to implement where ISPs are either government-owned or tightly controlled. Some governments have placed emphasis both on preventing access by end-users to particular websites – including major news sites such as that of the BBC and campaigning sites such as that of Amnesty International – and on identifying and arresting bloggers and citizen journalists. The relationship between governments and internet businesses has been particularly contentious in this context, as some governments have sought to require ISPs and search engines to monitor internet use and reveal the identity of their customers on demand.

Another issue raised within this context is that of "hate speech", which Wikipedia defines as speech (or text) "intended to degrade, intimidate or incite violence or prejudicial action against a person or group of people based on their race, gender, age, ethnicity, nationality, religion, sexual orientation, gender identity, disability" or any of a number of other characteristics.[17]

In some cases, "hate speech" and related content is easy to identify: for example, incitement to violence against particular social groups or instructions on how to make terrorist materials. In others, however, different countries have very different perceptions of acceptable and unacceptable behaviour. In the United States, very high levels of free expression are guaranteed by the First Amendment to the Constitution. In France and Germany, which also have high levels of free expression, the sale of Nazi memorabilia is nevertheless prohibited by law. In some countries, there are severe sanctions against criticism of religion or advocacy of the rights of women or sexual minorities. There is, in short, no common global understanding of "acceptable" content, or of the boundary between "hate speech" and legitimate political or religious debate.

Social censorship

The issue of "hate speech" lies at the boundaries between political and social areas of expression and organisation. The most prominent policy debates in this area, however, have taken place around pornography, particularly child pornography.

The internet has greatly increased the availability of pornography worldwide; indeed, it is probable that access to pornography was one of the principal drivers of the internet's transition from a specialist to a public medium in the mid-1990s. The level and type of pornography permitted by national legal jurisdictions is highly variable, and so content which is legal in many countries will be illegal in many other countries (and vice versa). With the exception of child pornography related to younger children, there is, as with hate speech, no common global understanding of what is or should be permitted and what should not. As a result of this, and the ability of internet users to remain (largely) anonymous in most jurisdictions, the internet enables citizens to bypass national regulations. Again, as with political views, some governments have sought to impose blanket restrictions on access to certain websites. In other countries, the burden of responsibility has been placed on internet service providers or on internet users themselves.

17 Wikipedia "Hate speech" accessed 24 October 2009 en.wikipedia.org/wiki/Hate_speech

Intellectual property

The openness of the internet for the production, distribution and use of written, audio and video content has challenged many of the assumptions previously underpinning the enforcement of intellectual property rights. A high proportion of music downloads worldwide, for example, fall outside the "fair use" provisions of established intellectual property agreements. Other issues raised by open content include the misrepresentation, unauthorised amendment and misattribution of material. Issues concerning the internet and intellectual property are discussed in Chapter 33.

The role of ISPs

ISPs provide the means by which internet users access content. Their relationship to that content is therefore important, and has been interpreted in different ways. Most ISPs would argue that their role is similar to that of postal services, i.e. that they convey content but have no knowledge of what is contained in what they convey. Some policy makers, however, have regarded them as more analogous to newsagents or even publishers, which do have control over what they make available. Similar arguments are applied to social networking and file-sharing sites.

This is important in a number of legal areas, including intellectual property but also pornography, hate speech and libel. The internet depends in practice on ISPs acting as channels of communication between internet users. It would not be practical for ISPs to vet all of the content which they convey or for social networking sites to vet all of the content that is uploaded to them. These practical constraints have not always been understood in political debate, but it has become the norm today for ISPs to be treated as having no responsibility for content transmitted by them unless and until they are notified that content infringes legal or intellectual property constraints, after which point they can be deemed responsible if they fail to take down content they know to be illicit.

Security

Concerns about security within the internet fall into three main categories:

- Concerns about the security of the internet itself (for example, about potential vulnerabilities within its architecture).
- Concerns about the security of internet users' data and internet behaviour (and their potential vulnerability to cyber crime and to state scrutiny).
- Concerns about the use of the internet to threaten security outside the virtual world (for example, by facilitating terrorism).

These concerns have some common linkages but are often confused with one another.

The security of the internet

Concern about the vulnerability of the internet itself has focused on the distribution of spam and malware, which is discussed earlier in this chapter. One of the principal reasons for the internet's success has been the way in which it facilitates interactivity, including the sharing of data files between remote computers. However, this openness has been increasingly exploited by some actors in the internet space, including criminal organisations, to distribute malicious software and potentially gain control of a distributed network of individual users' PCs around the world. Some commentators have questioned whether the internet can sustain the current level of abuse of this kind, suggesting that increasing risk may lead users to take refuge in more "guarded" spaces, comparable to the proprietary information-sharing spaces (such as Compuserve) which the internet displaced in the 1990s.[18]

The security of the user

One of the principal objectives of criminal engagement with the internet is to obtain data – from individuals or organisations – which can be used for fraud, identity theft, etc. The internet offers many opportunities for criminal activity of this kind, based around security failings in hardware and software and poor security behaviour on the part of users. Relevant issues include spam-related fraud such as "419 scams" and "phishing" (which solicit user data by offering spurious financial opportunities or by masquerading as organisations that might legitimately seek data); malicious software which can extract financial data from infected computers; and the abuse of credit card information (similar to that experienced offline). Data protection techniques such as encryption, anti-virus and anti-spyware software can deal with some, but not all, of the technical hazards, but weak user security – for example, poor password selection and security, outdated antivirus software, unsupervised computer use by children and third parties, and browsing of suspect websites – will continue to present opportunities for abuse. The rapid growth of access to the internet ensures a continuous supply of inexperienced users who are more vulnerable to sophisticated criminal attack than established users.

18 See for example Jonathan Zittrain, *The Future of the Internet*

The security of the state

Many governments have become concerned in recent years about the potential use of the internet to undermine state security. Particular concerns have included the risk of criminals and terrorists hacking into government and other official computer facilities and the use of the internet by criminal and terrorist organisations to organise and to transfer finances. Some governments have sought to take substantial powers to oversee internet use as a result of these concerns, raising questions about civil liberties within their jurisdictions. The potential value of a statement of internet rights and principles – which might also cover issues such as access – has, partly as a result, become a matter of contention within the Internet Governance Forum. These issues are considered in Chapter 31.

The internet and climate change

The relationship between the internet and the environment, particularly climate change, was raised extensively during the 2008 Internet Governance Forum. Access to and use of the internet and other ICTs is one of the fastest growing contributors to greenhouse gas emissions. At the same time, some uses of the internet and other ICTs have the potential to reduce greenhouse gas emissions in other economic sectors. The balance between these first and second order impacts of the internet on the environment is of increasing significance in internet policy debate, and is discussed in Chapter 34. ■

Section 6

ICTs and development

Chapter 22
ICTs, SOCIETY AND THE ECONOMY

Lead author ***David Souter***

An overall introduction to the relationship between ICTs and development was set out in Chapter 7. That chapter identified a distinction between two types of impact which ICTs may have on society and the economy: the impact which they have in their own right, and the impact which results from interventions which are explicitly aimed at making use of them to achieve development outcomes. This chapter is concerned with the former, i.e. the impact of ICTs on society and the economy. Chapter 23 looks in more detail at the relationship between ICTs and development interventions.

ICTs and society

The role which information and communications play in society, in particular in social relationships, was discussed in Chapter 2. As that chapter puts it, our capacity to achieve much of what we want to do depends on us working and communicating with others: to agree common objectives, to issue and receive instructions, to learn and to share what we have learnt, to express our aspirations and concerns. Societies – from the smallest villages to the largest nation-states – are held together by shared information and communication between all who take part in them: governments, businesses, civil society groups and individual citizens.

ICTs enable us to extend the range and quality of information and communications in two main ways:

- By increasing our capacity to observe, store and analyse information.
- By extending the reach of our communications both geographically and over time.

Today's new ICTs – television, mobile telephony, computing and the internet – are the latest in generations of technological enhancements to our information and communications capabilities, and a starting point for further generations of enhancements yet to come.

There is, therefore, an underlying continuum of change and adaptation in the development of information and communications and their impact on society. Many people see the present rapid expansion in the range and role of ICTs as a step change, perhaps amounting to an "Information Revolution" (see Chapter 7), but even those who emphasise this level of transformation recognise that ICTs are building on pre-existing information and communications patterns, are influenced by human behaviour as much as by technology, and that their impact varies considerably from place to place and time to time.

Chapter 2 summarised the dimensions of information and communications behaviour, and their relationship with new ICTs, as illustrated here in Table 22.1.[1]

Table 22.1: **Communication skills and ICT applications**

Communication skills	**ICT applications**
Observation	Data monitoring and collation; applications including remote sensing, global positioning by satellite (GPS), etc.
Memory	Data storage; applications such as databases
Thought/analysis	Data manipulation; applications such as spreadsheets
Research	Databases; digital libraries; the World Wide Web
Calculation	The original functions of the "computer"; data manipulation; applications such as spreadsheets
Organisation	Management information systems and other "information technology" applications
Speech and writing	Communications ICTs, including telephony, email, etc.
Influence	Mass communications ICTs, including broadcasting and the internet

1 This table draws on work by David Souter and James Deane for the United Nations Development Programme and by David Souter, Jacqueline Davies and Ellen Helsper for Plan International.

The following paragraphs look at some of the issues raised by these changes, firstly in terms of the individual, and then in terms of the dynamics of communities.

Individuals

Individuals, it might be said, seek to gain information in order to achieve better outcomes for themselves (and those dependent on or associated with them), and to communicate in order to maximise these gains. The outcomes desired may be social or economic, concerned with personal well-being or the accumulation of wealth and power. Information and communications, in this sense, are "ethically neutral". They have the capacity to empower, but how that capacity is used is determined by people's objectives, not by technology; and how available that capacity is to people is determined by social structures as much as infrastructure networks.

People adapt to new technologies and new resources in different ways, according to their own needs, priorities and capabilities. Some people are much more experimental in their approach than others, who are temperamentally more cautious. Changes take place in human behaviour much more slowly than they do in information and communications technology; and it is the pace of change in human behaviour that ultimately determines the pace at which new technologies are adopted and integrated in society.

Research on information and communications behaviour suggests that people are most likely to use new resources if they add significant new opportunities in areas that are of high value to them or enable them to do things that they value highly either significantly more easily or at significantly lower cost. More complex resources and those which are more difficult to use or offer less additional value will be adopted more slowly. What might be called "habituation" is also important – the degree to which confidence in using new resources builds up with experience. So are network externalities – the extent to which the use of networked communications resources depends on the number of relevant other users on the network (see Chapter 15).

These issues were well illustrated in a study of the adoption of telephony in low-income communities in India and Africa which was undertaken in 2004. This study found that mobile telephony was most highly valued amongst the poor for two purposes which were highly prized but previously unavailable: for seeking help urgently in an emergency; and for maintaining contact with family members living away from their communities (either as migrant workers or in the global diaspora). These uses were much more important than seeking information (for which broadcasting and face-to-face communication with trusted individuals were preferred) and making money (which was only important to some higher-income individuals). It is likely that, in time, as people have become habituated to and more confident with telephones, their use for information gathering and income generation has increased, but the initial drivers for adoption of this new technological resource in the communities researched were these two highly prized specific roles.[2]

Communities

This has a number of important implications where the social dynamics of ICT adoption are concerned. The evidence suggests that, within any community, certain social groups are likely to be early adopters of new technology and to make use of new technologies in more innovative ways. These social groups will be determined partly by individual characteristics, but also by ownership of assets which are relevant to ICT use (money, literacy, education) and by power and status within the community.

Early adoption of ICT use therefore tends to focus on those who are wealthier, better educated and more open to new ideas, and this can have significant implications for the distribution of power and resources. On the one hand, for example, it can reinforce and widen the divisions between those who have and those who have not: between rich and poor, educated and uneducated, men and women. On the other hand, it can disrupt established social dynamics by increasing opportunities for some otherwise disadvantaged groups: the young, for example, are often better educated and more experimental than older generations, take more advantage of new technologies and gain resources through them with which they can contest established authority.

The use of broadcasting and telephony is relatively "democratic", especially now that they are widespread, because their use requires relatively little skill or money – but this is much less true of higher-cost, higher-skill ICTs like computing and the internet. Because computers and the internet are more expensive to use and require higher skill levels, they are likely to be more substantially used by the more prosperous, the more successful, the more educated and the young than by other social groups. In some countries, the location of internet access facilities may also favour men and boys and disadvantage women and girls. As well as impacting on social dynamics and distribution in themselves, these implications pose challenges for those designing ICT-based interventions which are intended to improve service delivery or address community needs.

2 David Souter et al. *The Economic Impact of Telecommunications on Rural Livelihoods and Poverty Reduction* (CTO for DFID, 2005) www.telafrica.org/R8347/files/pdfs/FinalReport.pdf

The national level

At national level, industrial societies have become very dependent on new information and communications technologies. Television has become the most important source of news and entertainment for most people. It has not replaced radio, newspapers and books, but has led to significant changes in the role they play and the ways in which they are marketed. Music recording and public entertainment have been transformed by the introduction of permanent media (the gramophone, radio, cassettes, CDs, downloading; the cinema, television, DVDs). Successively, telephones, mobile phones and the internet have become fundamental means of communication – to the extent that most people who have them cannot imagine how they lived without them. The internet has replaced textbooks as the first recourse for children's homework (with mixed results). People use computers at home and at work; use them to manage their finances and store their photographs; and even find their cars controlled by them. Government databases increasingly compile information about individuals and coordinate the delivery of public services and the management of state security. All of this, together, can arguably be described as social transformation.

Middle-income countries, too, are rapidly reaching this level of dependence on new ICTs. Their reach is less extensive, however, in lower-income developing countries. Urban elites in Nairobi and Mexico City use ICTs as extensively as their counterparts in Paris and New York, but – with the exception of radio, television and the mobile phone – ICTs have not yet attained the same prevalence in lower-income urban communities or, especially, rural areas. The impact of ICTs on society as a whole, at present, is therefore less pervasive and more unevenly distributed in developing countries than it is in richer countries. However, it is increasing and changing over time, in ways that businesses, governments and civil society have all found difficult to predict.

ICTs, productivity and economic growth

The relationship between ICTs, productivity and economic growth is often thought to be straightforward. ICTs improve individual productivity, it is said, and this will be translated into improved productivity in businesses in general, and so at national level. Improved national productivity will enhance national competitiveness and so foster economic growth. Failing to invest in ICTs, by contrast, will make countries fall further behind their international competitors and risk economic decline.

In practice, the picture is somewhat more complicated. While there are well-known examples of countries and regions in which ICT investment has generated wider economic growth – South Korea, for instance, and the cities of Bangalore and Hyderabad in India – their experience has not yet been widely repeated elsewhere. In fact, for a long time, it proved difficult for economists to demonstrate significant links between ICT investment and increased productivity and economic growth at national level in industrial countries. This paradox was summarised by the economist Robert Solow in 1987 in the words "you can see the computer age everywhere but in the productivity statistics."[3]

The problem here lies with the relationship between IT investment and other factors in the production process. Information technology alone is insufficient to generate economic growth; it needs to be associated with complementary changes in other areas, such as human capacity and process management, and to occur within an economic environment which fosters innovation and enterprise.

The "Solow paradox" was not convincingly "resolved" until recent studies conducted by the Organisation for Economic Co-operation and Development (OECD). These showed that investment in information technology does, normally, lead to increased productivity and economic growth at national level, but that it takes a number of years for this to happen in industrial countries, and may take longer in developing countries.[4] Three main reasons were identified for this:

- Only some parts of the economy see high levels of ICT investment. Within any supply or production chain – the process of turning raw materials into exportable goods and services – the impact of ICT investment in some parts of the chain, which are susceptible to ICT investment, will be diluted by that in other areas where there is (or can be) less ICT investment. More generally, some areas of the economy (such as the service sector and high-end manufacturing) have much more scope for ICT investment than others (such as low-end manufacturing, mining and agriculture).
- While individual firms can show rapid and substantial gains from ICT investment – for example, in productivity, turnover and growth – this does not mean that these generate economic growth at national level. Many of the gains made by individual firms are likely to be made at the expense of other firms with which they compete (perhaps those that do not invest in ICTs), rather than representing new business gained by the country overall. One cannot calculate national gains, in short, by adding up the gains of individual firms.

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3 Robert Solow "We'd Better Watch Out" *New York Times Book Review* 12 July 1987

4 Organisation for Economic Co-operation and Development *ICT and Economic Growth: Evidence from OECD countries, industries and firms* (OECD, 2003) browse.oecdbookshop.org/oecd/pdfs/browseit/9203031E.PDF and David Souter *ICTs and Economic Growth in Developing Countries* (OECD, 2004) www.olis.oecd.org/olis/2004doc.nsf/LinkTo/NT000090CE/$FILE/JT00175866.PDF

- ICT investment alone does not increase productivity. It can only do so if it occurs in conjunction with other factors. In particular, ICT investment is only likely to improve performance at the level of the firm if it is accompanied by changes in the way the firm does business that enable it to realise its advantages – for example, automating processes that were previously done by hand. Workforces also need to be reskilled in order to manage new technologies. These processes take time and money. They are also often affected by policy issues at a national level – for example, how easy it is for a company to set itself up in business or to market a new service.

These OECD findings are positive about the relationship between ICT investment and economic growth, but also challenging for developing country markets:

- Most developing country markets depend much more on agriculture and raw material extraction industries – which benefit less from ICT investment – than on services and manufacturing.
- IT-led companies generally have higher skill requirements than the rest of the economy. Highly skilled labour may not be available, particularly if IT skills are specifically required. The benefits of IT investment may also be less apparent in low-wage economies where the balance between capital investment and unskilled labour costs favours the latter rather than the former.
- Business regulation is often much more rigid in developing countries than industrial countries, making it more difficult for entrepreneurs to initiate new businesses or establish innovative services.

It is hard to find good statistical evidence about ICTs and growth in developing country economies. In particular, it is often difficult to establish causality. For example, there is usually (as noted in Chapter 6) a strong association between GDP per capita and teledensity. Some have argued that this implies that higher levels of telephone use increase GDP per capita, though it is more usually argued that higher income levels (for which GDP per capita is a proxy indicator) enable more people to buy telephones. Each may contribute to the other, while the effect of network externalities in the growth of telephone networks (see Figure 15.2 in Chapter 15) is also likely to be influential.

It is clear, however, that it must take time for changes in ICT investment to have an impact on macroeconomic indicators. The OECD's work suggests some ways in which governments might encourage ICT investment and business innovation. These include, for example, measures to increase education and training in ICT-related skills (including low-level skills and maintenance as well as high-end skills such as programming and web design); measures to reduce ICT costs (such as removing tariffs on computer equipment and liberalisation of telecoms markets); and measures to foster innovation in the business use of ICTs (such as removing restrictions on new business formation and the promotion of ICT business zones or clusters). Although these are policy areas outside the ICT sector itself, they can have a powerful impact on the potential of ICTs within society.

A number of countries have sought to use IT businesses as drivers for economic growth, in some cases in manufacturing but more often in the service sector. Countries which have developed significant manufacturing sectors in ICTs tend to be larger, middle-income countries rather than small low-income countries. Examples include Brazil, South Korea and Malaysia; and, more recently, India and China. The large size of these countries means that they have large workforces, including significant numbers of skilled and highly skilled workers, as well as scope for local component industries and perhaps significant domestic as well as export markets for their products.

A larger group of countries have sought to create – or are seeking to create – service sector industries built around call centres, back-office functions or business process outsourcing (BPO) and, at the higher end of this market, software design and production. The examples of the Indian cities of Bangalore and Hyderabad are often cited in such plans. These cities have established clusters of ICT-focused businesses, many with high-level expertise and production. They have achieved significantly higher economic gains than other cities of comparable size in India. In most cases, BPO plans aim to deliver outsourced services to industrial country businesses at lower cost than can be obtained in those businesses' home markets, by trading on the lower labour costs which developing countries can provide.

Back-office outsourcing is not, however, an opportunity available to all countries. Those that have been successful in establishing call centres and BPO have been able to combine a number of critical factors that have given them a competitive advantage – in particular, an abundant supply of people with relatively high qualifications (particularly in the English language) and low labour costs. Low-end call centres (such as those involved in marketing rather than in technical support) are highly vulnerable to business churn, as the businesses that hire them move on to newer, cheaper locations.

Within developing countries, as elsewhere, there is significant demand for IT skills in business – both in international firms (such as banks) and in support for smaller enterprises. This has provided opportunities for a lively and entrepreneurial small business ICT sector to develop in the cities of most developing countries, providing installation and maintenance services, ICT training and, at the higher end, software tailoring and web design. However, maintenance and other ICT skills are often in short supply in rural areas.

A good deal has been written about the opportunities which ICTs can provide for small businesses in developing countries to improve their management and incomes. Small businesses, for example, can make use of computer programmes to manage their accounts, use the internet to market their services, or use the telephone to check market prices and negotiate better terms with intermediaries. A good deal of anecdotal evidence has been published about these potential impacts, although there has been relatively little systematic analysis.

ICTs undoubtedly provide a lot of opportunities for small businesses, but the extent to which such businesses can take advantage of them depends on many other factors. Computer accounting programmes, for example, are only cost effective for businesses with sufficient scale to afford the necessary investment in equipment and training. Small-scale farm produce and craft businesses may not have the necessary capital, skills or bookkeeping experience to make them useful without significant support from government or other agencies. Internet marketing also has its limitations: only certain goods are easily marketed on the World Wide Web, and international markets require high web design and production standards to generate buyer confidence – something that is more likely to be achieved by cooperatives or government marketing agencies than by small-scale entrepreneurs.

More evidence is needed, too, about the ways in which ICTs can change the dynamics of markets for small producers in developing countries. There is a good deal of evidence of cases in which the ability to find out information about market prices in different places has enabled producers to negotiate better terms with intermediaries. However, small producers are rarely in a position to bypass wholesalers altogether and sell directly to the final consumers of their produce. More information can reduce the asymmetries of information within markets and help small producers negotiate better terms – but it cannot always overcome the disadvantages which many small farmers have in markets which have a very small number of potential buyers (which are, in economic terms, monopsonistic or oligopsonistic). The relationships between producers and intermediaries in this kind of market are discussed further in Chapter 27. ■

Chapter 23
ICTs AND DEVELOPMENT POLICY

Lead author ***David Souter***

A broad introduction to development issues and their relationship with ICTs can be found in Chapter 7. This chapter builds on that introduction by describing some of the current priorities of international and national development thinking, and relating these to debates concerned with ICD and ICT4D. Its opening sections reiterate some of the key points which were discussed in the earlier chapter.

The meaning of "development"

The meaning of the term "development" is explored briefly in Chapter 7. The word is not easy to define, and its meaning has been contested over the years. At different times, for example – and in different places and by different actors – more or less emphasis has been placed on macroeconomic growth, or on social factors such as health and education, or on individual and community livelihoods and empowerment. Lengthy and unresolved debates have continued about whether development is best driven from above (by government action or by large-scale infrastructure) or from below (through community action and an emphasis on the basic needs of the poor); about the impact of trade relations and the effectiveness of international aid; about the importance of "good governance" and the detrimental impact of corruption and civil conflict; and about the best ways to measure developmental change. In development, as in other areas of public policy, fashions also come and go, with emphasis being placed at different times on different issues – for example, on industrial growth in the early 1960s; on the agricultural changes of the "green revolution" in the later 1960s and early 1970s; on "basic needs" in the later 1970s and 1980s; and on structural adjustment (economic liberalisation) in the 1980s and 1990s.

A difference in emphasis can often be found in these debates between those who prioritise economic growth (i.e. overall growth in production and national economies, measured for example by national income or GDP per capita) and those who prioritise poverty reduction (i.e. a reduction in deprivation, measured for example by the proportion living in absolute poverty, equivalent to an income level of around USD 1 per day). In recent years, emphasis has been placed by donors on the establishment of national Poverty Reduction Strategies, although in practice these are often as concerned with macroeconomic growth as they are with the lives and livelihoods of the poor.

Many different factors play a part in determining whether "development" (however defined) "is taking place", and many different indicators are used for this. In practice, it is rare in any society to find all of these indicators moving in the same direction at the same time. High rates of economic growth are often associated, for example, with (at least short-term) increases in economic disparity (the gap between rich and poor). Social and economic changes need to be measured over a significant period of time in order to determine whether the long-term trend in indicators is "positive" or "negative" (as determined by development objectives). Positive economic growth and poverty reduction outcomes can easily be jeopardised, in countries which are heavily dependent on particular commodity exports, by changes in global economic circumstances. Previously unanticipated problems, such as HIV/AIDS and climate change, have major impacts on development potential. Development gains are also vulnerable to political disruption and civil conflict.

The role of information, communications and ICTs

Views about the role of information, communications and ICTs within overall development thinking vary widely, both amongst proponents of "ICD" and between them and the wider "development community".

A distinction was drawn in Chapter 7 between the impact which ICTs have in society by virtue of their availability and use (regardless of development objectives) and their conscious use, by governments and other actors, for developmental purposes.

Many governments and development agencies include, within their thinking about ICTs in development, the importance of creating or retaining an enabling environment that encourages the deployment and use of ICTs in ways that will maximise the social and economic gains made through their availability and use. Interventions in this area – including institutional reforms such as the liberalisation of communications markets and independent regulation – seek to take advantage of the general value of ICTs in building more informed, more diverse and (it is hoped) more prosperous and more equal societies.

A further distinction was drawn in Chapter 7 between two main strands of thinking within development agencies about the role of information and communications in development:

- One strand, which is much older and which (in this handbook) is referred to as "ICD", emphasises the value of information and communications within development, irrespective of technology. This strand argues that:
  - Those who are better informed are better able to make choices about their lives – what to plant, when to sell, how to maintain good hygiene, how to plan parenthood, etc. – and so to improve their lives and livelihoods.
  - Those who are able to share their experiences and communicate their concerns and needs are better able to influence decisions by those in authority in their favour.

Proponents of ICD, as so defined, emphasise communications rather than technology, and continuity between people's experience of old and new communications media. They are particularly concerned with information and knowledge sharing, education, responsive interaction between development actors and local communities, and empowerment initiatives (such as local and community radio). They stress the importance of human behaviour and are often wary of the claims made for new technology's potential.

- The second strand, which is more recent and which (in this handbook) is referred to as "ICT4D", emphasises the role of new technologies in enhancing the information and communications resources which are available to individuals and communities. This strand argues that:
  - New ICTs make a profound difference to the availability and potential value of information and communications.
  - Those who have access to them are thereby enabled to understand their environments, share their experiences and exploit their knowledge more effectively than they were before ICTs became available or than are other citizens without access to comparable ICT facilities.

Proponents of ICT4D, as so defined, put much greater emphasis on technology, and on discontinuities between old and new communications media. Some are particularly concerned with the value of access to infrastructure, new technology and digital services, especially the internet. Like governments concerned with the macroeconomic impact of ICTs, they stress the importance of big decisions (for example, about technology deployment and investment) as well as those rooted in communities (such as public access facilities and local content). Others are particularly concerned with the potential which ICTs have for changing the nature of service delivery.

While ICD thinking (as defined here) has played a significant part in development policy over many years, ICT4D has been much more recent and more controversial. Until the mid-1990s, it would be fair to say that much mainstream development thinking dismissed telecommunications as being of little interest to the poor, and therefore unimportant to development intervention, particularly that funded through development aid. It was only in the late 1990s – when mobile telephony and the internet began to play a powerful role in industrial countries – that their potential for development began to be seriously explored, and not until the turn of the century that any real evidence began to be accumulated about what might be happening.

By the time of the first session of the World Summit on the Information Society in 2003, however, ICT4D had attracted numerous advocates and become something of a movement. Strong advocates of ICT4D could be found in multilateral development agencies like the World Bank and UNDP, in bilateral donor agencies such as the Swiss Agency for Development Cooperation, and in civil society organisations like the International Institute for Communications and Development (IICD). OECD countries had established a Digital Opportunities Task Force (DOT Force) with developing countries, the private sector and civil society organisations, to develop an overall approach to ICT4D, backed up by specific interventions.[1] An international advocacy coalition, the Global Knowledge Partnership, had significant impact projecting the potential of ICTs across a broad development field. The United Nations established a UN ICT Task Force as a multi-stakeholder discussion forum.

However, there are still many development specialists, particularly in "mainstream" development fields such as health, education and agriculture, who are unconvinced about the potential of ICT4D, especially about whether it can play a transformational role in their areas of work. Although it took place at much the same time as the second phase of WSIS, the Millennium Review Summit in 2005 paid virtually no attention to ICTs as instruments for delivering the Millennium Development Goals (see below). ICT4D plays little part in most Poverty Reduction Strategies.

Is there is a "paradigm gap" between the thinking of ICT professionals and advocates of ICT4D, on the one hand, and the mainstream development community, on the other? ICT professionals and ICT4D advocates, according to many mainstream development personnel, give too much credence to the potential of technology and pay too little attention to the difficulties of successfully deploying technological solutions in difficult social,

1 The DOT Force worked between the G8 summits in 2000 and 2002.

economic and geographical environments. Mainstream development professionals, according to many ICT4D activists, overestimate the challenges and underestimate the potential of the new. There are few forums in which ICT4D advocates and mainstream sceptics interact, and WSIS notably failed to bring them together.

One of the underlying difficulties here is the weakness of the present evidence base concerning ICT4D. Development professionals are used to making decisions on the strength of past evidence about what works and what does not. The evidence base for ICT4D, however, is very weak in comparison with that concerning other development interventions. Partly this is because ICT4D is relatively new, and there has been little time yet in which its impact (positive or negative) can be assessed. In addition, the pace of technological change is such that the technology which might be deployed in future is almost never the same as that which has been previously deployed. It is also true, however, that much of what has been presented as evidence for ICT4D has been anecdotal rather than analytical, and this has failed to convince development professionals who are used to more substantial and sophisticated evidence. ICT4D agencies are coming to understand the need for more critical and analytical evidence to be produced.

One outcome of these debates – which has become increasingly important in development agency thinking about ICT4D – concerns the principle of "mainstreaming".

"Mainstreaming" is a well-used term within development policy. Over the years, there has been much discussion and there have been many changes of practice concerned with, for example, mainstreaming gender or environmental issues within established areas of development practice (such as health or rural development). Mainstreaming essentially sees particular issues as being of "cross-cutting" importance in development – relevant in all areas and so requiring incorporation in all areas of development thought and practice.

In the case of ICD and ICT4D, mainstreaming has been used to differentiate between two possible approaches to the role which ICTs might play in development policy and practice:

- One possible approach would emphasise the ICT sector as such, in particular the availability of access (network deployment, low-cost services, facilities such as telecentres, diversity in broadcasting, etc.). This approach sees ICTs as having broad transformational power within society, but has become less prevalent in development agencies during the present decade and particularly since WSIS.
- The alternative approach is to see ICTs as having primarily instrumental value, i.e. to regard them as tools which can help to achieve other established development objectives. This approach has been particularly associated with the mainstreaming of ICTs within development. On the one hand, it sees the value of ICTs as essentially cross-cutting, applicable (to some degree) in all development sectors. On the other, it sees that value as essentially secondary – the servant of each established development sector rather than a major contributor to its transformation. Mainstreaming has been particularly associated with the drive in all development agencies today to focus on poverty reduction and achievement of the Millennium Development Goals (see below).

Most multilateral and bilateral development agencies now see ICTs primarily as mainstream tools within the broad development agenda rather than as instruments which they can use on their own to achieve widespread social and economic transformation. However, they also recognise the significance of the changes in information and communications behaviour which ICTs are driving in societies in general, and some remain interested in promoting an enabling environment which may accelerate their impact. There has, nevertheless, been a significant reduction in the amount of donor agency funding committed explicitly to ICD in the period following the World Summit on the Information Society (i.e. since 2005).

The remainder of this chapter discusses some of the major issues within development policy and practice today, and relates these to these ICD/ICT4D debates.

International development policy issues

Thinking about international development today, at governmental level, is dominated by three international agreements – the Monterrey Consensus, the Paris Declaration and the Millennium Development Goals – and by a consensus between donors and developing country governments about the importance of building national development programmes around Poverty Reduction Strategies. Those who are concerned to promote the role of ICTs within development need to understand these international priorities, and to think about how ICTs and ICT4D can engage effectively within them.

The Monterrey Consensus and the Paris Declaration

The Monterrey Consensus is the outcome of a United Nations Conference on Financing for Development, which was held in Monterrey, Mexico, in 2002. It represents an agreement between governments (rich and poor) and international financial institutions about ways of financing development, which seeks to draw together six main sources of potential funding:

- Domestic capital
- Foreign direct investment (private sector capital)

- Finances generated by international trade
- Financial and technical cooperation (overseas aid)
- Debt relief
- Steps to change international trade and finance systems in ways that will increase their contribution to development.

Although the Monterrey Consensus does not link particular funding sources with particular investment sectors, the view has been prevalent since the early 1990s in international development agencies that investment in the ICT sector, including infrastructure networks, should be led by the private sector. Issues of infrastructure finance were discussed by the Task Force on Financing Mechanisms which met between the two phases of the World Summit on the Information Society (see Chapter 29) and rejected calls for new, ICT-specific funding mechanisms.[2]

The Paris Declaration is an international agreement, reached in 2005, which is concerned with one of these financial flows, bilateral and multilateral aid. The aim of the Declaration is to improve the quality and impact of aid in contributing to overall development. It pays particular attention to the ownership of development processes, emphasising that development plans should be based on priorities which are determined by national governments. It also seeks to achieve more harmonised and predictable disbursement of aid, better integration of the efforts of donors and beneficiary governments, and the untying of aid from procurement in donor countries.

The Monterrey Convention and the Paris Declaration establish an overall framework for how relationships are expected to work between development partners, i.e. between developing countries and those governments and international agencies that are engaged with them (as investors, donors, etc.). In particular, after decades in which donor countries and multilateral agencies were accused of seeking to impose social, economic and political values on aid beneficiaries, these agreements emphasise the importance of national policy ownership and partnership between industrial and developing countries.

One outcome of this is that any emphasis on ICTs within national development policies has to come from the governments concerned, and will not be externally imposed. A global summit such as WSIS, for example, can advocate that greater attention should be paid to ICTs in national development plans, but its advocacy will not translate into international action unless the demand for international support arises from within national governments.

2 The Task Force report is at available at www.un-ngls.org/doc/wsis-tffm-final-report.doc

The Millennium Development Goals

The Millennium Development Goals (MDGs) were agreed by the United Nations in 2000 and set targets for the reduction of poverty, usually by measuring the movement of selected proxy indicators between 1990 and 2015. The MDGs are summarised in a series of eight goals and eighteen targets, which are set out in Table 23.1.

The MDGs and the targets associated with them have become the benchmarks by which social development is measured, and therefore the main focus of most international development activity. Achieving them will be difficult. Although some developing countries – notably India and China – are ahead of most MDG targets, others – notably in Africa – are lagging well behind. This has tended to increase the priority which governments and donors attach to them, and made it less likely that development funding will be used for purposes outside the MDGs.

As Table 23.1 shows, ICTs do get a mention in the MDGs (goal 8, target 18). However, this goal and target are not readily measurable and so receive little attention when progress towards the MDGs is being discussed. For example, ICTs received very little attention in the reports and discussions during the 2005 Millennium Review Summit, which looked at progress at the halfway point between 1990 and 2015. The absence of more specific ICT targets from the MDGs makes it more difficult for the international development system to prioritise ICT-specific interventions during the MDG period than might otherwise have been the case.

Much of the discussion within development agencies about ICTs and the MDGs has therefore been concerned with ways in which ICTs can be used to help achieve the MDGs. This has contributed to the emphasis on mainstreaming ICTs in development agency thinking, and this emphasis may grow further as the term date for MDG achievement gets nearer. Issues concerned with the relationship between ICTs, the MDGs and development applications are discussed in Chapter 25.

Poverty Reduction Strategies (PRS)

Poverty Reduction Strategies and comparable national development strategies have been introduced in many countries since 1999. PRS were instigated by the World Bank, responding to criticism that it had sought to impose inflexible economic strategies on developing countries in the past – strategies which were felt to have paid too little attention to the needs of the poor and the impact on them of economic change.

PRS were promoted by the World Bank, with the support of other donors, as means to bring a new set of priorities to development thinking, focused on development's impact on the poor; increased national ownership

Table 23.1: **Millennium Development Goals**	
Goals	**Targets**
1. Eradicate extreme poverty and hunger	1. Reduce by half the proportion of people living on less than a dollar a day. 2. Reduce by half the proportion of people who suffer from hunger.
2. Achieve universal primary education	3. Ensure that all boys and girls complete a full course of primary schooling.
3. Promote gender equality and empower women	4. Eliminate gender disparity in primary and secondary education.
4. Reduce child mortality	5. Reduce by two thirds the mortality rate among children under five.
5. Improve maternal health	6. Reduce by three quarters the maternal mortality ratio.
6. Combat HIV/AIDS, malaria and other diseases	7. Halt and begin to reverse the spread of HIV/AIDS. 8. Halt and begin to reverse the incidence of malaria and other major diseases
7. Ensure environmental sustainability	9. Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources. 10. Reduce by half the proportion of people without sustainable access to safe drinking water. 11. Achieve significant improvement in lives of at least 100 million slum dwellers.
8. Develop a global partnership for development	12. Develop further an open, rule-based, predictable, non-discriminatory trading and financial system, including commitment to good governance, development and poverty reduction. 13. Address the special needs of the least developed countries. 14. Address the special needs of landlocked countries and small island developing states. 15. Deal comprehensively with the debt problems of developing countries. 16. Develop and implement strategies for decent and productive work for youth. 17. Provide access to affordable essential drugs in developing countries. 18. In cooperation with the private sector, make available the benefits of new technologies, especially information and communications.

of development policy; and participative engagement in policy design, implementation and management. Five core principles were established for their development. These indicated that PRS should be:

- Country-driven and -owned, predicated on broad-based participatory processes for formulation, implementation, and outcome-based progress monitoring.
- Results-oriented, focusing on outcomes that would benefit the poor.
- Comprehensive in scope, recognising the multidimensional nature of the causes of poverty and measures to attack it.
- Partnership-oriented, providing a basis for the active and coordinated participation of development partners (bilateral, multilateral, non-governmental) in supporting country strategies.
- Based on a medium- and long-term perspective for poverty reduction, recognising that sustained poverty reduction cannot be achieved overnight.[3]

3 See World Bank and International Monetary Fund *Poverty Reduction Strategy Papers–Operational Issues* (Washington: World Bank and IMF, 1999)

Poverty Reduction Strategies, in one form or another, have been introduced in more than 60 countries, and form the basis for development partnerships between those countries and major donors, including the World Bank. A good number of countries were implementing their second PRS by the time of writing (mid-2008). However, very few Strategies have placed emphasis on information, communications or ICTs.

A significant number of countries have also adopted national ICT strategies in recent years. The relationship between these, PRS and other national development strategies is discussed in Chapter 24.

ICTs and development funding

One of the implications of the absence of substantive ICT initiatives in major development policy statements like those described above is that it is more difficult for ICT interventions to secure development funding than areas of development activity which are prioritised in the MDGs and PRS. Any allocation of development funds to ICT or ICD programmes – other than mainstreaming – is seen by many development professionals to imply a corresponding reduction in the funds available for those more established priority areas.

Some ICT4D advocates argue, against this, that ICTs contribute to the delivery of all development goals and so should not be seen as competing for development funds with other sectors such as health and education. While appealing to ICT4D advocates, this argument is not considered convincing by mainstream development specialists. Most development sectors – agriculture, health, education, employment, governance, etc. – are interlocking and contribute to achieving one another's goals. Investment resources are limited and need to be prioritised. What matters most in this prioritisation is maximising impact with the funds available, and ICT4D proposals have to be compared in terms of proven effectiveness with other potential uses of scarce funds. Many development goals are also short term, and the impact on health and education outcomes, for example, that might be attributed to increased ICT access is likely to be achieved only in the longer term.

The relationship between ICTs and overall development policy is therefore still in something of a state of flux. Many hold high hopes for ICTs to make a major contribution to development, but more evidence is needed before these hopes will be widely shared within the mainstream development community, which is currently preoccupied with efforts to meet targets that were set at an earlier stage of ICT development. ■

Chapter 24
NATIONAL ICT AND ICD POLICIES

Lead author ***David Souter***

The increasing potential of ICTs in social and economic development has led many governments to develop national ICT policies and strategies. The development of these has been encouraged by a number of international organisations, including United Nations agencies – notably the UN Economic Commission for Africa (UNECA) through its African Information Society Initiative (AISI). They provide an obvious point of entry for civil society organisations into the national debate about the directions in which the deployment and use of ICTs should move. This chapter aims to categorise these policies and strategies and to summarise experience to date.

Policy and strategy

There is sometimes some confusion in people's minds about the difference between policy and strategy. The difference might be summarised as in Table 24.1.

Policy making precedes strategy development. It sets out the overall purpose which officials and others subsequently seek to achieve. The policy-making process should include the establishment of core objectives for social and economic development (for example, low-cost communications access or the creation of a business process outsourcing sector) and the identification of alternative approaches which might be taken (for example, liberalisation or the establishment of special investment zones). It should include consideration of available resources (human and financial), and choices between broad objectives and approaches according to the likelihood that they will achieve desired results. Once these broad objectives are agreed, it is possible to develop a strategy which will seek to achieve them in the most efficient and effective way. It is at this strategic level that decisions need to be taken about, for example, how markets should be liberalised or what incentives might be used to attract investors.

The illustration of a policy and strategy process presented in Figure 24.1 is taken from an ICT policy development plan which was designed for the Pacific islands region. It illustrates both the sequence of decision-making processes involved and the content which needs to be considered at strategic level.

The fundamental sequence of decision making here moves from policy to strategy to implementation. The primary decision makers in policy making for ICTs/ICD are national politicians and senior officials in communications ministries. Those responsible for strategy development are more usually technical experts (often including external consultants as well as ministry officials and regulators), whose final recommendations may also require ministerial or parliamentary approval. Implementation is generally led by local officials, under the guidance of responsible ministries and regulators.

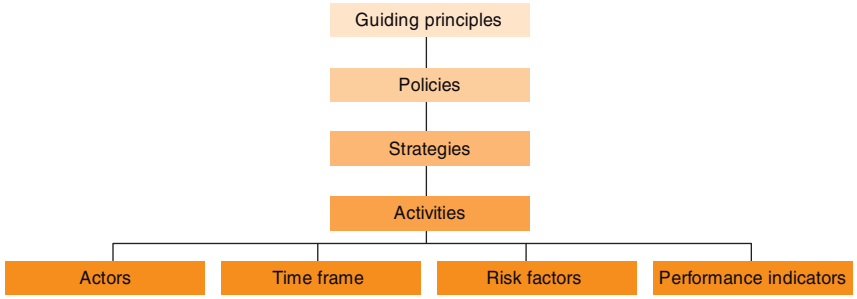
It is often observed that policy making is easier than strategy development and that both are easier than implementation. It is certainly true that a number of countries have agreed national policies in ICTs/ICD, but failed subsequently to deal with these at a strategic level. There has also been a good deal of criticism that national strategies have been poorly translated into action on the ground. Some of the possible reasons for this are discussed later in this chapter.

The rapid pace of change in communications technology and markets poses particular problems where the translation of policy into strategy and implementation is concerned. It is difficult to predict technological or market developments with any confidence more than three or four years ahead. As a result, policies and strategies are naturally obsolescent, i.e. they have a short lifespan and will become obsolete within a short period of time. Policies therefore need to be translated into strategies and action quickly if they are not to become inappropriate. They also need continuous review in order to take account of new developments. Unless

Table 24.1: **Policy and strategy**

	Policy	**Strategy**
Purpose	To establish the broad direction of national objectives	To set out the ways in which agreed objectives should be pursued
Determined by	Politicians/policy makers in government ministries	Technical experts

Figure 24.1: **The structure of policy making and implementation**



this happens, they can lock governments and other actors into approaches which are no longer appropriate in a changed environment for ICT development and deployment.

Prioritisation and sequencing

One area which has caused significant difficulty in translating policies into strategy and implementation involves decisions about prioritisation and sequencing.

The word "prioritisation" is used with two distinct meanings:

- In one sense, it means choosing between a number of objectives or courses of action (all of which may be desirable) on the basis of which has more or most *importance*. In this sense, it leads to resources being focused on certain objectives or courses of action at the expense of others (which there may be insufficient resources to pursue at all).
- In another sense, it means determining the *sequence* or order in which particular actions are pursued. This recognises that some interventions must precede others if the latter are to become viable: for example, rather obviously, the deployment of network infrastructure must precede the establishment of e-government service delivery in a locality.

The former sense of prioritisation is essentially a matter of policy; the latter of strategy. Nevertheless, there is often confusion between the two. This confusion is exacerbated if the resources available for strategy implementation are unclear. A number of national ICT policies/strategies, for example, present possible/desirable activities for which no resources are currently available but to which governments hope to attract donor funding. The uncertainty that surrounds strategies as a result of this makes coherent implementation more difficult to achieve and weakens the integration of different interventions.

ICT and ICD policies and strategies

The second important distinction that affects national policies and strategies concerns their overall purpose. Here, too, there is often some confusion.

National policies and strategies in this area can be divided into two main groups:

- Some, which are referred to in this handbook as **ICT policies or strategies**, are concerned primarily with the ICT sector – i.e. with the deployment of infrastructure, the structure of communications markets, their regulation, and the relationship between national and international ICT businesses.
- Others, which are referred to in this handbook as **ICD policies or strategies**, are concerned primarily with the application of ICTs to social and economic development – i.e. with issues of access, including local access; administrative change and service delivery, including e-government; content and empowerment.

The emphasis in these two kinds of policy or strategy is fundamentally different. The former are oriented primarily towards the ICT sector, the latter towards development (particularly ICT4D). However, ICT sector and development-oriented ICD policies and strategies inevitably interact, and many governments have sought to include both within a single policy and strategic framework. This can have the advantage of achieving greater coherence and integration, particularly where implementation needs to be carefully sequenced. However, it can also lead to confusion and contests over powers and responsibilities – for example, over whether a combined ICT/ICD strategy is led by the ministry of communications, the ministry of finance, development sector ministries, or an overarching governmental institution like the office of the president.

A more nuanced categorisation of the objectives included in national policies and strategies is set out in Table 24.2,

Table 24.2: **Approaches to ICT strategies**

Strategic approach	Prime objective	Key stakeholders
ICTs as contributors to macroeconomic growth	To develop the ICT sector as an important focus for economic growth, including employment and participation in the global economy	Macroeconomic ministries ICT ministries and regulator ICT sector businesses
ICTs as a productive sector in their own right	To develop the ICT sector itself in order to create employment, exports and income substitution	Macroeconomic ministries ICT ministries and regulator ICT sector businesses
ICTs as cross-cutting instruments of development	To use ICTs in all development sectors in order to improve the administration and delivery of development activities	Mainstream development ministries and actors
ICTs as enabling instruments for initiatives and applications	To use ICTs as the primary instrument for delivering specific ICT services, including both existing services and new services only deliverable with ICTs	Selected development ministries and actors
ICTs as tools for empowerment and voice	To enable individuals and communities, particularly the poor, to articulate their concerns and bring them to the attention of decision makers	Civil society organisations Media organisations

which results from analysis of a significant number of recent policy and strategy documents. A version of this table can also be found in Chapter 7.[1]

The table suggests that five main approaches have been taken in policy and strategy documents to the role which ICTs and ICD may play within national social and economic development. These are not mutually exclusive: policies and strategies often include more than one, but very rarely, all of these approaches. The table also identifies key stakeholders who tend to be identified in the documents concerned.

Finally, the scope and scale of ICT/ICD policies and strategies varies considerably from country to country. Some policy documents are relatively brief – a matter of 30 pages or so – and leave the detail to be worked out later. These may or may not have led to subsequent strategic plans. Some strategies, on the other hand – particularly those developed with consultancy support from UNECA – are wide ranging and comprehensive, including many detailed commitments in several hundred pages.

ICT/ICD strategies and PRS

Poverty Reduction Strategies (PRS) have been established in many countries, particularly LDCs. These seek to focus both national policy and donor resources on efforts to reduce the incidence of poverty within an overall framework of national economic growth. They are described in Chapter 23.

The development of PRS is usually led by central government ministries with wide-ranging responsibilities, such as ministries of finance or development planning. This is partly because these ministries have primary responsibility for negotiating with international financial institutions (like the World Bank) and bilateral donors. Input is sought into strategies from other government departments (including those responsible for sectoral development policies) and from other stakeholders; and strategy development should also be informed by participatory poverty assessments which seek to accumulate evidence on the poor's own perceptions of the causes of poverty, its impact and measures that may increase prosperity and opportunity.

Information and communications ministries have not usually been significantly involved in the development of PRS, and few PRS pay much attention to ICTs or ICD. One consequence of this is that, where a country has both a PRS (or similar national development strategy) and an ICT/ICD policy or strategy, the two may not be well integrated. For example, the ICT/ICD strategy may prioritise areas which are not included within the PRS, may require the commitment of local officials to tasks which are not included in the PRS, or may seek donor funding for purposes which are outside the PRS. Conflicts between PRS and sectoral strategies (for ICTs or other sectors) are likely to prove difficult within government, and more productive outcomes are likely to be achieved if there is congruence between them – even if this means that less priority is given to ICT/ICD objectives.

Strategy development

The development of ICT/ICD policies and strategies is generally approved – though not necessarily prioritised – within international development agencies. However, there has been a good deal of criticism of the way in which many policies and strategies have been drawn up and implemented. Some of these criticisms have already been mentioned in this chapter. The main problem areas identified are:

- Lack of coherence between ICT/ICD strategies and national development strategies such as PRS.

1 The table is derived from work by David Souter and Abiodun Jagun for the World Bank in 2006.

- Lack of attention to prioritisation, resource constraints and limits to the viability of ICT solutions in challenging environments.
- Lack of consultation with relevant stakeholders, including development professionals in mainstream areas (such as health and rural development) and end-users.
- Focus on policy and strategy at the expense of implementation.
- The tendency for policies/strategies to lock implementing agencies into approaches which become outdated as a result of change in technology, markets and services.

None of these problems – except perhaps the last – is in any way unique to ICTs or ICD. Some are discussed in more detail elsewhere in this handbook (for example, in Chapter 25 on ICD applications). This chapter concludes with a brief discussion of two key areas in which civil society organisations, in particular, can play a role.

Policy and strategy processes

It is generally agreed that successful policy and strategy processes pay close attention to all of the different phases involved in policy and implementation, from the initial selection of objectives and strategy design to the implementation of projects on the ground and the feedback of results into subsequent policy cycles. The World Bank summarises the way in which most experts feel this should be undertaken in Poverty Reduction Strategies in four phases, as follows: [2]

- Phase 1 Poverty diagnostics ("understanding the nature of poverty")
- Phase 2 Strategy design and development ("choosing poverty reduction objectives" and "defining the strategy for poverty reduction and growth")
- Phase 3 Implementation and management
- Phase 4 Monitoring and evaluation.

Each of these phases needs to be coherently linked into those preceding and succeeding it, and the whole encompassed by feedback mechanisms which enable policy and strategy to be adjusted in the light of experience and changing circumstances. Circumstances here may change because of changing needs or because of changes in the technology and services that can be made available.

This four-phase approach to strategy design and implementation applies as much to the development of ICT/ICD strategies as to strategies in other areas. The importance of feedback loops is particularly important in the case of ICT/ICD strategies because of the very rapid changes which are taking place in communications technology and markets and, thereby, in communications behaviour and in the scope for ICT-enabled service delivery.

It is important to pay particular attention to the first, diagnostic, phase in ICT/ICD strategy design. While in many areas (such as health and education) there is a good deal of background knowledge available about both general issues and local circumstances, comparable background knowledge about information and communications is often lacking. Many ICT/ICD strategies have therefore made assumptions about the existing communications environment, and about the ways in which people will respond to new communications opportunities, which have not always proved justified.

There is, therefore, increasing agreement that more attention needs to be paid to understanding the communications environment in the design phase of ICT/ICD strategies. This is not simply a matter of technology. Among the issues which need to be considered – and this list is not exhaustive – are:

- The availability of communications networks.
- The affordability of communications products and services (newspapers, radios, telephones, computers, the internet).
- The availability of skills required for making use of different information and communications types.
- Patterns of communications behaviour (including face-to-face communications with peer groups as well as communications mediated through networks and devices).
- Patterns of information acquisition (how people gain information that they need in particular areas of life, the role of information intermediaries).
- Identified preferences for information and communications.
- Perceptions of existing resources (and of gaps in provision).
- People's propensity to make use of new products and services that may become available.

Communications audits which ask about these issues often find considerable differences between different local communities and between different social groups within communities (women and men, poor and rich, those with low and high educational status or income levels, old and young, etc.). National strategies need to be sensitive to these differences if they are to be

2 See World Bank *PRS Sourcebook* web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTPRS/0,,contentMDK:20175742~pagePK:210058~piPK:210062~theSitePK:384201,00.html

responsive to the needs of local communities, and it is increasingly felt that more attention needs to be paid to them in strategy design and implementation.

Stakeholder participation

It is also increasingly agreed that the participation of diverse stakeholders is important in the design and implementation of ICT and ICD policies and strategies. Many early ICT and ICD strategies were drawn up by government officials or external consultants with relatively little input from those who would be required to implement them or from those who would be affected by their implementation.

The stakeholder communities involved here are widespread, and also differ significantly between ICT and ICD strategies (as defined within this chapter). Figure 24.2, for example, illustrates some of the main stakeholder groups which are concerned with ICT policies.

These stakeholders are principally concerned with the ICT sector. ICD strategies, however, are much more substantially the concern of development sector stakeholders, as illustrated in Figure 24.3

Participatory assessment processes can do much to elucidate the needs and preferences of individual consumers and local communities in strategy design. There are many different ways in which these can be undertaken, ranging from household surveys and focus groups to more extensive community development dialogue.

The involvement of development professionals from service delivery sectors, such as health and education, is also crucial if the design of ICD strategies is to match the realities of service delivery in real communities. The relationship between ICT-enabled service delivery and mainstream development applications is discussed further in Chapter 25. ■

Figure 24.2: **ICT stakeholder communities**

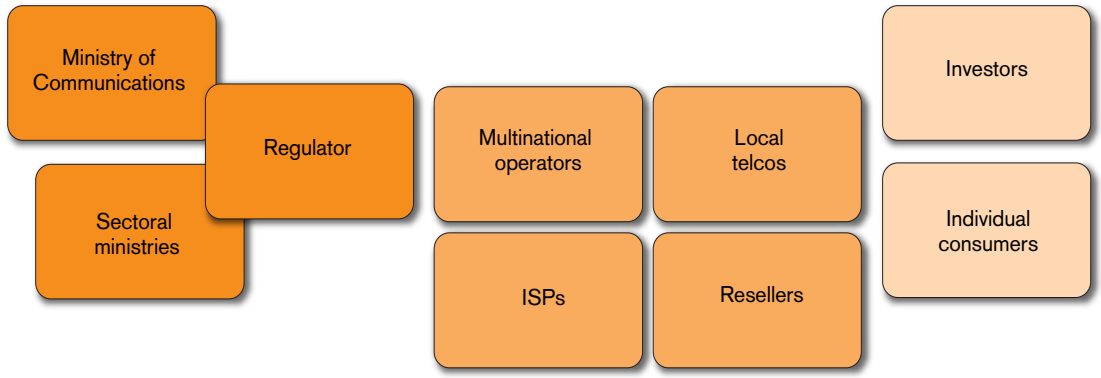
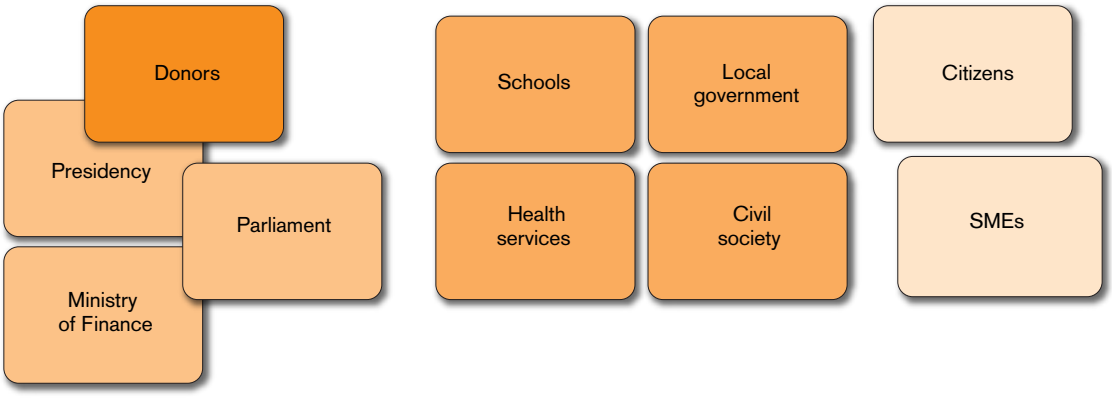


Figure 24.3: **ICD stakeholder communities**



Chapter 25
INFORMATION AND COMMUNICATIONS DEVELOPMENT APPLICATIONS

Lead author ***David Souter***

As discussed in Chapters 7 and 23, ICTs have impact on the societies in which they are used both in their own right and through their specific use within social and economic development initiatives.

Most of the impact of ICTs on society results from the use which businesses, organisations and people make of them to achieve their own objectives – whether that involves using a street-corner ATM to obtain cash or a computer database to manage the payroll of a multinational company; listening to a weather forecast on the radio, blogging about last night's concert or telephoning to ask a family member for advice.

The vast majority of ICT use results from choices of this kind, rather than from development interventions. It depends on the added functionality and value which ICTs offer for meeting basic human information and communications needs. And it is this kind of use of ICTs, rather than development interventions, which has most impact on social and economic life – from increased efficiency (and perhaps job losses) in government administration to the management of global supply chains; from increased contact within diasporas to the loosening of controls on access to political information, pornography and gambling.

The majority of the applications which people and organisations use to meet their information and communications needs are developed, introduced and supplied by commercial businesses operating in competitive markets. These include markets for equipment, software and services; for broadcasting, telephony and the internet; for cinema, audio and video entertainment. Much of their effectiveness depends on the interaction between ICTs and other aspects of social and economic life, as illustrated in the section on mobile banking below.

In addition to this background, generalised adoption of ICTs and ICT-enabled services, many governments, development agencies and NGOs have been making increasing use of ICTs. They have done so in two main ways:

- To improve the efficiency and effectiveness of their own operations – for example, by computerising payroll or digitising tax and other databases.
- To improve the delivery of services to those with whom they interact – for example, by improving information to health workers, teachers, other information intermediaries and individual citizens; by broadcasting programmes and advertisements aimed at increasing awareness and changing behaviour regarding HIV/AIDS; or by bringing services such as land registration closer to the citizen at local level.

In addition, some governments, development agencies and NGOs have supported the provision of access to ICTs through facilities like telecentres (see Chapter 17), with a view to empowering citizens and increasing their ability to create opportunities for themselves.

It is these interventions by governments, development agencies and NGOs that are usually considered to be ICT4D. A good deal of attention has been paid to them in recent years, and issues relating to them are discussed later in this chapter. It should, however, be remembered that they are responsible for a relatively small amount of the change which ICTs are enabling within society, most of which depends on decisions which people and organisations make outside the frame of development intervention.

The role of information intermediaries is also particularly important when assessing the role of ICTs within development. Most people in all societies access most of the information which they need and use through some kind of intermediary – from teachers and doctors, through public service and private sector customer support staff (such as agricultural extension officers and sales clerks), to radio and newspaper journalists and trusted friends, family members and successful peers. Much of the information that people need requires interpretation based on experience and expertise, which end-users themselves often lack – for example, the knowledge needed to diagnose a medical condition, or to interpret data on soil fertility. Most successful development interventions in the communications field recognise that raw information is of little value to the poor if it is not contextually relevant and if it is not associated with interpretive support, whether through training of end-users themselves or of trusted information intermediaries.

ICTs in society – an example

Many of the broader changes which ICTs can bring about within societies have substantial developmental impact or potential. One area of this kind which was much discussed at the time this chapter was written (mid-2008) was that of mobile banking and transactions, services which were then beginning to become available in some countries. They provide a useful example of how ICTs

can interact with other economic sectors in ways that change, and in this case potentially improve, access to non-ICT services for citizens and end-users.

Access to capital is a major problem for the poor in most developing countries. Without access to capital, including credit, it is more difficult for the poor to manage fluctuating family finances, support their children's education or develop business opportunities. Banks in developing countries are focused on business and more wealthy clients, and it is difficult for the poor, even in urban areas, to set up bank accounts. Bank networks are largely absent from rural areas, making the majority of people dependent on their own and their neighbours' resources both for savings and for credit, with funds often having to be kept in cash. (Savings clubs and microcredit institutions mitigate this problem in some cases.)

Financial transactions are also constrained in developing countries by a number of issues, including security, which could be ameliorated by more effective financial institutions at a local level. The increasing scale of remittances between urban and rural areas, and between industrial and developing countries – now larger in value worldwide than overseas aid and approximately the same value as foreign direct investment – has increased the need for more accessible and more secure financial institutions for the rural and urban poor.

Mobile telephony has already enabled a number of innovative ways for communications technology to meet latent demand for services beyond mere telephony. SMS (texting), for example, has provided a very cheap form of communications which particularly meets the needs of certain social groups (such as the young), while music downloads have greatly increased the possibility of music ownership (which previously depended on retail outlets selling physical CDs and cassettes).

Financial services (banking and transactions) provide another area in which mobile phones have potential of this kind. The advantages which mobile phones offer here are threefold:

- The networks on which they rely are far more pervasive than the physical network of bank branches – not just the communications network itself, but also the network of airtime resellers and others who can act as agents for financial services.
- The devices required for use (mobile phones) are widely available, to both subscribers and non-subscribers.
- The service providers involved have robust established systems for managing financial transactions, in particular micro-transactions, which can be adapted or supplemented for banking purposes.

By the end of 2008, a significant number of mobile banking services had been established in developing countries, and were attracting a significant number of customers. These services offered different services in different places, using different technologies and different business models. There was, therefore, a good deal of experimentation underway. In their early stages, users were mostly established telephone subscribers from higher-income groups, but that is likely to be the case with any new resource and so does not necessarily indicate the long-term user base. One of the best-known mobile banking services, Safaricom Kenya's M-PESA service, gained more than a million subscribers in the year following its launch in 2007 and has continued to grow rapidly.

There are a number of obstacles within the wider economic environment that need to be overcome in order for mobile banking and transactions to achieve their full potential. These include the difficulties of verifying identity amongst the poor, especially where birth certification is not universal; and the rigorous regulatory constraints governing international financial transfers (so limiting the use of mobile banking for international remittances). However, the potential for mobile phones to deliver innovative solutions through mobile transactions is significant, and could have a transforming effect on the ability of the poor to obtain and manage their financial resources.

ICTs within development initiatives

The scope for ICTs to bring about change in social and economic life is obviously significant and has been much promoted in forums like the World Summit on the Information Society (WSIS). Much of the literature on it is couched in terms of social and economic transformation. As the WSIS Declaration of Principles put it: "ICT applications: benefits in all walks of life."[1]

Development agencies and governments have devoted significant attention to creating an enabling environment for these potential benefits to grow – for example, liberalising broadcasting ownership, introducing competition between telecommunications networks, removing restrictions on the import of ICT goods, and establishing legislative frameworks for e-business and e-commerce. These issues are discussed in other chapters of this handbook.

ICTs have led to significant underlying changes in the ways in which development agencies, governments and NGOs undertake development work. These include changes in the ways in which agencies communicate internally and with their stakeholders; the use of databases to manage development programmes; ICT-enabled means of supporting public servants and development workers in the field; and automated service delivery. The extent of these underlying changes in

1 Geneva Declaration of Principles, para. 51

ways of working is often underestimated by development actors.

Development agencies, governments and NGOs have also sought to bring about specific gains through ICTs in particular areas of social and economic development. These are sometimes established as national programmes, for example, in detailed national ICD strategies or sectoral ICT strategies. Many, however, are initiated through pilot projects, intended to provide evidence of whether an approach is likely to be viable if it is scaled up from pilot communities to larger groups or nationwide.

It would be possible to fill many pages with examples of ICT-enabled development initiatives. They are highly diverse and range across a wide variety of fields:

- Some are primarily concerned with monitoring and collecting data – for example, on parasite or pollutant levels, meteorological conditions, or education and health statistics.
- Some are primarily concerned with the distribution of information – for example, with the broadcasting of information about public health issues (such as malaria or HIV prevention), or with the distribution of market prices and other economic information for small businesses.
- Some are primarily concerned with the efficient provision of citizen services – for example, with the supply of birth, death and other certificates, or with accessible forms of land registration.
- Some are primarily concerned with particular target groups – for example, initiatives to help patients remember to take medication on time (and so reduce the costs to health services of unnecessary readmissions).
- Some are primarily concerned to provide services which enable citizens to fulfil their own priorities more effectively – for example, in taking advantage of new income-generating opportunities, or in maintaining more effective family contact.
- Some are primarily concerned with empowerment – for example, initiatives to promote understanding of children's rights through child media and other ICT resources.

Many projects focus on entirely different areas of development from these examples, and they make use of many different, and rapidly changing, technologies. There is not the space here to consider these examples in any detail, and in any event, specific examples rapidly fall out of date. It is important to remember, however, that they are highly diverse, and that experience with one technology in one environment does not necessarily provide substantial evidence about other ICTs in other contexts.

The evidence base

As discussed in Chapter 23, there is still a good deal of scepticism amongst mainstream development professionals about the effectiveness of ICT applications in delivering the social and economic gains with which they are concerned. This scepticism is rooted in uncertainty about the quality of evidence so far available.

The evidence base for ICT4D is weaker than that in other development areas. Four main reasons can be given for this:

- The use of ICTs in development practice is relatively new. There has been insufficient time yet for the impact of ICT4D programmes and projects to be measured with any reliability.
- The nature of ICTs is continually changing. The inputs that were used in a particular programme or project designed three years ago would not be the same were that programme or project designed today, because of technological change and because the information and communications environment has changed (for example, many more people now have mobile phones). This makes it more difficult to use past experience to develop future plans.
- Most ICT4D initiatives are pilot projects. There is very limited evidence to date about the impact of ICT4D initiatives at national level (i.e. for scaled-up outcomes), or about the impact of ICTs in general on specific population groups (e.g. children, or the very poor).
- Much of the existing evidence base is anecdotal and/or compiled by project proponents, who have a vested interest in demonstrating success, rather than through independent evaluation.

Assessing the impact of development initiatives is notoriously difficult. Impact assessment is concerned with identifying what lasting changes in people's lives can be attributed to an intervention. This differs from evaluation, which is concerned with whether a programme or project has achieved what it set out to do. Programmes or projects can be successful in terms of evaluation without having lasting impact on people's lives; while changes in people's lives may be positive or negative, predicted or unexpected. They also usually result from a complex web of interactions between interventions and other changes in the environment surrounding a development programme or project, which make attribution very difficult.

To date, the majority of the evidence presented by ICT4D advocates has been anecdotal – based on early evaluations of project achievements rather than the longer-term assessment of programme impact. The case for "mainstreaming" ICT4D will become more convincing to non-ICD professionals as the evidence base improves over time and as longer-lasting impacts can be observed.

Three issues which will be scrutinised particularly closely by development decision makers are the distributional impact of ICT4D initiatives, their cost-effectiveness and their sustainability.

The **distribution** of the gains resulting from any development initiative is an important factor in assessing its impact. Development analysts are usually concerned about both equity in general – whether the initiative increases or decreases the gap between the "haves" and "have-nots" within a community – and about the impact on particular disadvantaged groups, such as women and girls, the poor or ethnic minorities. Achieving the inclusion of the very poor or those suffering from multiple disadvantage – sometimes called "socially excluded" – is particularly problematic.

The distribution of outcomes from ICT4D initiatives raises a number of questions:

- Firstly, different ICT products and services require different resources. ICTs such as radios and mobile telephones, which are relatively cheap and easy to use, are much more accessible to the poor and disadvantaged than more complex ICTs like computers and the internet.
- Secondly, access to ICT facilities often depends on social factors as well as income and inclination. Facilities which are located in government offices, for example, may be seen as unavailable to those who are not part of local government circles of influence. Facilities are often located in environments which are not accessible – because of social norms – to women and girls.
- Thirdly, while ICT access may increase access to information and communications opportunities for all, this does not mean that its impact will be evenly distributed. The ability of people to make use of new resources varies, and the outcome of ICT access and services may redistribute power and income within communities rather than enabling gains for the community as a whole. For example, ICT access may benefit one local business at the expense of its competitors.
- Fourthly, as noted earlier in this chapter, most people depend on information intermediaries to interpret much of the information which is available to them, particularly kinds of information that require nuanced interpretation and/or were hitherto unfamiliar. Some information, such as market prices, is much easier for users to interpret than other information, such as soil fertility. Much can therefore depend on the availability and capability of local information intermediaries, and on the training which is provided to them and to end-users in understanding and interpreting information which becomes available.

These factors are important because, as many ICT4D texts recognise, unless steps are taken to make ICTs more inclusive, they will tend to benefit the rich and better educated more than the poor and disadvantaged. Ensuring equitable inclusion is an important issue in the design of ICT4D initiatives, and is particularly challenging where the very poor and socially excluded are concerned.

The **cost-effectiveness** of ICT4D initiatives also depends on a number of factors. These include:

- The costs of installation, maintenance and regular upgrading of equipment (hardware and software).
- The costs of management time and the training of managers and users of facilities;
- The reliability and cost of required infrastructure (communications networks, power networks, security services, etc.).
- The level of demand for services which can be provided using new facilities, and the added value which they may provide in addition to these services.
- The cost of alternative service provision (set against any reduction in effectiveness or added value).
- The opportunity cost represented by the allocation of funds and human resources to this rather than other possible uses.

These issues need to be assessed realistically. Many ICT4D projects have failed to deliver to the expectations held of them because they have underestimated maintenance and upgrading costs for necessary equipment or the reliability of power supply; or because they have overestimated levels of demand, particularly in the early stages before people become used to the availability of new ways of doing things. Proposals for ICT4D initiatives are often couched in terms of what the initiative *could* do in ideal circumstances rather than assessing potential gains in the context of the real environment in which they are actually deployed.

ICT4D advocates sometimes argue that ICT4D initiatives, particularly access initiatives, have cross-cutting value, particularly in empowering citizens, and so add to the effectiveness of all development sectors. They suggest that this means that they should not be seen as competing for resources with initiatives in other development sectors, but as complementary to them. This argument has not been persuasive to mainstream development managers, however, because in practice they need to make decisions between competing potential uses of limited funds, and so tend to place high value on proven cost-effectiveness when weighing up the risks and potential of competing uses.

A third key issue for consideration is **sustainability**. Pilot projects might be said to have three main objectives:

- To help determine whether a particular intervention can deliver what is hoped from it.

- To assess whether it will become self-sustaining over a period of time, or will require long-term subsidy or other external funding.
- To assess whether and how it can be replicated in other locations or scaled up to regional or national level.

Financial sustainability is particularly important here. An initiative – for example, a telecentre – that builds a constituency of users or establishes a business model which enables it to remain in place after a given period of time (say, the three years of a project funding cycle) has much more lasting impact than one which ceases to exist after its funding period ends. An initiative that requires and receives long-term funding to survive locks up financial resources that could be used for other projects and/or communities in other locations. The ability to attain financial sustainability is particularly important where decisions must be taken about replicating or scaling up initiatives. Scaling up projects to national level can be very expensive; not doing so, however, runs the risk of providing advantages to some communities which are denied to the majority population.

Designing ICT4D initiatives

These problems are not, of course, peculiar to ICT4D programmes and projects, but they are particularly acute where they are concerned because of the lack of a strong established evidence base, which means that many ICT4D initiatives are quite experimental in character, and because of the rapid changes taking place in information and communications technology and markets.

Increasingly, development agencies, governments and NGOs are learning lessons from experience which they are applying to the design and development of new ICT4D initiatives. The following are among aspects of programme and project design to which more attention is now being paid.

- **Communications audit:** Agencies are increasingly conscious of the need to have a thorough understanding of the information and communications environment for which initiatives are proposed. This includes an understanding of the information and communications resources which people currently use, of their preferences and priorities, their skills and the financial and skill resources which they can deploy if alternatives become available. The work required to achieve this understanding is sometimes called a "communications audit".
- **Participation:** As in other areas of development, the participation of end-users is increasingly considered crucial to good programme and project design. Participation of end-users, sometimes referred to as "target beneficiaries", helps to ensure that initiatives focus on what matters to people and increases the likelihood that facilities will be well used, cost effective and sustainable. Participation processes can be simple or sophisticated, ranging from one-off surveys and focus groups to long-term engagement with communities before initiatives are implemented ("community development engagement"). It is, obviously, important to ensure inclusive participation within the community, including the participation of those who are often excluded from decision making (women and girls in many cases, the socially excluded, minority ethnic groups, the young, etc.).
- **Multi-disciplinary involvement:** It is increasingly clear that programmes and projects are more likely to be successful if they are designed in partnership between those with expertise in ICTs and those with expertise in the development sector or sectors that will make use of them. Programmes to use ICTs to deliver health outcomes, for example, will be unlikely to work if they are designed around technology; they need to be designed to meet the needs of end-users (patients, citizens) and of the professionals (doctors, health workers) who deliver services to them. Input from these professionals has proved critical to establishing the feasibility of project proposals, to enabling operational value to be derived from ICTs, to ensuring that new systems have their consent, and to enabling the organisational changes required to make them work.
- **Assessment of complementary requirements:** Most ICT4D initiatives rely substantially on resources other than ICTs for their success, in particular on the reliability of complementary infrastructure such as power and the availability of expertise to manage and maintain equipment and communications links. It is increasingly seen that programme design needs to include a realistic assessment of downtime and the provision, where necessary, of alternative ways of maintaining service delivery when electronic facilities are unavailable.
- **Assessment of costs:** In the past, the cost of implementing ICT4D initiatives has often been calculated from initial capital and set-up costs, and from basic operational costs (such as the salaries of project managers, property rent, etc.). In practice, the costs of maintaining equipment have often been underestimated – for example, the costs of maintaining and replacing hardware in difficult environments (such as those affected by frequent power outages), of buying peripherals and antivirus software, and of upgrades to operating systems and other programmes. Successful ICT4D projects have often also incurred higher communications usage charges than expected, especially if they are reliant on dial-up

internet connections. These additional costs of owning and using computer equipment can easily exceed the original capital cost of acquisition. It is now seen as good practice to estimate costs over the project lifecycle rather than initial capital costs, to plan for short replacement cycles, and to factor in post-project costs.

- **Training and changes in operational systems:** New systems require new skills on the part of both managers/staff and users. Changes in operational systems are often also required for the full value of ICT-led initiatives to be unlocked (data need to be stored differently, traditional ways of doing things become redundant, new ways of sharing information require changes in staff behaviour, etc.). Training staff to take full advantage of new systems is expensive; and it takes time for new systems to be well adopted. Until this happens, cost savings and efficiency gains are likely to be below expectations. End-users also often need to be taught how to make use of new facilities if they are to gain most advantage from them. The transition to new ways of doing things therefore needs to be carefully planned, and old and new systems often need to be maintained in parallel for a considerable period of time.

A number of agencies are now putting more emphasis on the sharing of experience in practical design and implementation of ICT4D initiatives. Some have also shown more interest in establishing baseline data when projects begin, and ensuring continuous monitoring of outcomes – which enables positive achievements to be recognised and built upon, problems to be identified and acted on, and changes to be spotted in the communications environment which may require adaptation of project plans. Good baseline data and continuous monitoring are also crucial to building the stronger evidence base concerning ICT4D experience which is needed by development planners. ■

Chapter 26
E-GOVERNMENT

Lead author ***David Souter***

E-government refers to the use of ICTs to undertake government processes, including administration and service delivery. High hopes have been placed on e-government in many countries. There have also been significant problems with the delivery of e-government projects. As in many other areas of ICTs, it is expected that mixed experience today will improve implementation in the future.

E-government projects can be divided into three main categories:

- Those that are principally concerned with data collection and analysis.
- Those that are principally concerned with internal processes, such as interdepartmental communications and database management.
- Those that are principally concerned with external processes, such as the delivery of public services.

E-government, data collection and analysis

The quality of many government decisions depends on the availability of accurate information about the population (demographic data), its environment and developments in society and the economy. Without accurate data, it is more difficult to predict future developments, to plan public services and to prepare for new social, economic and environmental challenges. The collection of information – both quantitative data and qualitative data derived from surveys, interviews and focus groups – is crucially important to the development of Poverty Reduction Strategies and national ICT/ICD strategies, as well as to understanding social trends, market conditions, etc.

However, reliable and accurate data are difficult to collect and difficult to analyse. Accurate data collection is particularly challenging in developing countries because of the limited financial and human resources available, and because many of the data types which are valuable for planning purposes cannot be accurately established – for example, because citizens are not formally registered at birth, because few people pay tax, or because their incomes and expenditure patterns are highly variable from day to day and season to season. In most developing countries, national statistical offices also have limited capacity to undertake thorough analysis of the information which is available.

Computerisation assists in data collection and analysis in two ways:

- Firstly, data collection can be improved by digitisation and computerisation. Rather than relying on postal returns, for example, local government offices can upload data to centralised computer systems, ensuring greater accuracy and speed in data delivery. Some data types can only be accurately gathered through automated systems, for example, remote monitoring of pollution levels.
- Secondly, data can be much more systematically and comprehensively analysed by computers. Analytical programmes enable more detailed disaggregation of data (dividing it into particular social groups) and more extensive analysis of associations and correlations between different measurements. They also make it easier to identify social and economic trends.

Data collection and analysis, however, are always dependent on human as well as technical capabilities. Information which is not collected accurately or which is not representative of the social groups concerned will lead to false conclusions, no matter how extensively new technology is used. There is also a danger of information overload – of data being collected which is not, in fact, useful for analysis or administration, and which hampers rather than improves outcomes.

E-government in administration

Computerisation enables many government administrative operations to be undertaken more efficiently – for example, the management of personnel in government-run services, payroll, procurement and supply-chain management. Many developing country governments have implemented substantial e-government projects or placed e-government initiatives at the heart of their national ICT strategies.

The computerisation of administrative systems may help to make government systems more accountable and less vulnerable to corruption, although the extent to which this happens will depend as much on how they are deployed as on technology itself. Computerisation may also help to identify errors within administration, for example, "ghost workers" (employees who have remained

on the payroll after leaving employment), and so improve the efficiency of system performance and service delivery. It should make record keeping more accurate and simplify access to records.

As well as internally facing administrative changes such as these, computers are often used to establish digital databases in place of manual systems. One example that is often cited is the computerisation of land records. This seeks to establish an authoritative and readily accessible information resource which can be used by all parties in land disputes, transactions and inheritance settlements. In many cases, this has proved very advantageous. However, the quality of any land registration database is dependent on that of the information which is uploaded into it. A database which incorporates one party's interpretation of the ownership of land that is in dispute can exacerbate problems rather than relieving them.

As in business, computerisation of administrative systems will only yield efficiency savings or improvements in performance if the human systems and organisational structures that surround it adapt to new ways of doing things that take advantage of computers. This usually takes a significant period of time, during which staff are retrained to do their jobs in different ways, and new systems may need to be rolled out gradually when many different offices are concerned (for example, in different localities). Very often, it is necessary to maintain parallel systems for a significant period of time, i.e. maintaining old alongside new processes, which adds to roll-out costs. In the long term, computerisation often involves significant job losses, and this may be resisted by employees and their representatives.

One further claim which is often made for e-government is that it enables better coordination between government departments – more "joined-up government", as it is sometimes called. Different government departments can share management systems and also share information about citizens, businesses, etc. which could not previously be coordinated. Again, while technology can act as an enabler, whether this happens in practice is dependent on the relationships between government departments and officials. There are often conflicts between different groups within bureaucracies, some of which will gain and some will lose from the introduction of new ways of doing things. Some aspects of integrated digital government also raise privacy concerns for citizens – for example, the sharing of tax and health information outside the government departments specifically responsible for them.

E-government in service delivery

The third main area of e-government is service delivery. Experience here overlaps significantly with that of other agencies that use ICT applications in development, as discussed in Chapter 25.

There are many examples of areas in which governments have used ICTs for service delivery. These can be graded by level of complexity, as follows:

- At the simplest level, government departments establish a web presence which provides users with information and other resources, but has no interactivity. This is very similar to a staffed information kiosk which might be provided in a local authority office or other public area.
- The next level of sophistication offers limited interactivity, for example, through email contact, as well as access to online databases, the opportunity to download forms for return by post, etc. Again, this offers what is essentially a digitised service comparable to that offered by staffed kiosks.
- The third level offers the opportunity for users to receive services electronically, through their own computer devices, and to engage directly in transactions, for example, applications for certificates and licences. This might be undertaken by users themselves online, or through government offices where users can either access services directly or with the assistance of trained officials (or perhaps commercial staff or small-scale entrepreneurs paid by government departments for the purpose). This may include arrangements for financial transactions. One example of a service of this kind is the Bhoomi land registration service in Karnataka, India.
- Finally, services may migrate entirely or primarily to a digital delivery model, based around web portals. This stage is only really feasible where the user group concerned (whether citizens as a whole or a more specialised user group like small businesses) is (almost) universally equipped with relevant ICTs.[1]

At present, the later stages in this graded hierarchy are much more widespread in industrial than in developing countries.

Some of the more frequently cited areas of ICT-based service delivery include:

- Curriculum support to teachers and teacher-training resources.
- Diagnostic support for basic health workers.
- The provision of agricultural and meteorological information to extension workers and directly to farmers.
- The delivery of certificates on demand (including birth and death certifications, driving licences, land registration documents, etc.).
- Electronic self-assessment and payment of tax liabilities.

1 This hierarchy is adapted from Subhash Bhatnagar *E-Government: From Vision to Implementation* (New Delhi: Sage Publications India, 2004) and earlier work by Gartner Dataquest.

Implementation problems

It has been widely remarked that most e-government projects fail, and that more complex projects are particularly prone to failure.[2] Four main problems have arisen with the implementation of e-government.

The first problem concerns the overall **management** of e-government projects. This can be located in different areas of government – from the president's office, to the ministry of finance or a ministry of information technology, to a special agency set up to manage e-government activity. The location and powers of the managing institution are often contested, particularly where established government institutions consider themselves threatened by new ways of doing things or where e-government is seen as a platform for establishing increased power and authority within the government establishment.

There is also often tension between IT professionals/experts and general managers within government. IT professionals have often taken the lead in e-government initiatives. Experience suggests that they tend to emphasise the "e-" (i.e. the technology) rather than the "-government" in design and implementation, and some governments now take care to place e-government activity under the authority of experienced generalist managers.

The second, which has been raised above, is concerned with **process**. In practice, e-government is organisational change enabled by the use of information technology. Simply adding ICTs to inefficient processes will not make them more efficient. The processes themselves have to be rethought – "re-engineered" is the term that is often used – in order to take advantage of the greater efficiency which ICTs permit. This reorganisation often includes job losses. It should certainly include retraining of staff in order to equip them to meet the needs of new technology and systems. One of the reasons why some e-government projects fail is that insufficient attention has been paid to rethinking operational systems and to training staff to use them.

The third problem concerns **design and procurement**. The design of new government systems is complex. Many different factors need to be taken into account, which go well beyond technical issues to include operational systems (see above), and the responses of end-users. System design has often failed to take these other factors fully into account, particularly information systems factors, with the result that e-government implementation has been delayed, redesign has been required, and projects have gone significantly over budget. In addition, officials have often been tempted to buy unnecessarily elaborate ("over-engineered") systems from hardware and software vendors, which are more complex to use and require much higher training costs.

Problems of this kind are found in all countries. The design and procurement of a number of major e-government projects in the United Kingdom, for example, have been heavily criticised for exceeding budgets, delays in implementation and under-performance.

The fourth problem concerns **user response**. E-government systems will only improve efficiency and service delivery if users are happy to make use of them and find them valuable. Users in this context include system managers (the government officials concerned), intermediaries (such as shopkeepers who host facilities on behalf of government) and, especially, end-users (the citizens whose services are affected). Experience suggests that people are quick to take up services which are easy to use and which offer clear advantages over what they had before. However, people are less responsive where new services are more complex or require significant changes in the way they must relate to services. This is often particularly true where people have to make use of unfamiliar equipment, and among those who are most vulnerable (who lack confidence in dealing with new situations or lack skills which they think will be necessary).

Many service delivery projects have run into difficulties because they have allowed too little time for users to adjust to new systems. In practice, it is almost always necessary to run new and old systems in parallel for a while, partly because it takes time to roll them out effectively but also because it is important to allow end-users to become familiar and comfortable with them. E-government systems are usually designed by people who enjoy experimenting with new technology; many users do not, especially if they lack skills and confidence, and those who are already marginalised can be unintentionally excluded if system change takes place too quickly. Attention needs to be paid to training end-users as well as managers. The need to run two systems in parallel also means that e-government systems are often more expensive in the short term, although they may achieve financial savings over time.

A related problem here concerns the "ownership" of systems. Delivering services digitally can increase people's independence from bureaucracy and thereby prove empowering. However, this is not always so. Some new service delivery projects have been designed in ways which make end-users more dependent on intermediaries, such as government officials, to provide them with information. The role of intermediaries is complex and, in many cases, positive, but overdependence on intermediaries, and circumstances in which intermediaries hold power over end-users which they can exploit, are likely to be counterproductive.

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2 See for example Richard Heeks *Implementing and Managing eGovernment: An International Text* (London: Sage Publications, 2006) and Danish Dada "The Failure of e-Government in Developing Countries: A literature review" *Electronic Journal of Information Systems in Developing Countries* www.ejisdc.org/ojs2/index.php/ejisdc/article/viewFile/277/176

The fifth problem which has arisen with e-government concerns **privacy and security**. This problem has been most raised in richer countries, but the rights issues involved are important in all. Consolidating data about individuals from different government sources means that governments can know much more about individuals' activities than was previously the case. While consolidation of data can increase citizens' ability to access entitlements (to public services, etc.), governments can also exploit it to exert greater control over citizens' lives.

Consolidated data are also potentially vulnerable to hacking and to loss as a result of poor organisation and system control. In the United Kingdom, for example, personal and financial information concerning half the population was potentially put at risk when disks containing data from the child benefit system went astray within the official messenger network. It is difficult for managers to ensure against operational breaches of security, but the risk to citizens resulting from them can be high. Financial and medical records are sources of particular anxiety. These privacy and security issues are covered in more detail in Chapter 31. ■

Chapter 27
E-BUSINESS

Lead author ***David Souter***

Introduction

The word "business" refers to the production of goods and services for exchange (or "commerce") between individuals or organisations ("businesses"), and the markets through which such goods and services are exchanged. It includes the production of the large majority of agricultural produce and almost all manufactured goods and services in almost all societies today.

The markets through which goods and services are exchanged are normally commercial and competitive, i.e. markets in which a significant number of producers offer comparable goods to consumers, who choose between them on the basis of price, quality, value for money, etc.[1] Markets are often intermediated (through wholesalers and retailers, who form part of a supply chain between producers and consumers). The final (retail) price of goods and services normally covers all costs of production and distribution, plus a margin (profit) which is extracted at each stage in the supply chain and provides the income of producers and others in that chain.

Two significant areas of production and exchange of services lie outside this business context. These are:

- Subsistence agricultural production and craft production which is for purely household use, where produce is not intended for exchange.
- Some services – such as health and education – which are either wholly or partly provided as "public services" in some societies, i.e. provided on a non-profit basis and funded from taxation or other revenue which is not generated by sales. (However, even where "public services" are common, their provision is often mixed, with both public sector and commercial provision.)

In addition, some governments have widened the range of goods and services provided by state institutions to include what amounts to business activity. Many governments have done this with network infrastructure goods and services such as broadcasting, postal services, telecommunications, transport, power and water, but the trend beginning in the last quarter of the 20th century has been for these to move towards competitive commercial supply. This is particularly true of broadcasting and telecommunications. A few governments, historically, have sought to manage almost the entire economy through public monopoly rather than competitive business – notably the communist governments of Eastern Europe in the latter half of the 20th century. Today, there are very few examples of this degree of state control.

Business environments are usually complex. Today, many areas of business are global in character. Multinational companies, some with financial turnovers higher than the GDP of some countries, play the central role in many international and national markets, sometimes acting in many different types of market in different countries, often selling global rather than national brands. (Indian conglomerate businesses are particularly diverse.) Even without dominance by multinational business, trade in goods and services is now often global in extent, with, for example, East African flowers and vegetables achieving substantial reach in European markets. Yet the majority of people in many countries are employed in small and medium-sized enterprises, with up to 250 or so employees, and many in developing countries are employed in micro-businesses or in the informal sector, which works on the margins of regulation.

Businesses are also involved in complex supply chains. Producers sell goods to wholesalers, who sell to retailers, who sell to consumers. But producers are also themselves consumers – buying inputs (seeds and fertilisers; raw materials for craft and industrial production; transport and communications services; auditors and lawyers) and hiring staff (through labour markets) in order to make the goods and services that they go on to sell.

Information, communications and business markets

Information is an important aspect of the functioning of commercial production and exchange:

- Producers of goods and services need to understand their own costs, to select the most appropriate and cost-effective inputs, and to make the most of the demand for their output among consumers. They make use of information about market conditions, the labour market and other factors of production in order to reduce costs and maximise the return on their investments.

1 In some circumstances, known as "natural monopoly" and "market failure", competition fails to arise or becomes unsustainable. These circumstances are described in Chapter 4.

- Consumers need information about goods and services to select what suits their requirements best, according to the criteria (price, quality, variety, colour, reliability, etc.) that are most important to them. The more information they have, the more likely they are to manage their expenditure effectively.
- Intermediaries, such as wholesalers and retailers, sit between producers and consumers and need to understand both supply and demand if they are to maximise their reach and profitability.

In addition, all actors within markets need to understand how external factors – such as taxation – affect the choices that they make.

Communications between market actors are also important in reducing transaction costs, i.e. the costs incurred in managing supply chains. Where supply chains are lengthy (especially for high-end manufactured goods), these transaction costs (and the savings that can be made by good communications) can be very large. A common example of this in industrial countries during the late 20th century was the adoption of "just-in-time" manufacturing, in which improved communications were used by manufacturers to order inputs as and when they were required, so avoiding costs for storage and interest on loans required to maintain inputs in the form of stock.

Information and communications might therefore be described as lubricants of the market. Where all actors in a market are highly informed about all aspects of the market and the goods and services available within it, then they are best equipped to make the most appropriate choices for themselves. If there are no other barriers to market effectiveness (such as unregulated market dominance by a single supplier or intermediary), then this high degree of information is likely to lead to the most economically efficient market, i.e. to a market in which supply and demand track one another closely with a low final cost for outputs. Where information is inadequate, by contrast, producers and consumers have to make allowances for uncertainty – for the greater risks involved in sales and purchases and for the higher transaction costs that arise from these.

Two other factors should be borne in mind when thinking about the relationship between information and markets, especially in developing countries and where the poor are concerned:

- Information within markets is rarely symmetrical. Producers, intermediaries and consumers often have different degrees of information about the goods and services which are being exchanged. For example, in agricultural markets, intermediaries often have better information about market demand and prices than producers. Consumers may be unfamiliar with the goods they are buying (because they are occasional or technical purchases) or may be overwhelmed by choice (for example, of different mobile phone tariffs). Those with more information – producers, intermediaries or consumers – are able to exploit the market to their advantage over those with less.
- Increased information alone is not necessarily sufficient to enable a market actor to reduce costs or improve profitability. Many producers are constrained by other barriers to freedom of action within a market – for example, contractual agreements with suppliers and intermediaries (which constrain their ability to move between alternatives, but which may also offer valuable long-term security such as guarantees of sales), indebtedness or shortage of capital. Similarly, consumers may be unable to act upon information because they have established contractual agreements for a period of time (for example, with internet service providers) or because their choices are constrained by lack of funds (so that they are unable to buy in bulk or to buy more expensive but more reliable products).

Recent years have seen a good deal of interest in the supply of goods and services to the very poor, those consumers described by the Indian economist C. K. Prahalad as "the bottom of the pyramid". Prahalad's approach to this market builds substantially on the potential for breaking down sales units (e.g. one cigarette rather than a packet of cigarettes) and aggregating demand at the micro level through market mechanisms aimed at meeting the small-scale demands of the poor/many (e.g. through telecentres). While this new approach has achieved considerable resonance, it should also be remembered that, in the words of one of its critics, "a poor person is far more constrained by lack of income than by lack of goods and services offered in the market."[2]

ICTs and business markets

As in other areas of social and economic life, new ICTs have the potential to change the ways in which information about markets, goods and services is delivered and the ways in which market actors can respond to information. There is also a good deal of anecdotal evidence about the impact of ICT-based information on market behaviour, although there has been little systematic research on this to date. As a result, many ICT businesses and development agencies have been keen to promote the role of ICTs as change agents in business markets.

The principal role which ICTs play in these contexts is to provide channels for better information reaching market actors. Much of the anecdotal evidence, for example, concerns primary producers, such as farmers and fishers, using mobile phones to check on market prices before taking goods to market or selling them through intermediaries.

2 Aneel Karnani "Fortune at the Bottom of the Pyramid: A Mirage" *California Management Review* 49, 4 (2007)

Sophisticated technology is not essential to improve information resources in this way – market prices, for instance, can be broadcast on local radio stations as well as being made available though telephone, SMS or internet services – but can improve the quality of information.

In cases such as these, better information becomes available to producers, enabling them to direct their produce more efficiently towards markets where demand outstrips supply (also benefiting consumers), or to negotiate better deals with intermediaries. In other cases, however, evidence shows that the improved supply of information may benefit intermediaries or consumers rather than producers. Much depends on the dynamics of the individual markets concerned.

The relationship between information and the wider social and economic context is also important, for three reasons:

- New information resources rarely become available to all potential users within a local area at the same time: in most cases, they probably become available to wealthier producers in larger communities before they become available to poorer producers in smaller communities. This has implications for the distribution of potential business gains from enhanced information resources.
- Information cannot overcome other barriers to market behaviour, which particularly affect the poor, such as indebtedness and lack of capital; and these may inhibit some producers from taking full advantage of it.
- Information may also have wider effects on long-term supply and demand. Increased information about the whereabouts of fish stocks, for example, can lead to overfishing, and/or to reductions in consumer prices rather than increases in producer incomes. Again, local market circumstances are likely to have a determining effect on the outcomes resulting from increased information.

Nevertheless, it is clear that improved access to information has significant potential to enable primary producers to improve incomes in many contexts, and that new ICTs are playing a part in improving information access.[3]

Development and government agencies have also sought to use ICTs to provide producers with better generic information in such areas as crop management and animal husbandry, in order to improve their business practice. Experience suggests here that accessibility and ease of use are crucial factors in determining how valuable such resources may be. Broadcast radio programmes, for example, are much more widely accessible than information provided over the internet. They can be accessed more conveniently by target beneficiaries and require no additional cost or research skills. They also offer guidance from information intermediaries (agricultural extension officers, broadcasters, respected peers) with whom end-users develop relationships of trust. More sophisticated ICTs such as the internet are therefore being used more, today, in such contexts as channels to improve the skills and expertise of "infomediaries" than as direct channels of information to primary producers.

Much the same might be said of the ways in which small businesses can use ICT-enabled services to manage their businesses more effectively – for example, bookkeeping software and marketing websites. While high-end small businesses may find it relatively straightforward to computerise their business systems, many small businesses lack the experience and skills needed to do effective accountancy, for example, with or without computer support, while the cost of necessary software can also be prohibitive. Similarly, the development of marketing websites which are sufficiently attractive to reach new customers is expensive and time consuming for small businesses. Experience suggests that many or most are likely to gain better outcomes by participating in cooperative or government-sponsored collective marketing arrangements than by developing their own websites.

ICTs and business at a national level

The remainder of this chapter is concerned with ICTs and business at a national level, and with the more specific use of ICTs to facilitate business management and transactions known as "e-business" and "e-commerce".

E-business

The term "e-business" refers to the use of computers, IT and digital communications to improve the effectiveness of business performance. The majority of "e-business" activity is concerned with management and administration rather than with transactions (to which the term "e-commerce" is applied).

The implications of ICTs for national economies have been discussed in Chapter 22. As noted in that chapter, ICTs have often led to substantial improvements in the productivity of individual firms, although these have not necessarily led in turn to improvements in national productivity (for example, because improvements in the productivity of one firm may lead to market consolidation at the expense of less innovative rivals, rather than to market expansion).

These increases in productivity have been achieved in two main ways:

- In some cases, ICTs have played a major part in transforming the nature of productive processes. In

3 See for example Robert Jensen "The Digital Provide" *The Quarterly Journal of Economics* 122, 3 (2007) www.mitpressjournals.org/doi/pdf/10.1162/qjec.122.3.879

the automobile industry, for example, many of the manufacturing activities previously undertaken by people are now undertaken by robots; while the digitalisation of telephone trunk networks has drastically reduced the need for telephone engineers and operators. This replacement of human labour by investment in ICTs has led to substantial cost reductions and improvements in product consistency. In other cases, ICTs have enabled changes in non-manual aspects of production – for example, in the introduction of computer aided design (CAD) in many manufacturing and construction processes, and in monitoring productive processes in order to achieve efficiency improvements over time.

- ICTs have also been used to improve the effectiveness of ancillary processes, particularly administration and management. Common examples in this area include the computerisation of bookkeeping, payroll and inventory; and the introduction of improved internal business communications, including email, intranets and the use of audio- and video-conferencing between different sites within a business. In large multinational businesses, this has been greatly facilitated by the availability of international leased telecommunications lines and global communications management services offered by multinational telecommunications businesses.

It should be noted that the circumstances surrounding these productivity changes are not necessarily uniform. The incentive to replace labour by investment in ICTs is much higher in countries and sectors where labour costs are high (such as Western Europe and automobile manufacturing) than where labour costs are low (for example, in Africa and agriculture). Productivity gains through ICT investment may therefore be more profitable, and so achieved more rapidly, in industrial countries than in developing countries where labour costs are low. The transition to ICT-based production and administration may also be constrained in developing countries (particularly smaller countries) by lack of ICT skills in the economy.

It should also be noted that productivity improvements do not arise from ICT investment alone, but from the combination of ICT investment with other changes in production and management that enable the potential gains from ICT investment to be realised. Call centres provide a good example of the way in which many firms have taken advantage of ICTs to provide a more cost-effective customer management service. Moving from traditional customer management to a call centre requires substantial changes in management style and corporate culture. Other cultural changes that have often been associated with e-business include de-layering of management and outsourcing of non-core functions.

Without adaptations of this kind, it is unlikely that businesses will be able to maximise the value of digitising their businesses. However, they commonly involve reductions in personnel, and are therefore often opposed by trade unions.

E-commerce

The term "e-commerce" is used specifically to refer to the use of ICTs to manage transactions between a firm and its suppliers and customers. This is a part of "e-business" but, in most firms, forms a smaller part of overall ICT investment than that devoted to administration and management.

E-commerce is often divided into two main categories:

- B2B e-commerce, which is concerned with transactions between businesses.
- B2C e-commerce, which is concerned with transactions between businesses and consumers.

Another, intersecting, division which is useful in assessing e-commerce is that between:

- E-commerce that seeks to support and improve existing business relationships, including supply-chain management.
- E-commerce that seeks to develop new business relationships, including marketing to new potential customers.

Many businesses and governments have held high hopes for e-commerce, expecting it to transform economic relationships between firms and consumers. In particular, it has been expected that e-commerce will enable closer engagement between producers and consumers, reducing the role of intermediaries in many markets. Although the pace of change which was originally anticipated has not materialised in practice, e-commerce has nevertheless led to substantial changes in business relationships and is continuing to do so. This is particularly true in industrial countries, where internet availability is now pervasive.

In the late 1990s and first half of the following decade, the predominant forms of e-commerce were B2B e-commerce concerned with existing business relationships, particularly supply-chain management.[4] The evidence from this period shows that it was possible for firms to make significant savings on supply-chain management through the use of ICTs – for example, through just-in-time ordering. It was much easier for them to reduce costs in this way than it was to use ICTs to recruit new customers. Firms also found it easier to build upon their existing relationships than to make use of new transaction-oriented websites, aimed at serving B2B needs, which were not rooted in their existing business relationships.

4 See John Humphrey et al. *The Reality of E-Commerce with Developing Countries* (London: London School of Economics, 2003)

It may be that the very rapid expansion of internet access which has taken place during the first decade of the 21st century has changed the balance between B2B and B2C, at least where businesses focused on mass markets in industrial countries are concerned. Most businesses in industrial countries now have websites, and a large number of these offer secure transaction services enabling customers to buy direct from the producer rather than through intermediaries.

Some goods and services are more readily marketable through B2C e-commerce than others. In practice, B2C has been particularly successful in three areas:

- Where it enables customers to bypass legal constraints or social norms concerning particular goods and services. The most obvious examples of this are pornography – a major driver of personal internet use in industrial countries following the advent of the World Wide Web – and gambling, which is either illegal or socially disapproved in many countries.
- Where it distributes goods and services which can be delivered digitally, as file attachments, without significant loss of value by comparison with physical products – for example, transport and entertainment tickets; music, documents and (more recently) video products; and software.
- Where it improves the ordering and acquisition of specific goods (such as books, electronic equipment and supermarket produce), in particular by extending consumer choice beyond what would be available in physical shops, where the goods concerned can be delivered by what is in effect a mail order type of service.

Some traditional service businesses have also provided internet transaction support – notably banks, the majority of which (in industrial countries) now offer customers the opportunity to manage their accounts online. This usually entails savings to banks as well as increasing convenience to customers, although many people prefer to continue to manage their accounts in the traditional way because of security concerns (see below).

It should be noted that some goods are less susceptible to internet sales than others. These include goods which are highly perishable and goods where personal inspection of quality and verification of provenance are significant factors in purchase.

The mass market forms of B2C described here have had some wider impacts on consumer markets. In particular:

- A number of physical retail markets have been adversely affected to a substantial degree. These include music (CD) retailers, bookshops, travel agents and insurance brokers.
- Substantial new intermediaries have appeared in internet markets. These include online retailers of digitised goods (iTunes, eMusic.com), services such as travel agencies (Expedia, Opodo), mail order retail (Amazon.com), and discounted goods (lastminute.com). These have often been more successful than internet marketing services developed by traditional retailers.
- Some markets, particularly financial services, have also seen the development of comparison websites which offer information about competing products to consumers. These may be funded by advertising or commission.
- The internet has also fostered secondary markets in discounted or used goods (including auction sites such as eBay); and in the higher price reselling of goods for which demand exceeds supply (notably entertainment tickets). These secondary markets may be facilitated by more mainstream internet intermediaries (such as Amazon.com and Ticketmaster).

Constraints and challenges

Internet-based e-commerce has posed a number of challenges to the regulation of business and the oversight of transactions. Three of the most important of these issues are described below.

Firstly, internet transactions take place outside rather than within monitored national borders. This poses substantial difficulties for different countries' fiscal regimes. It is, in practice, often not feasible to levy sales taxes, such as value-added tax, on goods bought by internet customers in one country from suppliers in another – particularly digital goods, but also physical goods that are delivered by international postal services. Similarly, it is difficult to apply customs and excise duties to digital goods crossing national frontiers. This issue also affects competition within purchasers' markets, sometimes giving overseas suppliers a price advantage over local businesses.

Secondly, internet transactions take place outside regulatory norms, which also vary between countries. For example, a pornographic image may be legal in the country from which it is downloaded, but illegal in that to which it is downloaded. Similarly, pharmaceuticals which are illegal in the country of purchase may be ordered by post from websites located in countries where they are legally available. The US government has been particularly concerned to prevent access to international internet gambling sites from distorting the markets for legal gambling within the United States.

Thirdly, traditional regimes for the verification of contracts, agreements for sale, etc. are based on signed paper documents, often written in particular forms and held in particular ways in order to comply with national business regulations. Strict rules often apply to financial transactions, in order to prevent money laundering, fraud

and tax evasion. The mechanisms by which these regulations are enforced pre-date electronic commerce and are not appropriate for this new form of transactional relationship. Legislation is therefore required to enable many e-commerce transactions, in such areas as digital signatures and data protection.

Finally, internet-based B2C e-commerce raises issues of consumer welfare and rights of redress.

Many consumers are concerned about issues of security in electronic transactions, in particular the possibility that credit card and other personal data will be used for purposes of fraud and identity theft. Although responsible commercial websites in industrial countries use encryption to prevent personal data from being visible to business staff and hackers, such safeguards are less available in developing countries, and fear of fraud is a significant inhibitor of e-commerce.

Consumer rights, likewise, are well protected in many industrial countries, enabling customers who have not received the goods or services which they expected to receive to complain and seek redress from vendors. Such remedies are not readily available when sales occur across national boundaries. Where sales have questionable legality (as with pharmaceuticals), it is also not possible for internet consumers to determine whether they are buying genuine or fake products, and to seek redress if they are dissatisfied.

M-transactions

The early years of the 21st century have seen a further development in electronic commerce, which shifts the emphasis away from the internet towards a different platform, mobile telephony. This is increasingly referred to as "m-commerce" and the transactions involved as "m-transactions".

E-commerce, as described above, has developed in industrial countries where the internet is becoming pervasive, reaching the large majority of households and so enabling the large majority of citizens to buy goods online. The internet is not yet widely available in developing countries. There, however, the mobile phone has become increasingly widely available, with a majority of adults owning a mobile phone in some developing countries and the large majority of adults having access to mobile telephony.

Today's mobile phones are much more sophisticated devices than traditional fixed phones, often including additional equipment (such as a camera and .mp3 player) and having the intelligence required to memorise and manage transactions. Since the early days of mobile telephony in developing countries, some users have also found ways of using mobile phones as transactional devices – for example, by storing or trading airtime as a form of virtual currency. The use of mobile phones as virtual wallets is also thought to have particular potential for the purchase of low-value products such as soft drinks which are available from vending machines.

In most developing countries, banking services are poorly developed, with limited networks of physical bank branches, while the majority of the poor remain "unbanked". This is a major constraint on the ability of individuals and small businesses to build capital and to develop financial relationships with others at a distance.

The first experiments with mobile banking, which seeks to provide a banking service to both existing bank customers and the unbanked, took place in the early 2000s, notably with service providers and users in the Philippines. Mobile telephone networks provide two kinds of interlinked network which can overcome the weakness of the banking infrastructure: they have a physical infrastructure which is capable of managing transactions, and they have a human network (airtime sellers, etc.) which can handle physical money in place of physical bank branches.

Businesses in a significant number of countries are now experimenting with different models for providing mobile banking services – some integrated with mobile telephone businesses, some with banks, and some in partnerships between the two. Mobile banking is discussed further in Chapter 25.

One important constraint with services such as these has concerned identity. Banks – and financial regulators – usually require proof of identity before an individual is allowed to open a bank account (sometimes known as "know your customer" requirements). Proof of identity is often difficult for the poor in developing countries. Mobile banks are seeking ways of overcoming this challenge for potential customers.

The most important long-term market for mobile banking may lie with remittances. The total value of remittances sent to developing countries by citizens living in the global diaspora now exceeds the value of international development aid, and approximates that of foreign direct investment. At present, remittances are mostly sent to recipients by messenger (i.e. by travellers returning home) or by financial transfer companies which charge high commissions (typically something like 10%). Mobile banking businesses could provide a money transfer service for remittances much more cheaply, but need first to overcome regulatory difficulties arising from international financial rules designed to prevent fraud, money laundering and financial transfers by criminal and terrorist organisations. ■

Chapter 28
INTERNATIONAL ICT POLICY INSTITUTIONS

Lead author ***David Souter***

Many international organisations play a part in deciding policies that affect information and communications technologies. These include:

- Technical agencies, such as the Radio and Standardisation Bureaux of the International Telecommunication Union (ITU), the Internet Engineering Task Force (IETF) and the Internet Corporation for Assigned Names and Numbers (ICANN).
- Communications policy forums, such as the ITU Plenipotentiary Conference and Development Bureau, and the Internet Society (ISOC).
- Specialist agencies from outside the ICT world whose areas of responsibility intersect with ICTs, such as the World Trade Organisation (WTO) and the World Intellectual Property Organisation (WIPO).
- Development agencies, such as the World Bank, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the United Nations Development Programme (UNDP).

Some of these organisations are purely intergovernmental in character (such as United Nations bodies). Others are based around the private sector (such as the technical forums which develop many new technical standards). Others again – particularly where the internet is concerned – have less formal membership arrangements, including individual membership.[1]

As well as global organisations, there are many regional organisations which coordinate ICT policies and regulations. Tanzania, for example, is a member of the African Telecommunication Union (ATU), and of the e-Africa Commission of the New Partnership for Africa's Development (NEPAD); a participant in the work of the UN Economic Commission for Africa (UNECA)'s African Information Society Initiative (AISI) and other programmes; a signatory of the Southern African Development Community (SADC) protocol on transport and communications and a member of the Communications Regulators Association of Southern Africa (CRASA); a member of the East African Community and East African Regulatory, Postal and Telecommunications Organisation (EARPTO); a member of the Commonwealth Telecommunications Organisation and the Commonwealth Broadcasting Association; and so on. Its communications businesses and civil society organisations participate in many more international organisations at continental and regional levels.

International decisions about ICTs are often highly technical but can be extremely important in determining what governments, businesses and citizens can do. Decisions about the allocation and use of spectrum, for example, or about the rules for financial transactions across national boundaries, can have a major impact on the viability of communications services in individual countries and the costs that are paid by end-users. Participation in so many organisations is, however, time consuming and expensive for governments, and even more challenging for private sector and civil society organisations.

History

The nature of international communications decision making has changed greatly since the restructuring of the communications industry began in the early 1980s.

Before that time, international relations in the communications sectors were dominated by intergovernmental organisations within the United Nations system: the International Telecommunication Union (ITU)[2] and the Universal Postal Union (UPU). Different countries were (and still are) represented in these organisations by their governments, and there is limited scope for direct participation by the private sector or civil society. (However, the ITU has established what is known as "sector membership", which allows private sector companies to play a part in aspects of its work, particularly standardisation. Some governments also include private sector and – less often – civil society participants in their delegations.)

These UN family bodies regulated the interface between different communications suppliers in different countries – for example, establishing rules for the use of spectrum, for technical interoperability and for accounting arrangements applicable to cross-border transactions. In almost all cases, historically, national communications entities were monopolies – monopoly telecommunications businesses and postal services, and state broadcasting

1 The IETF has no formal membership: anyone can participate in any activity.

2 Note that the T in ITU is for Telecommunication (singular), not Telecommunications (plural).

monopolies. They often negotiated bilateral terms between countries within these rules. Accounting arrangements for the termination of international telecommunications traffic, for example, were until very recently the result of bilateral agreements between national telecoms operators, based on negotiating power rather than standard accounting principles such as cost-orientation.

In addition to these UN agencies, international treaty-based organisations controlled a number of international facilities, particularly satellite systems (like INTELSAT and INMARSAT). Some undersea cable consortia were also established by groups of governments, although the private sector now dominates the international cable industry. (INTELSAT and INMARSAT have also now been privatised.)

These monopoly arrangements have broken down in the last twenty years as communications markets have been transformed in technology and structure. Some of the most important changes are as follows:

- Most communications markets have been (partly) privatised and (largely) liberalised (see Chapter 15). As a result, governments can no longer easily represent communications networks and services (which are in the private sector), while the interests of competing networks and services do not necessarily coincide.
- Many national networks and services are also now part of multinational businesses, whose interests and ways of working are not easily represented in a system based on nation-states. These multinational businesses work together in partnerships and alliances that are often subject to rapid change.
- In addition, there are many business ventures that now run international facilities, including satellite and cable networks. There has been a proliferation of new infrastructure, especially on high-density routes (such as the Atlantic), which has massively increased capacity and reduced costs of transmission.
- There has, partly as a result, been a tremendous increase in international voice and data traffic, including traffic generated by the internet.
- The networks and platforms used to deliver different types of communications – such as broadcasting and telephony – have been converging. International communications is overwhelmingly based today on IP (Internet Protocol) networks rather than the traditional PSTN networks that provided telecommunications services in the past.

Mapping the international ICT environment

These changes have led to great changes in the international governance of ICTs. Old-style bilateral accounting arrangements, for example, become irrelevant when IP networks replace traditional telephone networks. Competing telecommunications operators use competing infrastructure to convey traffic over competing routes. Standards for new technologies are increasingly set, not by intergovernmental discourse, but by the businesses which are at the cutting edge of new technology; they are seen now as matters for technical expertise rather than political consensus or diplomatic compromise.

The number and scope of international organisations involved in international ICT decision making has also expanded greatly, in two main ways:

- Firstly, the number of modes of communication has increased, most notably through the introduction of mobile telephony (which uses a variety of standards that need international agreement) and of the internet (which has developed its own mechanisms for cooperation outside the norms of intergovernmental agreements).
- Secondly, the increasing importance of ICTs has meant that it intersects much more importantly with many more areas of domestic and international governance. In addition to ICT-specific international organisations, therefore, policy which concerns ICTs – their development, deployment and application – is now also made in other technical UN agencies (such as WIPO), in development agencies (such as the World Bank) and in agencies which are primarily concerned with other social and economic issues (such as policing and security).

One example of this broadening of ICT policy making, and the increasing need for cooperation between international agencies, can be seen in mobile banking, which is also discussed in Chapters 25 and 27. Mobile banking services make use of communications networks to substitute for the networks of banking offices and agents which are found in better-served communities. Financial services, however, are much more tightly regulated than communications, in order to ensure the security of bank customers' money and to prevent fraud, tax evasion, money laundering and the use of banks to facilitate criminal and terrorist activity. These controls are particularly important where international transactions are concerned. The effective development of mobile banking therefore involves interactions between the national and international policy and regulatory environments for both communications and financial services.

The advent of the internet has been particularly disruptive to the framework for international ICT decision making, for several reasons. One of these – the fact that internet governance has grown up outside the conventions and norms that apply to other areas of international governance – is discussed in Chapter 20. In addition:

- The internet has disrupted the international structure of telecommunications by offering new ways of bypassing conventional telecoms routing and accounting (IP networks, voice over internet).

- It has introduced new internet-specific problems that require international cooperation if they are to be effectively addressed (e.g. spam).
- It has enabled, through its global character, bypass of established national and international constraints on content (intellectual property rights; controls on pornography, gambling and pharmaceuticals) and behaviour (cyber crime, phishing).
- It has facilitated new forms of behaviour for which there are no established international norms (e.g. Web 2.0 social networking).

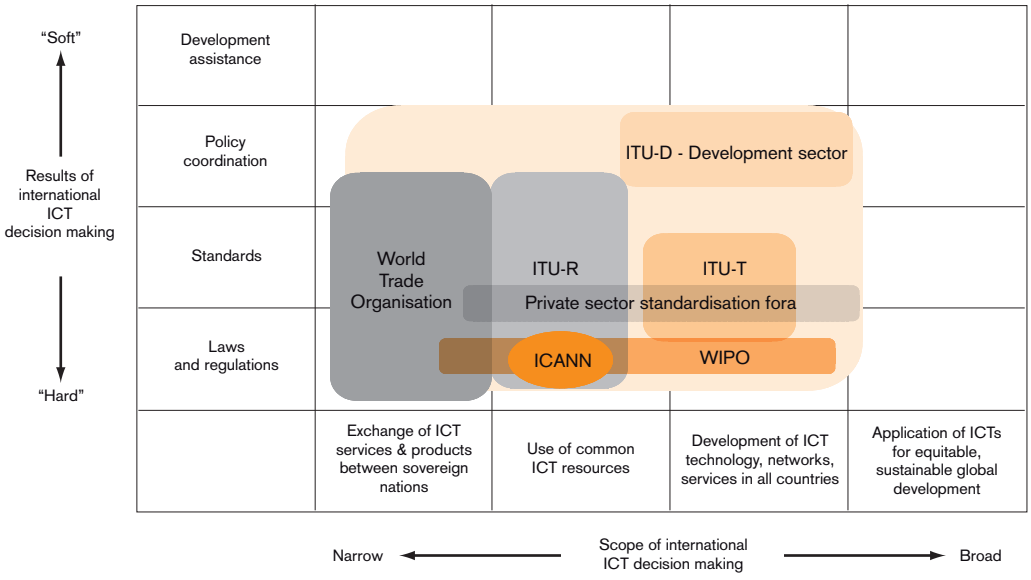
The rise of the internet has challenged many assumptions in national and international law, which are increasingly the concern of non-ICT as well as ICT-related international policy. It has also challenged many of the assumptions of internet pioneers about the extent to which it can (and should) remain independent of mainstream international governance. The prevalence of spam, for example, which now accounts for over 90% of email traffic, is not just a problem for the internet, but also for the telecommunications industry, for policing and security, for business stability and even the environment (every email has its own, if tiny, carbon footprint).

A number of attempts have been made to map the international ICT environment, but these have been increasingly complicated by the growing complexity and range of institutions involved, described above. One approach, developed for the G8 Digital Opportunity Task Force (DOT Force) in 2002, seeks to categorise international decision-making forums according to the breadth and depth of their authority. The diagram in Figure 28.1 illustrates the approach and locates a number of international forums according to these parameters.

The horizontal axis on this diagram represents the scope of decision making – i.e. the narrowness or breadth of its engagement with ICT and wider policy issues. The vertical axis represents the depth of the authority of decisions which can be made – from powerful agreements on international laws, through rules and regulations, to the loose authority conveyed by cooperative guidelines.[3]

One organisation, the International Telecommunication Union, has some form of authority over a great deal of this decision-making territory – although the depth of its authority varies from one aspect of telecommunications to another, and overlaps to a greater or lesser degree with that of other organisations which may well be more powerful in particular areas of responsibility. Some international organisations have a great deal of power in narrowly defined areas, such as ICANN, which manages the internet domain name system, while others have much looser or more diverse authority.

Figure 28.1: **ICT issues and governance entities**



3 Don MacLean, David Souter, James Deane and Sarah Lilley *Louder Voices: Strengthening Developing Country Participation in ICT Decision-Making* (Panos/CTO for UK DFID, 2002) www.panos.org.uk/?lid=324

Major decision-making bodies

There is not a great deal of space in this handbook to describe the major international ICT decision-making bodies. Brief summary notes on some of the most important are included in an Appendix to this handbook. Some of those concerned with the internet are also discussed in Chapter 20, which deals with internet governance. The following paragraphs deal with two global institutions which have particular global significance.

The **International Telecommunication Union (ITU)**[4] was formed in 1865 and initially regulated telegraphy (the transmission of text messages by Morse code). Its remit subsequently extended to telephony and, more recently, to other forms of data communications (but not the internet). In the late 1940s, it became a specialist agency of the United Nations, with its headquarters in Geneva, Switzerland.

The ITU is governed by a Plenipotentiary Conference (Plenipot), which meets every four years, and an elected Council, which meets between times. Its secretariat is headed by five officials elected at each Plenipot: a secretary-general and deputy, and the heads of three sector bureaux, concerned with radio spectrum management (the Radiocommunication Bureau, ITU-R), technical (including accounting) standards (the Standardisation Bureau, ITU-T), and the development of telecommunications (the Development Bureau, ITU-D). Each sector also holds its own conference to determine its work programme, usually every three or four years. Although ITU-D is primarily concerned with the development of telecommunications, it has in recent years paid increasing attention also to the role of telecommunications in development.

The ITU played the lead role in organising the World Summit on the Information Society (WSIS) in 2002-2005 (through its secretary-general's office, not through ITU-D). Some WSIS participants were concerned during this period that it was seeking to extend its mandate by becoming the UN agency with lead responsibility for the internet and for ICD issues. Industrial countries, the private sector and most civil society organisations have resisted the idea that the ITU should gain authority over the internet, while other UN agencies have been uncomfortable with it taking a more significant role in developmental issues.

Membership of the ITU belongs to governments. However, the liberalisation and privatisation of telecommunications have made it hard to sustain a purely governmental structure. Since the 1980s, while decision making remains in the hands of governments, the ITU has allowed private companies to become sector members and thereby play an important role, particularly in standards issues. This reflects a shift in power within the telecommunications sector as a whole from governments to private business. By the beginning of 2008, the ITU had 191 government members, 567 sector members (some companies were members of more than one sector) and 137 associate members (with lesser entitlements). It described itself on its website as "a global forum through which government and industry can work towards consensus on a wide range of issues affecting the future direction of this increasingly vital industry."[5]

Civil society organisations are not normally able to become sector members (although this is contested by the ITU). A number of initiatives have sought to enable civil society participation in the ITU. After WSIS, the ITU's 2006 Plenipot established a review of the extent to which civil society partipation might be enabled in its wider (non-telecoms-specific) work.

The **World Trade Organisation (WTO)** is the international organisation which governs trade in goods and services. Its membership is less widespread than that of the United Nations – by the middle of 2007, it had 151 member countries out of the UN total of 192 – but between them these account for the large majority of international trade.

The WTO has adopted three important agreements on ICT issues: the Basic Telecommunications Agreement (BTA, 1997), the Value-Added Telecommunications Agreement, and the Information Technology Agreement. Of these, the BTA is most important, and had been signed by 88 countries by the beginning of 2008 – countries which between them account for the vast majority of national and international telecommunications traffic. Its main objectives are to facilitate free trade in telecommunications services, including freedom of investment and the right of companies based in other countries to participate in the telecommunications markets of BTA signatory states. However, the terms of BTA engagement vary from country to country, as national governments have made individual commitments with varying levels of national and international liberalisation. The BTA also includes a "Reference Paper on Regulation" which has become the common denominator of telecoms regulatory practice (see Chapter 16).

The Information Technology Agreement, reached in 1996, had 70 signatory countries by 2007, which between them accounted for 97% of world trade in IT products (as opposed to services). It is essentially a tariff-cutting mechanism, which aims to reduce to zero the tariffs levied on IT goods such as computers. Developing country participation in this agreement is relatively low, and, in particular, there are very few African signatories.

4 Note that ITU style always refers to "Telecommunication" rather than "Telecommunications", especially in the names of ITU institutions.

5 www.itu.int/members

Participation in international ICT decision making

Participation in international ICT decision making varies from organisation to organisation. Two important issues arise from this:

- The range of stakeholders that may participate in particular decision-making processes.
- The capacity that stakeholders have to participate actively once they are entitled.

These are discussed in turn below.

(Multi-)stakeholder participation

The term "multi-stakeholder" (which implies the involvement of different types of participant alongside governments) should be distinguished from the term "multilateral" (which implies the involvement of many or all governments, as is the norm in UN institutions). The UN sometimes describes all non-governmental entities, including the private sector, as "civil society", though civil society organisations tend to distinguish between the private sector and non-commercial entities as different stakeholder groups.

Participation in intergovernmental organisations is usually restricted to governments – although some governments choose to include non-governmental representatives (from businesses or civil society) in their delegations. For example, the South African delegations to most WSIS PrepComs and both WSIS summits included a substantial number of non-government participants.

Some intergovernmental organisations have recognised that the restructuring of the industry means that it is no longer possible to fulfil their roles without at least the private sector being involved. The ITU, for example, as noted earlier, has established a status called "sector membership" which enables private sector businesses to play a leading role in areas like standardisation in which they now, in practice, take the lead. Civil society organisations have argued that this right to participate should be extended to them as well as to the private sector. At its 2006 Plenipotentiary Conference, the ITU agreed to explore possible new arrangements for civil society participation in aspects of its work concerned with WSIS issues (though not in its core work on telecommunications). However, as an intergovernmental agency within the UN system, the ITU is not able to move towards allowing non-governmental actors to vote on final outcomes.

Many internet governance organisations are much more open to broad participation. Their openness results from the fact that the internet's development was led by a community or network of individuals with a particular interest in the internet and, more recently, by the private sector, rather than by governments. Indeed, the internet may be the first major social and economic phenomenon to have emerged from non-governmental activity in this way since the Industrial Revolution. Many of those involved in this "internet community" have been and remain suspicious of government involvement in the internet and anxious to avoid government control.

Although its representation at governmental level is contentious, for example (see Chapter 20), ICANN's institutions have been much more open to participation by non-governmental stakeholders than those of intergovernmental agencies like the ITU, including extensive representation by constituencies. ICANN has even experimented with direct election by individual internet users. Membership of the Internet Society (ISOC), which acts as a forum for discussion of internet policy, is open to all. The Internet Engineering Task Force (IETF) allows anyone to participate in the development of technical standards for the internet, the degree to which they are able to influence outcomes depending on their technical expertise rather than their social or political status. While membership of other internet bodies, such as the World Wide Web Consortium (W3C) and Regional Internet Registries (RIRs), is less open, they usually allow anyone – members and others – to participate in the development of policies and standards.

There was a great deal of debate at WSIS about the principle of "multi-stakeholder participation". This was interpreted at WSIS as participation involving governments and international organisations, the private sector and civil society, and the technical community concerned with ICTs (particularly the internet).

Although participation by the private sector and civil society was opposed by some governments within WSIS, its final outcome documents strongly endorsed the principle of multi-stakeholder participation. The Working Group on Internet Governance, held during WSIS, was a multi-stakeholder forum, and multi-stakeholder principles were written into the terms of reference for the Internet Governance Forum and for the "action line" processes designed to follow up WSIS' conclusions (see Chapter 29).

This movement towards greater participation by non-governmental stakeholders has been broadly welcomed by civil society, but poses some important questions.

One of these concerns the form which multi-stakeholder participation should take. Some have argued that this should be based on the representation of stakeholder groups as separate communities which might adopt contrary views – for example, that a decision-making forum should be made up of equal numbers of government, private sector and civil society representatives. Others have argued that multi-stakeholder participation should be based on individual rather than collective engagement – for example, that participants should

Table 28.1: **International and national participation challenges**	
International participation challenges	**National participation challenges**
Lack of easy, affordable and timely access to information about issues	Lack of linkage between ICT and mainstream economic/social/ development agencies and institutions in government
Lack of functional participation in international forums, especially in the informal tier of decision making (i.e. discussions held outside formal meetings)	Limited technical and policy development capacity – including poor knowledge management of the information available and lack of political leadership
Ineffective use of financial resources available for participation	Lack of stakeholder involvement in national policy making (including private sector and civil society involvement)
	Lack of linkage between international decisions and national implementation strategies

have the same status in discussions regardless of their stakeholder background. The first approach emphasises the likely differences between stakeholder perspectives, and is well suited to the "caucus" approach to civil society policy making which has developed in a number of international forums. The second approach, by contrast, emphasises the scope for consensus building across stakeholder boundaries.

The development of multi-stakeholder forums like the IGF also poses strategic challenges for civil society. In the past, exclusion from decision-making forums limited the strategic options available to civil society, often focusing these on points within intergovernmental agreements which civil society organisations generally opposed. The invitation to participate in international forums broadens the strategic options available to civil society, in particular allowing them to build common positions across stakeholder boundaries, i.e. with particular governments and private sector stakeholders. There was some significant movement towards this at WSIS, but not all civil society organisations have been comfortable with a consensus-building stance.

One final issue concerns the breadth of civil society participation within international decision making. Although some of the issues with which this is concerned (such as ICT infrastructure and access) are ICT-focused, others (such as rights-based issues and those concerned with the application of ICTs in social and economic development) are much broader. To date, general or mainstream rights and development agencies have played a relatively small part in ICT policy advocacy and campaigns. Their greater participation might dilute the ICT emphasis of such advocacy, but would add weight to it with governments and the private sector.

Effective participation

Alongside the right to participate, it is necessary to consider the capacity of different actors to participate. International ICT issues are often highly complex, and require considerable technical expertise. ICT decision-making processes are also often complex and multi-layered, and it is difficult for small countries and small organisations to attend all of the relevant meetings, let alone gain influence and achieve impact.

The difficulties which smaller delegations face in participating in international decision making were assessed in the report for the G8 DOT Force which developed the institutional mapping approach illustrated earlier in this chapter. This report, *Louder Voices*, used interviews with many developing country participants in order to identify underlying reasons for their relatively weak engagement with the international decision-making process. These interviews identified two main sets of issues, which are set out in Table 28.1.

National capacity weaknesses – in both technical and policy areas – were identified in the report as being particularly important in contributing to the weakness which participants felt existed in much developing country involvement and influence.

Civil society organisations face many of the same problems as developing country governments in developing the expertise and reputation required for effective participation in international forums – as well as the challenge of being accepted as participants in the first place. Experience suggests that civil society organisations are most effective when they build on the particular experience they have to offer and can support this with genuine expertise. ■

Chapter 29
THE WORLD SUMMIT ON THE INFORMATION SOCIETY (WSIS)

Lead author ***David Souter***

The World Summit on the Information Society (WSIS) was a global forum which was held in two phases – the first leading to a summit meeting in Geneva in December 2003, the second leading to a summit meeting in Tunis in November 2005. It was organised by the International Telecommunication Union (ITU) on behalf of the United Nations.

Although the WSIS process ended in late 2005, and there have been many new developments in ICD and ICT4D since then, the Summit is still seen by many people as a keynote event in the development of ICD thinking and activity. This chapter summarises the outcomes and output documents which emerged from WSIS, and their relationship with developments since then.

Whose Summit?

APC has published a major study of WSIS, focusing on developing country and civil society participation. This study, written by David Souter with additional research by Abiodun Jagun, includes a detailed account of organisation and debates held within WSIS and its associated forums. This chapter draws extensively on the study, which can be found at: www.apc.org/en/node/5587/

The origins of WSIS

The decision to hold a world summit followed a period in which ICTs had become much more prominent in discussion about international development. Until the 1990s – apart from a short debate around the Maitland Commission's *Missing* Link report in 1983/1984 – telecommunications had been regarded as something of a luxury within the development community (see Chapter 23). In the late 1990s and the early years of the present century, however, a number of international conferences and initiatives drew attention to ICTs' potential for delivering development objectives. These included:

- A conference on the Information Society and Development, organised by the European Union and the South African government at Midrand in 1996.
- The first Global Knowledge Conference, held in Canada in 1997.
- The Digital Opportunity Task Force (DOT Force) initiated by the G8 group of industrial countries in Japan in the year 2000.

A proposal to hold a world summit around "information society" issues had been raised by some within the United Nations system in the 1990s. The spark for WSIS came, however, from a motion agreed – without debate – by the ITU's Plenipotentiary Conference in 2002. Its call for a world summit on the subject was taken up by the United Nations, which then asked the ITU to organise the summit on its behalf.

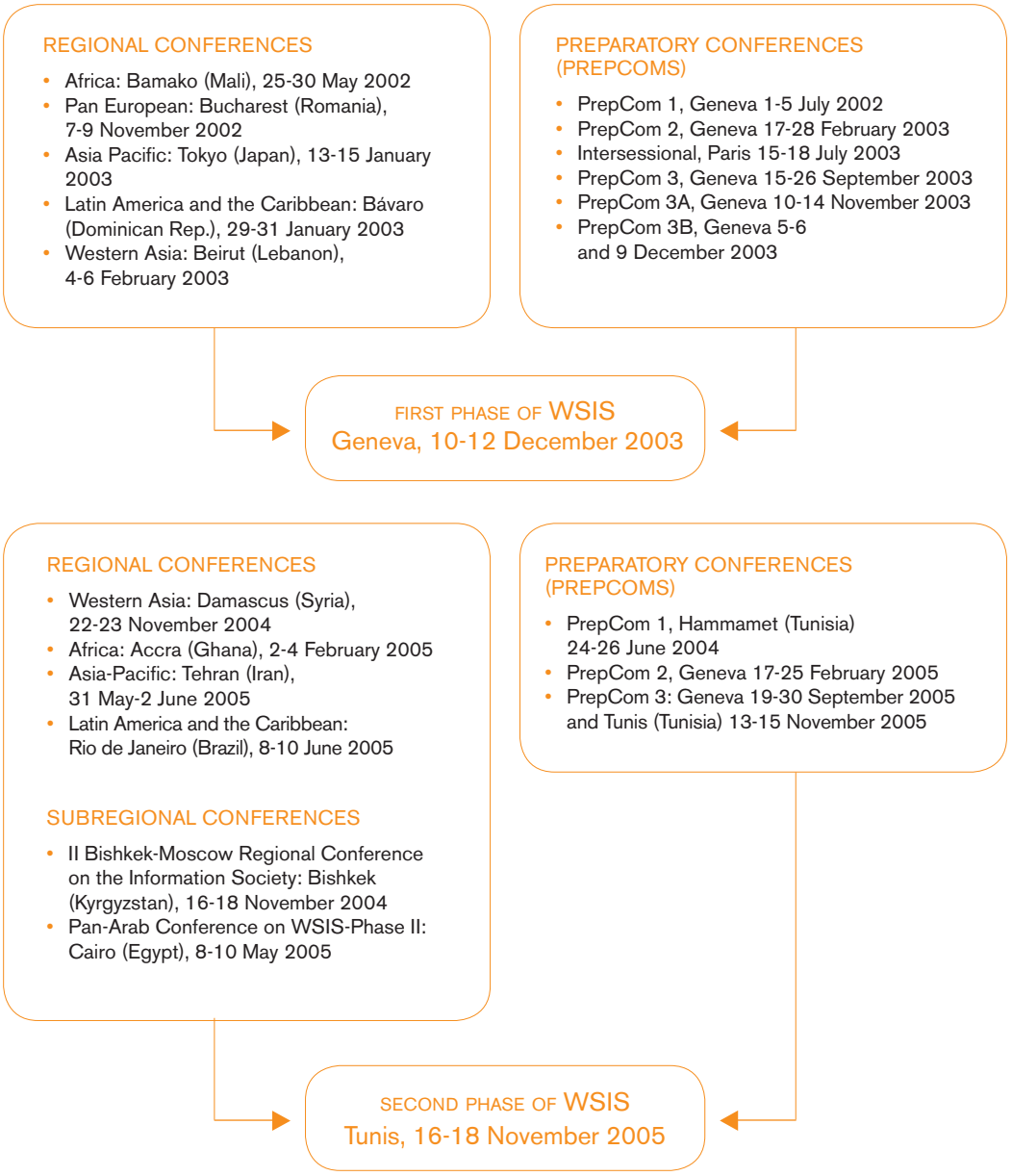
The WSIS process

The United Nations system has held many global summits over the years, including some – such as the Rio summit on the environment and development in 1992 and the Beijing Women's Conference in 1995 – which are widely held to have changed perceptions of the issues with which they dealt. Other summits have been less successful. Within the UN system, summits are considered most useful when an intractable problem requires the agreement of governments throughout the world. They have been used less often to consider how to maximise the value of a more positive development, such as ICTs.

The World Summit on the Information Society was held in two phases – the first leading up to a plenary summit meeting in Geneva in December 2003, the second to a plenary session in Tunis in November 2005. This two phase arrangement is unique to WSIS. The UN presented it as offering an opportunity to divide consideration of the issues into two linked phases: the first summit dealing with points of principle, the second with implementation.

The plenary summit, which is attended by heads of state and government, is just the final part of a lengthy process of negotiation in any summit process. As with other summits, each WSIS plenary was preceded by more than a year of preparatory meetings, known as PrepComs, during which the draft texts which were to be agreed at the plenary were negotiated. The overall

Figure 29.1: **WSIS timeline 2001-2005**



structure of the WSIS process is illustrated in Figure 29.1.[1]

There has been a good deal of discussion of participation in WSIS, including the APC report mentioned above. The majority of official delegates to WSIS came from the traditional telecommunications sector – ministries of communications, telecoms regulators and fixed network operators – and from the diplomatic community. Relatively few countries included representatives of new ICT sectors such as mobile telephony and the internet in their delegations, or representatives of the wider development community with experience of using ICT applications in development activities. Private sector telecommunications businesses were fairly well represented, but many important firms chose to stay away. Civil society representation was led by agencies with a special interest in ICT/D, and there were relatively few participants from mainstream or generalist rights or development NGOs. Some have argued that this preponderance of ICT specialists, particularly from the telecommunications sector, contributed to a weakness in WSIS outcome texts where wider development issues are concerned.

1 Taken from David Souter *Whose Summit? Whose Information Society? Developing countries and civil society at the World Summit on the Information Society* Montevideo: APC, 2007 www.apc.org/en/system/files/whose_summit_EN.pdf

The first phase

The texts which emerge from the PrepCom process, and which are adopted in summit plenaries by heads of state and government (or their representatives), are compromise texts to which it is possible to gain the consent of all participating governments. (Other stakeholders, such as civil society and the private sector, have no formal role in adopting them, although they seek to influence their content.) As a result, summit texts are often stronger on aspirations (on which it is easier to reach agreement) than on concrete, funded plans for implementation. Some areas of text within them are negotiated word by word, until a form of words is found that can be generally agreed – sometimes because it can be understood in different ways.

In practice, the two WSIS phases had quite different characters.

The first phase was concerned primarily with developing an overall text concerning the role of ICTs within society and development. This text eventually took the form of two documents:

- The Geneva Declaration of Principles, which set out visions and aspirations for the role of ICTs and the nature of an information society.
- The Geneva Action Plan, which sought to translate these into "action lines" promoting the use of ICTs to achieve development objectives.

The ethos of these documents is strongly positive about the role of ICTs in social and economic development, their potential for delivering on development objectives like the Millennium Development Goals, and the scope for building transformative information societies. They are particularly concerned that the benefits of ICTs should be available to all (and so with measures that will close digital divides).

The opening paragraph of the Geneva Declaration of Principles clearly articulates the aspirations that were held for WSIS:

> We, the representatives of the peoples of the world, … declare our common desire and commitment to build a people-centred, inclusive and development-oriented Information Society, where everyone can create, access, utilise and share information and knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life, premised on the purposes and principles of the Charter of the United Nations and respecting fully and upholding the Universal Declaration of Human Rights.

The Declaration follows this with an emphatic endorsement of the potential role of ICTs in development:

> We recognise that education, knowledge, information and communication are at the core of human progress, endeavour and well-being. Further, information and communication technologies (ICTs) have an immense impact on virtually all aspects of our lives. The rapid progress of these technologies opens completely new opportunities to attain higher levels of development.

However – reflecting the concerns of donors in particular – the Declaration also affirms the importance of mainstreaming ICTs within development (see Chapter 23): "We are aware," it says, "that ICTs should be regarded as tools and not as an end in themselves."[2]

As noted above, the texts of the Declaration and Action Plan were the product of negotiation, based on suggestions put forward by different governments. As a result, they are not comprehensive – some development areas receive much more attention than others – and the Action Plan is more of a list of possible actions than a prioritised programme of work.

A number of "targets" for access and connectivity to ICTs in developing countries were included in the Action Plan, to be achieved by 2015, the same year as the majority of the Millennium Development Goals. These are listed in Table 29.1. It should be noted, however, that they are much less precise than the targets associated with the MDGs (see Chapter 23): no specific target numbers are included, while the meaning and scope of the "connectivity" or even "ICTs" referred to are also usually unspecified.

The Geneva Action Plan set out a number of action lines within which future work on the information society might be organised. These action lines subsequently formed the basis for post-WSIS monitoring of the Summit's development commitments. They cover the themes outlined in Table 29.2.

Most of the negotiations during the first phase of WSIS were not, however, about the detail of these development texts, but about four specific issues. There was a good deal of heated argument about these issues and disagreements about them threatened at times to disrupt the whole summit process. They were as follows:

- There was considerable argument about the degree of **participation by private sector and civil society organisations**. Summit texts are formally agreed between governments, and some governments strongly opposed the suggestion that non-governmental organisations (such as businesses and civil society groups) should participate in their development. Others, including some governments, argued for a more multi-stakeholder approach, which would recognise the leading role which the private sector plays in ICTs and particularly the internet, and the expertise of civil society in social and economic spheres. This remained a point of tension throughout WSIS, though in practice private sector

2 These quotations are from paras. 1, 8 and 9 of the Geneva Declaration of Principles. The WSIS outcome documents can be found at www.itu.int/wsis/index.html

Table 29.1: **WSIS Action Plan access and connectivity targets**

- To connect villages with ICTs and establish community access points.
- To connect universities, colleges, secondary schools and primary schools with ICTs.
- To connect scientific and research centres with ICTs.
- To connect public libraries, cultural centres, museums, post offices and archives with ICTs.
- To connect health centres and hospitals with ICTs.
- To connect all local and central government departments and establish websites and email addresses.
- To adapt all primary and secondary school curricula to meet the challenges of the Information Society, taking into account national circumstances.
- To ensure that all of the world's population have access to television and radio services.
- To encourage the development of content and to put in place technical conditions in order to facilitate the presence and use of all world languages on the internet.
- To ensure that more than half the world's inhabitants have access to ICTs within their reach.

Source: WSIS Geneva Plan of Action, para. 6.

Table 29.2: **WSIS action lines**

1. The role of governments and all stakeholders in the promotion of ICTs for development
2. Information and communication infrastructure
3. Access to information and knowledge
4. Capacity-building
5. Building confidence and security in the use of ICTs
6. The enabling environment
7. ICT applications:
   - E-government
   - E-business
   - E-learning
   - E-health
   - E-employment
   - E-environment
   - E-agriculture
   - E-science
8. Cultural diversity and identity, linguistic diversity and local content
9. Media
10. Ethical dimensions of the Information Society
11. International and regional cooperation

Source: WSIS Geneva Plan of Action, *passim*, and Tunis Agenda for the Information Society, annex.

and civil society organisations were able to play a reasonably influential role.

- There was also considerable argument about the relationship between **ICTs and human rights**. It has been usual for summit outcome documents to refer to the body of human rights agreements, dating back to the 1948 Universal Declaration of Human Rights, which have been agreed from time to time by governments. Some governments resisted the inclusion of rights-based text within the WSIS documents, but in the end it was largely included.

Two further issues were left unresolved at the end of the first WSIS phase:

- There was disagreement about **financing mechanisms** for the information society, and in particular a proposal from the president of Senegal to establish a "Digital Solidarity Fund" which would be administered by the United Nations and would direct investment towards ICT projects, including infrastructure. This proposal was supported by the representatives of many developing country governments, on the argument that ICT activities require additional specified funding sources. It was opposed by donors, which argued that a separate mechanism for ICTs was unnecessary (and likely to be inefficient), and that the proposal undermined existing international development agreements such as the Monterrey Consensus and the Millennium Development Goals (see Chapter 23). When no agreement could be reached on this, the matter was referred to a Task Force on Financing Mechanisms (TFFM), which would consider the issue further between the two phases of WSIS.
- There was also disagreement about **internet governance**, especially the dominant role which many developing country governments felt the United States had over the root server system and over the Internet Corporation for Assigned Names and Numbers (ICANN) (see Chapter 20). Some governments, mostly from developing countries but also including Russia, wished to use WSIS to establish more tra-

ditional intergovernmental arrangements for the internet, perhaps through the ITU. Some also wanted to bring the internet at national level under greater government control. Industrial countries were resistant to more governmental control over the internet at either national or international level, arguing that it was its very autonomy from government control that had enabled it to develop innovatively and achieve a high level of social and economic importance. When no agreement could be reached on this, the matter was referred to a Working Group on Internet Governance (WGIG), which would consider the issue further during the PrepComs of the second phase.

Inter-sessional forums and the second phase

The first phase of WSIS therefore established some basic texts on the potential role of ICTs and aspirations for a future information society, but left two major issues unresolved.

In practice, the Task Force on Financing Mechanisms was able quite quickly to reach a compromise on infrastructure finance. The agreement which it proposed emphasised the opportunity for infrastructure to be financed through existing mechanisms but also recommended new approaches, particularly involving public-private partnerships. The Digital Solidarity Fund became a voluntary mechanism, which has received little support from governments. The TFFM's report was adopted as part of the draft text for the second summit quite early in the preparatory phase.

It was also agreed early in the second phase that the first summit's texts would not be reopened and, as a result, development issues were barely discussed during the second phase. Very little attention was paid in the second phase to moving from principles to implementation, as had originally been envisaged. The second phase of WSIS was dominated in practice by further discussions about internet governance.

The Working Group on Internet Governance brought together a group of about 40 experts with different backgrounds to explore the meaning of internet governance and make suggestions as to how the impasse in the first summit phase might be resolved. WGIG was unusual within the United Nations system in that it was a genuinely multi-stakeholder forum: participants from governments, the private sector, civil society and the internet community were treated as equal individuals, rather than government representatives having a superior status as is usually the case. This multi-stakeholder character was welcomed by the private sector and civil society.

However, WGIG's report did not end the controversy about internet governance, and arguments about this – particularly the relationship between the United States, ICANN and the root server system – persisted throughout the second phase. For much of the time, it looked as if the whole summit might founder on this issue. Eventually, however, a compromise was reached, which looked towards "enhanced cooperation" in internet management (compromise wording which could be interpreted in different ways by different parties), and established an annual Internet Governance Forum (IGF) to act as a debating chamber on internet issues, but without any powers or legal authority. Further discussion of internet governance issues can be found in Chapter 20.

These compromises were set out in two final summit documents:

- The Tunis Commitment, which reaffirmed basic principles
- The Tunis Agenda for the Information Society, which set out WSIS' conclusions on infrastructure finance and internet governance, and also looked at follow-up activities.

Follow-up activities

Like internet governance, what should happen after WSIS divided governments. Some wanted to establish significant implementation mechanisms that could carry forward the WSIS ethos. Others, including most donor countries, felt that WSIS had contributed little new to thinking about the information society or about ICTs in development, and felt that follow-up activities would waste time and effort.

One further element that added to debate was institutional rivalry within the UN system. The information society cuts across boundaries of responsibility between technical agencies like the ITU and development-focused agencies like UNESCO and UNDP. Some within the UN system and some governments felt that the ITU wanted to extend its responsibilities through WSIS – to take on internet governance roles and to act as the UN family's lead agency in information and communications issues, including those in areas such as development policy which lay outside its expertise. Industrial country governments, the private sector and civil society were all generally reluctant to see such an expansion of the ITU's role along these lines.

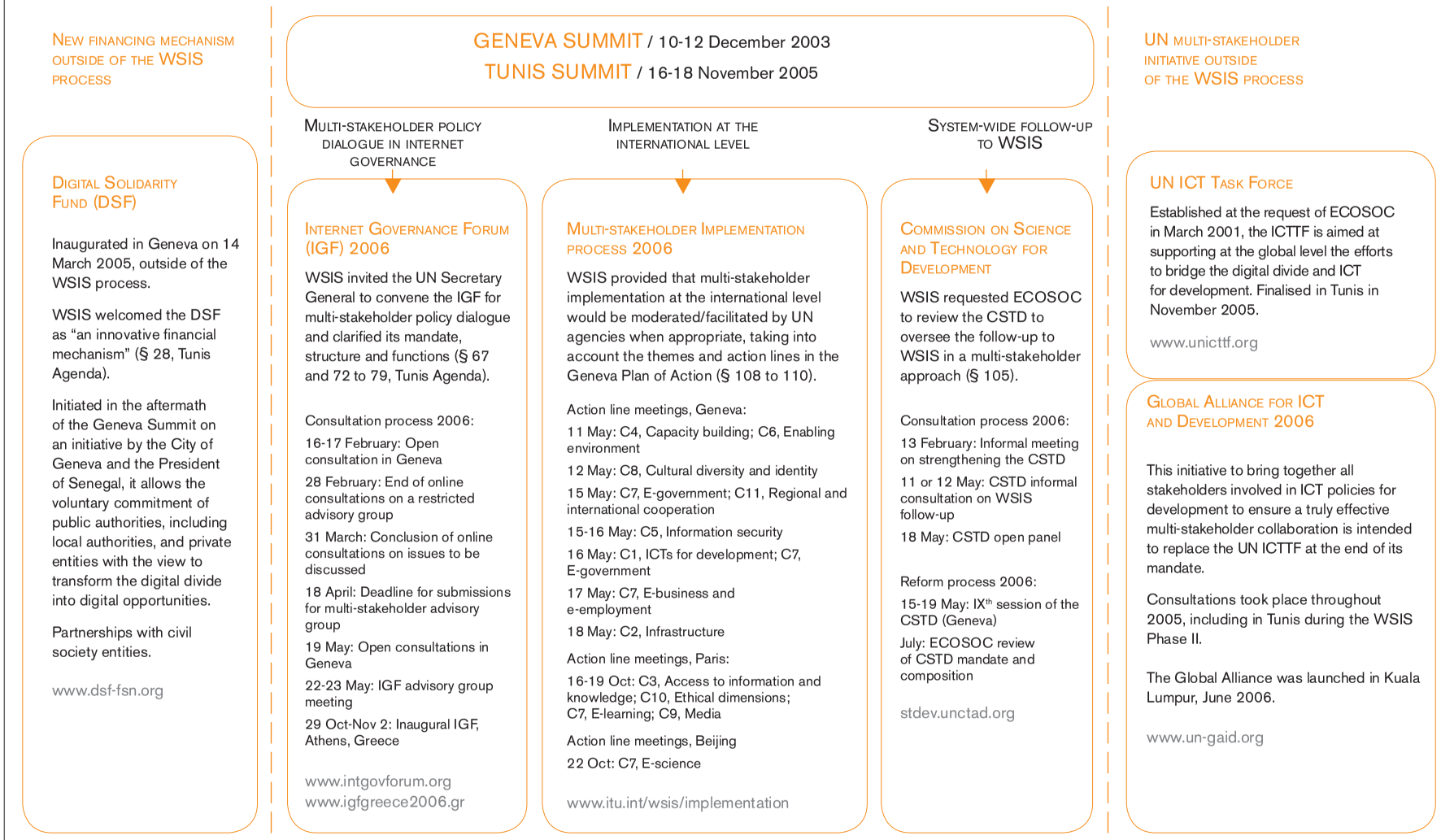
Figure 29.2 sets out the follow-up arrangements that were agreed by WSIS.[3]

These included three main elements:

- Arrangements for the general oversight of WSIS implementation, including reporting to the UN's central bodies.
- "Action lines" for the development areas covered by the summit texts.

3 Taken from David Souter *Whose Summit? Whose Information Society?* summary booklet www.apc.org/en/node/2576/

Figure 29.2: **Post-WSIS mechanisms**



Source: Philippe Dam at Congo

- Specific arrangements for the internet (the Internet Governance Forum and "enhanced cooperation").

In all of these areas, WSIS follow-up arrangements were expected to follow a consensus in favour of multi-stakeholder participation. This principle was first set out in two sections of the Geneva Declaration, one concerned with the information society in general, the other with the internet:

> We recognize that building an inclusive Information Society requires new forms of solidarity, partnership and cooperation among governments and other stakeholders, i.e. the private sector, civil society and international organizations. Realising that the ambitious goal of this Declaration – bridging the digital divide and ensuring harmonious, fair and equitable development for all – will require strong commitment by all stakeholders, we call for digital solidarity, both at national and international levels.[4]

> The international management of the Internet should be multilateral, transparent and democratic, with the full involvement of governments, the private sector, civil society and international organisations. It should ensure an equitable distribution of resources, facilitate access for all and ensure a stable and secure functioning of the Internet, taking into account multilingualism.[5]

The multi-stakeholder principle gathered support following experience in the Working Group on Internet Governance, and was then incorporated in the final texts establishing both the IGF and the action lines relating to different parts of the Geneva Plan of Action. The Tunis Agenda, for example, included the following phrase regarding multi-stakeholder participation in internet governance: "[T]he management of the Internet encompasses both technical and public policy issues and should involve all stakeholders and relevant intergovernmental and international organisations."

It also summarised the roles of different stakeholders as follows:

- Policy authority for Internet-related public policy issues is the sovereign right of States. They have rights and responsibilities for international Internet-related public policy issues.
- The private sector has had, and should continue to have, an important role in the development of the Internet, both in the technical and economic fields.
- Civil society has also played an important role on Internet matters, especially at community level, and should continue to play such a role.
- Intergovernmental organizations have had, and should continue to have, a facilitating role in the coordination of Internet-related public policy issues.
- International organizations have also had and should continue to have an important role in the development of Internet-related technical standards and relevant policies.[6]

4 Geneva Declaration of Principles, Section A, Article 17

5 Geneva Declaration of Principles, para. 48; this text is reiterated in the Tunis Agenda for the Information Society, para. 29

6 Tunis Agenda for the Information Society, para. 35

The "action lines" set up following WSIS have achieved little to date. They have no independent resources and few WSIS participants chose to take part in the first three annual meetings of "action lines" held in May 2006, 2007 and 2008. In practice, discussions about the role of ICTs in development have moved on from the WSIS texts, and work in these areas is guided by new thinking and work which is taking place in other international agencies.

The Internet Governance Forum held its first three meetings in Athens (2006), Rio de Janeiro (2007) and Hyderabad (2008), and further meetings were then scheduled for 2009 and 2010, during which period a review of the Forum's future usefulness would be undertaken by the UN Secretary-General. The first three sessions of the Forum were well attended and generally considered positive and useful, although the Forum has not yet made substantial contributions to the way in which other internet governance bodies do their work. There has been little or no movement on "enhanced cooperation", the compromise adopted to cover differences of view about the relationships between governments, established internet governance bodies, and other actors. These issues are discussed further in Chapter 20.

Summary

WSIS was intended to raise the profile of ICTs, particularly in relation to social and economic development, and to establish a framework for international cooperation on the information society. Viewed from this perspective, most participants would say that it had some success but also considerable limitations.

Most participants from developing countries, for example, would agree that WSIS did a lot to raise the profile of ICT and development issues within their own governments. Civil society organisations, similarly, gained a good deal from the experience of networking within WSIS – both in putting forward civil society perspectives and in increasing their understanding of each others' work. Above all, the WSIS outcome documents gave strong support to the principle of multi-stakeholder participation in ICT decision making, a principle that has been maintained in the IGF and has led to some rethinking of how civil society input can be introduced into the ITU.

However, the WSIS final texts have not been as influential as those of other summits (such as the Rio environment summit). Few mainstream development specialists attended WSIS: most participants came from the traditional telecommunications sector, and the development texts that they agreed reflected this rather than development ideas. The action plan meetings held since 2005 to implement them have not led to any significant new activity. In time, the IGF may be seen as the most important legacy of WSIS. Otherwise, the summit seems likely to be remembered as an important event in the development of an information society, though one whose importance lies more in the fact of its existence than in its formal outcomes. ■

Section 7

ICTs, rights and society

Chapter 30
ICTs AND GENDER

Lead author ***Heike Jensen***

This chapter provides an overview of significant ICT issues from a gender equality perspective. It builds on the five broad approaches to the role of ICTs within development outlined in Chapter 24, which are:

- ICTs as contributors to macroeconomic growth
- ICTs as a productive sector in their own right
- ICTs as cross-cutting instruments of development
- ICTs as enabling instruments for initiatives and applications
- ICTs as tools for empowerment and voice.

The meaning of "gender"

The following paragraphs provide a brief introduction to the term gender and its significance in policy making.

The term "gender", as used here, refers to the social and cultural meanings attached to sexual difference. Sexual difference in many societies is understood as a dichotomy, embodied in girls and boys, women and men. "Gender" is about the relationships between the sexes. These relationships, and the cultural meanings and prescriptions for each gender group, are seen in most gender analyses as being primarily caused by society rather than biology, because there is tremendous variation in the values attached to being a woman or man in different epochs, cultures, classes and social groups. Gender thus intersects with many other systems of social differentiation, among them race, age, and geographical location; and its meaning varies significantly between these and over time. This effect can be referred to as "intersectionality".

The term "gender" takes on a political meaning when it is used to explore power relationships between gender groups. In many societies, the gender dichotomy has been not only complementary but also hierarchical, usually privileging men over women. The resulting dominance, which has been inherited from generation to generation (and constantly renegotiated), is referred to as "patriarchy". It is not only observable in interpersonal relations, but also in social institutions and discourse.

Since ICTs – directly or indirectly – have diverse impacts on all aspects of people's lives, they have had diverse impacts on gender relations. These impacts have been uneven, due to the intersectionality of gender just described. They have created opportunities for some groups of women and men (often those with existing social advantages), while posing challenges for other groups of women and men (often those less privileged). The inherited prevalence of patriarchal structures has commonly led to a gender digital divide that disadvantages many girls and women in comparison with boys and men within the same societies: a divide that is comparable with those in other areas of social, cultural and economic life (see Chapter 6). If ICTs are to exert a balancing function between genders, therefore, it is clear that particular public policies will be required to achieve this. The process of examining what those policies might entail, and how and by whom they might be adopted and implemented, has only just begun.

One central tool for addressing issues of gender equality in this context is that of "gender mainstreaming". This approach was supported by the Fourth World Conference on Women, held in Beijing in 1995, and has subsequently been adopted by UN agencies, regional and national bodies. Gender mainstreaming, to quote from the definition agreed by the UN Economic and Social Council (ECOSOC Agreed Conclusions 1997/2):

> …is a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres so that women and men benefit equally and inequality is not perpetuated. The ultimate goal is to achieve gender equality.

Gender mainstreaming as a tool does not dictate any overall strategies of how gender equality can be achieved, and it can be used in diverse institutional and policy contexts. There is no agreement among gender equality advocates about the kind of institutions and features of society that should be adapted or established through gender mainstreaming. In discussions about this, the "liberal" feminist approach usually calls for the same rights and opportunities for women and men to be established within existing institutions and societies, while a more "utopian" feminist approach calls for transformative changes in the nature of society and social and economic relations. Both approaches can be found within the development discourse.

The following sections of this chapter now illustrate some of the policy challenges that arise from gender equality and gender mainstreaming in relation to the five different areas of ICT policy described in Chapter

24. They do not attempt to do this comprehensively but by considering specific dimensions of the challenges concerned.

ICTs as contributors to macroeconomic growth

An important issue in considering macroeconomics from a gender perspective is that macroeconomic analysis does not adequately consider much of the work that women provide in societies all over the world, because this work is not financially remunerated and/or is unquantified. This typically includes subsistence farming, work in the informal economy and work from home, as well as reproductive and care work within families and communities. Conventional indicators for economic growth, such as gross domestic product, do not include these kinds of work, and so do not take full account of the social and economic contribution made by women. Gender analysis also challenges the assumption, which has been made at various stages in development thinking, that all social groups necessarily benefit from economic growth.

A number of approaches have sought to integrate women more deeply into the development process since the 1970s. Early "women in development" (WID) approaches, which targeted women more or less as a biological group, have been succeeded since the mid-1990s by the "gender and development" (GAD) approach.[1] In line with the definition of gender and of gender mainstreaming given in the previous section, GAD seeks to understand gender as relational and to open up paths to development that empower women as well as men. However, since most of the special measures that have been devised in the wake of such gender analyses have still focused exclusively on girls and women, one recent discussion has tackled the issue of how useful a "men and development" approach would be to impact gender relations from another angle.[2]

Tools such as gender mainstreaming, and strategies such as special measures for women or men, can be used within any political, economic or social justice framework. Among gender specialists, there has been a good deal of debate in this context about the liberalisation agenda within what is known as the Washington Consensus.

At the time of writing (early 2008), the most comprehensive recent gender assessments were those published during the tenth-year review of the Beijing women's conference in 2005.[3] These suggested that, while there are some areas in which groups of women have benefited from the economic restructuring associated with the Washington Consensus, other developments have impacted negatively on many groups of women and also some groups of men. Some have argued that "neoliberalism" has generally augmented imbalances of economic power, both within families and within societies, and has hence also increased gender inequality. However, this view is contested.

The significance and roles of ICTs for macroeconomic development have received varying amounts of attention in discussion of gender and the economy. The uneven spread of ICTs across the globe has introduced significant changes in the types of work available for women and men, how these are distributed regionally, and how the labour market is structured regionally as well as internationally. This has contributed to changes in the worldwide division of labour, in which some (often more labour-intensive) links in the production and service chain have been outsourced from the global North to the global South. While these work-related changes are becoming better understood, more work is needed to understand the implications of digitalisation and globalisation on financial markets and the management of resources such as intellectual property. The more we understand these issues, the better placed we will be to address questions about the relationship between ICT investment and use and macroeconomic outcomes, about how these relate to one another, and about how they impact on gender roles and relations.

ICTs as a productive sector in their own right

A good deal of gender-sensitive analysis focuses on the jobs that have been created as a result of the growth in ICTs, most notably in the production sectors of the ICT hardware and software industries and in the service sectors of data processing and telework. These sectors are particularly interesting for gender specialists because they provide current and well-documented examples of the nature of occupational stereotyping of gender roles and of changes that may be occurring within these.

Gender activists argue that gender stereotyping – for example, defining specific jobs as "naturally" female – generally means in practice that women's jobs are devalued as "unskilled". In particular, it is suggested that in the early days of computing in the global North, many

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1 See for example Caroline Moser "Mainstreaming Gender in International Organizations" (draft paper for the 28th session of the Enquete-Commission of the German Bundestag "Globalization of the World Economy – Challenges and Answers", 18 February 2002) and *Gender Planning and Development: Theory, Practice and Training* (New York/London: Routledge, 1993)

2 A useful introduction is Alan Greig, Michael Kimmel and James Lang *Men, Masculinities and Development: Broadening our Work Towards Gender Equality* (UNDP, 2000). See also Frances Cleaver, ed. *Masculinities Matter! Men, Gender and Development* (New York: Zed Books, 2002)

3 Most centrally, see United Nations Research Institute for Social Development *Gender Equality: Striving for Justice in an Unequal World* (Paris: UNRISD, 2005). See also Women's Environment and Development Organization *Beijing Betrayed: Women Worldwide Report that Governments Have Failed to Turn the Platform into Action* (New York: WEDO, 2005)

women were involved in programming work when this activity was seen as "administrative" and "therefore" female, rather than "technological" and "therefore" male. At that stage, it is argued, programming work did not have "male" connotations, and so did not accrue the prestige and money-earning potential that it holds today.[4] More recently, however, the higher levels of programming work have tended to be considered "masculine", and have been commonly associated with a corporate culture of long work hours and "total commitment" that cannot easily be reconciled with family and child-rearing responsibilities. This culture appears to be widespread in both proprietary and FOSS (free and open source software) environments.

Gender activists have also argued that the association of programming and technology with men has had a negative effect on women's inclination and opportunities to train, study and work in the ICT sector, or to develop their own ICT businesses. There is some evidence, both in the global North and in the former Soviet Bloc, of reductions in the proportion of female students in ICT and related technology fields. This evidence suggests that women are found less often as researchers, advisors and decision makers in these fields. Similarly, where entrepreneurship is concerned, there is evidence that gender imbalances such as those in wealth, property and access to loan and venture capital have diminished women's opportunities to develop and manage larger ICT businesses.

The nature of employment in ICT and ICT-enabled sectors is changing rapidly as a result both of new technological opportunities and of the globalisation of some labour markets. The resulting labour markets are not stable and it is difficult to draw firm conclusions about how they currently operate or how they are likely to evolve in future. In particular, some jobs which have low status in industrial countries (such as call centre work) have much higher status in some developing countries – resulting in their having relatively high wage levels for the countries concerned and much lower levels of personnel turnover. The nature of employment in the call centre and outsourcing sectors clearly varies substantially from country to country, and needs to be assessed in relation to the general labour market (opportunities, pay levels, working conditions) within the country concerned.

However, gender analysts who have looked at occupational patterns worldwide have suggested that ICT and ICT-enabled sectors show patterns of segregation into predominantly male and female occupations similar to those in other sectors, with women's jobs often being seen as inferior to those of men. In some countries, for example, call centres and other business process outsourcing ventures employ relatively high numbers of women, as has previously been the case with repetitive manufacturing processes (such as assembly line and low-grade technical occupations in the production of electronics and computer hardware). Some analyses of women's work in these environments, particularly in lower-level call centres (which are based around cold-call marketing rather than customer support) suggest that many of the jobs within them are characterised by relatively low pay, low appraisal and repetitiveness of tasks, and have poor opportunities for career progression. Employers in such firms may see women's employment as secondary to their unpaid care obligations, and therefore only temporary. However, in some countries such as Brazil, India and Malaysia, there is evidence that significant numbers of women have been promoted as skilled workers in areas like software programming and computer analysis.

ICTs have also created and/or enabled diversification of some jobs within the informal sector. In particular, in many countries, women resell capacity on mobile phones either from kiosks or as street traders. In some cases – most famously the Grameen Phone initiative in Bangladesh (see Chapter 17) – women have been highly represented in this new telecoms market. On the other hand, as well as creating jobs, it should be noted that computerisation and information technology have reduced demand for workers in some areas which have been female-dominated in the past. Examples of occupations in these areas of declining labour demand include bank tellers and telephone operators.

To summarise, there is relatively little evidence at present to suggest that the ICT sector differs significantly from other sectors with regard to gender stereotyping in respect of education, training and work, resulting in limited work benefits and career opportunities for women. Measures to address these issues have relevance across the educational and employment fields, and the ICT sector therefore needs to be considered in that wider perspective.

ICTs as cross-cutting instruments of development

Much hope has been invested by many commentators in recent years in the potential of ICTs to improve delivery of a wide range of public services, usually signalled by terms such as "e-health", "e-education" and "e-government". These are discussed in general terms in Chapter 25. Gender advocates have participated in debates around these issues, for example, during the World Summit on the Information Society, seeking to shape (or "engender") the ways in which discussions about these terms address development objectives. These interventions range from the dissemination of knowledge to meet basic needs, on the one hand, to expert exchanges and training, on the other; from using e-services as supple-

4 See, for instance, the special issue on Women in the Field of Computing, edited by Betty Campbell, of the IEEE's *Annals of the History of Computing* 18, 3 (1996)

ments to existing service delivery to complete ICT-based structural changes within a development sector.

A central issue in the use of ICTs as cross-cutting instruments of development is access. In order for ICTs to have widespread impact in service delivery, they need to be available and accessible to as many people as possible. The gender digital divide puts women at a disadvantage in this respect, particularly in rural and underserved areas where (as a result of male labour migration) they often constitute well over half the adult population. Attention therefore needs to be paid to the gender impact of access strategies if they are to ensure that access becomes available in ways that are inclusive of women and girls. This is an issue both for national access strategy and at a local level.

At a national policy level, gender activists have argued that an overall commitment to social justice and gender equality requires explicit ties between policies meant to enhance "the public good", and affirmative action to address their gender equality implications (based on gender mainstreaming). So, for example, they have argued that network planning, deployment and modernisation need to be informed by social equity considerations, prioritising affordable and easy-to-use technology as well as universal access. This has implications for technological choice – for example, the availability of voice over internet and mobile Wi-Fi services – which need to be considered within the overall technical and regulatory framework.

At a local level, the cost and location of access points is particularly significant for women and girls. For women to make use of public access points, for example, these need to be located in areas where women can go without physical risk, where they are socially welcome and comfortable, which have business hours that accord with women's schedules of paid and unpaid work within local communities, and where positive advice and support are available to them. Gender activists have argued that women's economic ownership or management of access points needs to be encouraged, and that business training programmes and support mechanisms should be developed to promote it.

Another issue raised in this debate concerns the financing of services. Gender activists have suggested that universal service requirements might include gender-based features, such as tariff packages that address the needs of low-income rural women, the provision of accessible telecentres, and service pricing based on marginal costs rather than full cost recovery. Such approaches might be operationalised within the terms of universal access funds.

Finally, gender activists have stressed that women's objectives in using ICTs should not be prejudged, but that the ICTs and ICT training provided at access points, as at other centres of education, should offer diverse opportunities for appropriation and acculturation, so that women and men can make use of ICTs in ways that are most meaningful and useful for them.[5] In this context, gender theorists have employed a distinction between "practical gender needs" associated with established gender roles and the "strategic gender interests" involved in creating more gender-balanced communities.

ICTs as enabling instruments for initiatives and applications

As discussed in earlier chapters of this handbook, ICTs enable many tasks to be undertaken and services provided more efficiently and comprehensively than could otherwise be done. This section of the chapter looks in particular at one aspect of this, statistics and data analysis.

The unprecedented capabilities of ICTs to store, generate, process and communicate data make them particularly suited to the collection and analysis of statistics. ICT's powerful capabilities in the area of data processing can also be used to test policy hypotheses and to simulate the outcomes of different policy trajectories. It is, of course, generally understood today that disaggregation of data, particularly by gender, is crucial to both collection and analysis of data and to their use in policy development.

The value of data depends greatly on the quality and granularity of indicators chosen for collection and analysis. The United Nations Development Programme (UNDP) has introduced two important gender-focused tools for this purpose: the gender-related development index (GDI) and the gender empowerment measure (GEM). Like UNDP's Human Development Index (HDI), the GDI includes life expectancy and health, education and standard of living. However, whereas the HDI ranks countries, the GDI expresses the difference between men and women within individual countries, with low GDI scores representing wide gender gaps. The GEM, meanwhile, looks at women's participation in politics and the economy, and thereby also indicates women's chances to influence political and economic developments within a country. When comparing GDI and GEM, it becomes clear that, even where women have made gains in terms of health and education, similar gains are not generally found in political and economic decision making.

Gender-sensitive statistics are important when planning technology policy and deployment, for reasons discussed to some extent in the previous section of this chapter. In particular, statistics can help dispel some of the myths and assumptions that have accumulated around technology deployment.

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5 Anita Gurumurthy (2008): "Access and Connectivity in Least Developed Countries and Small Islands Developing States in Asia-Pacific" (note submitted to the UN GAID Expert Group on Connectivity and Access for the UN GAID Global Forum, Kuala Lampur, Indonesia, 18-22 May 2008)

There is evidence, for example, from analysis of internet participation, that the gender digital divide is not necessarily correlated with the overall digital divide between communities.[6] The gender digital divide may result from circumstances which are strongly related to infrastructure – for example, if much of the population is gender-segregated because many men live as migrants in cities (with good connectivity) while women remain in rural areas (with poor connectivity). In communities that are not gender-segregated, the gender digital divide is more likely to result from social rather than infrastructural factors.

Some evidence suggests that there is also no necessary correlation between the proportion of female internet users and women's empowerment as measured by the GEM.[7] This could indicate that women do not use ICTs for furthering their strategic gender interests, or it could imply that important barriers to women's equality lie beyond the sphere of ICTs.

These examples illustrate how much remains to be learnt in developing meaningful indicators and research questions for gender/ICT analysis, in interpreting gender-sensitive data, and in accumulating qualitative information as well as quantitative data for interpretative purposes. These tasks are necessary if gender advocates are to build a stronger case for public policy interventions for gender equality and social justice in this area, and considerable further work is required on them.

Finally, it should be noted that, if the results of research are to be used effectively by politicians and (particularly) by citizens, they have to be made available in understandable language and appropriate formats to all concerned stakeholders. As long as there is a digital divide and a gender digital divide, information will need to be made available through traditional media as well as electronically if it is to be genuinely inclusive.

ICTs as tools for empowerment and voice

Gender equality advocates have been pioneers in using ICTs for political networking and strategy development – something in which the APC Women's Networking Support Programme has played an important part since the early 1990s.

Gender advocates have been concerned with a number of issues in the context of empowerment and voice, using the media themselves to challenge stereotyping of girls and women and to address a wide range of issues, from pornography to e-democracy. The issues concerned have often been hotly debated.

Feminists have historically been divided, for example, over pornography – some seeing it as an aspect of male exploitation of women's sexuality, others as holding potential for women's as well as men's sexual liberation and pleasure. These differences have spilled over into ICT policy discourse. Some gender advocates have argued that ICTs allow women and other groups who do not identify with the pornography industry's perception of sexuality to create their own pornography, because the costs are much lower than those incurred by traditional film production. However, to date, pornographic content on the internet has predominantly followed the established model in the industry. This debate overlaps with that on censorship, over whose merits and dangers gender equality advocates have also been divided.

The potential of "e-democracy" is just beginning to be explored. Some argue that it offers opportunities to engage citizens further in democratic processes and in decision making that affects their lives. In particular, it is suggested that ICTs can facilitate administrative and political interactions between citizens and authorities, and provide tools to create more transparency and accountability. However, given the extent of the digital divides within current societies, including gender digital divides, this potential may not reach disadvantaged groups who would be most in need of it.

The international governance regime for ICTs, including both traditionally structured forums such as the ITU and new forums such as those associated with the internet, has also come under scrutiny. Gender advocates have argued that global governance forums – both those which are primarily intergovernmental and those which are heavily dependent on private sector or technocratic collaboration or leadership – have paid little attention to gender equality considerations. They have raised questions about their ability to address issues of empowerment and voice for women and other groups who are not adequately represented in their management and consideration of future plans and policy. Issues concerning international ICT governance institutions are discussed further in Chapter 28.

Gender and ICT policy development: A final note

Relatively few gender specialists have so far studied the communications policy sector in depth. Those that have done so have generally stressed the importance of access in addressing gender inequality within development, in particular emphasising goals of universal access and free or inexpensive service for underprivileged groups, rather than focusing on the high-end solutions that have characterised much ICD strategic planning.

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6 Sophia Huyer et al. *From the Digital Divide to Digital Opportunities: Women in the Information Society* (Montréal: Orbicom, 2005), 12

7 Nancy Hafkin "Some thoughts on gender and telecommunications/ICT statistics and indicators" (paper prepared for the Second Meeting of the Working Group on Gender Issues of the Telecommunication Development Bureau of ITU, 7-9 July 2003) www.itu.int/ITU-D/pdf/5196-007-en.pdf

In their writings, both Sonia Jorge and Nancy Hafkin[8] have gone further than this by stressing the potential for associating regulatory goals of universal access and affordable service with a mixture of more or less interlocking strategies and tools for gender equality, most notably (a) gender mainstreaming, (b) affirmative action to increase the number of female ICT specialists and policy decision makers, (c) special measures in education and training for girls and women and (d) measures to overcome discrimination against women in the economy. Their association of regulatory and social goals implies that regulation should be rooted in public policy objectives which address gender-based discrimination as a form of multifaceted "market failure".

Major policy issues that have been discussed in this context include network planning, deployment and modernisation; access point planning; universal service obligations; licensing policies and licence award criteria. Examples of policies that have been proposed include the improvement of gender disaggregation in sectoral data collation and analysis; increased training opportunities in telecommunications policy for women (as well as men), perhaps with subsidies for women's participation; and efforts to address workplace discrimination against women.

A similar combination of gender mainstreaming and affirmative action strategies has characterised gender advocacy arguments to change the landscape of technological research and development. To encourage girls and women to become scientists and innovators, these suggest, technology programmes need to become gender-sensitive (and possibly include positive discrimination quotas). In addition, it has been suggested that women need to be further promoted through scholarships, grant programmes, subsidies for their research efforts and their election to posts that represent the technological research and development community.

Lastly, decision making in the ICT sector – both in governments and business – is at present dominated by men. As Sonia Jorge puts it:

> Men still hold most of the management and control positions in telecommunication companies and regulatory or policy making bodies; regulatory decisions are made without any impact analysis; service licenses are attributed to companies without equal opportunity policies and controlled mostly by men.[9]

Gender activitists argue that policy analysis would be improved if more female engineers and other specialists were included in decision making, and if more effort were made to ensure that women's views were sought and articulated during consultation processes. Among the approaches which have been put forward in this context are changes to the composition, work conditions and structure of policy-making and implementation processes in communications ministries and regulatory agencies. Suggestions include the establishment of gender units inside regulatory agencies, and joint analysis with women's ministries (where these are established). ■

8 See Sonia N. Jorge *Gender Perspectives in Telecommunications Policy: A Curriculum Proposal* (Geneva: ITU, 2000) www.itu.int/ITU-D/gender/projects/GenderCurriculum.pdf See also Nancy Hafkin "Gender Issues in ICT Policy in Developing Countries: An Overview" (paper presented at the UN Division for the Advancement of Women Expert Group Meeting on Information and Communication Technologies and Their Impact On and Use as an Instrument for the Advancement and Empowerment of Women, Seoul, Republic of Korea, 11-14 November 2002)

9 Sonia N. Jorge "Gender-Aware Guidelines for Policy-making and Regulatory Agencies" (paper prepared for the Task Force on Gender Issues of the Telecommunication Development Bureau of ITU, 2001) www.itu.int/ITU-D/gender/pdf/GenderAwarenessGuidelines.pdf

Chapter 31
PRIVACY AND SECURITY

Lead author ***Gus Hosein***

Introduction

Issues surrounding privacy and security are among the most important debates of current times. They are particularly important in the ICT policy context because of the changes which new technologies have made and continue to make in the information which is available about citizens and the ways in which it can be used. Public concern and public debate about privacy and security are prominent in the media and in private discussion; and views about them are highly variable.

Privacy, in particular, as a right, is difficult to define. While many other rights have been accepted as inviolable, there is a rich and diverse contest of principle over how societies must negotiate the meaning of privacy. Nearly everyone sees both advantages and disadvantages in privacy, from their personal point of view and that of society as a whole – balancing the desire to restrict information about themselves in some contexts with the desire to share information about themselves in others; and balancing the desire to protect their own privacy with the desire to protect themselves from criminality and insecurity by curtailing the privacy of all. Issues concerning privacy are fundamental to how people behave and interact with their communities, societies, and political systems.

In recent years the nature of privacy has undergone significant changes:

- Some of these result from technological change, for example, through the development of advanced systems of communications that permit continual tracking of behaviour, and through the adoption of "always available" communications habits such as the use of mobile phones and online broadband.
- Other changes have resulted from our changing behaviour as citizens and as consumers. People now disclose much more information in order to exchange money and goods with companies than in the past, while people relate to others much more openly through media such as social networking sites, or advertise their thoughts and ideas much more openly on blogs and websites.
- The most easily understood and clearly articulated source of changes in privacy has come from the changing security environment. This includes new threats to individuals from online fraud and stalking; threats to organisations through hacking and denial of service attacks; threats to communities from crime, often of an international nature; and threats to national security from other countries and terrorist organisations. These have added new dimensions to the types of threat perceived within societies – which already experience very variable levels of security and threat.

Perceptions of privacy and security

The question is sometimes asked: "Which is more important – privacy or security?" In practice, most people are concerned about both. It is actually quite difficult to find people who believe firmly that security, *per se*, is more important than privacy or, vice versa, that privacy is more important than security. The relationship between the two is far more complicated and is often negotiated only on a case-by-case basis. While most people approve of fingerprinting convicted criminals, for example, they are more divided about whether a government should fingerprint all citizens or foreign residents.

Polling data on privacy issues produce mixed results. On the one hand, polls sometimes show individuals demanding high levels of privacy, while in their daily lives they willingly give personal information to companies in exchange for discounts and free prizes. Other polls suggest that individuals are in fact willing to give up much of their privacy in principle in exchange for security, particularly national or cyber security – though support for intrusive measures often declines as the personal implications are fleshed out in detail.

This ambivalence around privacy and security does not fit neatly into stereotypical political debates between "left" and "right" – not least because those with strong views across the political spectrum are themselves divided.

For example, those who are ideologically concerned with social equality and justice may think it appropriate to override individual concerns for privacy to ensure that governments know enough about people's health, education and social welfare to reduce social exclusion, protect the environment, etc. This approach can be seen, for instance, in widespread advocacy of e-government as a means of improving service delivery. At the same time, those concerned with social justice are also aware

of the threats to citizens that have resulted from data management in totalitarian regimes (of "right" and "left"), which have used surveillance powers to limit the political participation of social movements such as the civil rights movement and organisations like trade unions.

Left-leaning social activists and libertarians on the political right alike are wary of granting governments and private companies more information than they absolutely need about individual citizens and consumers.

For many citizens and politicians, the need to enhance public and national security is the pre-eminent concern today, emphasising issues such as the supervision of national borders and the protection of citizens against criminality, corruption and anti-social behaviour. Surveillance policies are therefore devised to ensure that the police have visual surveillance capacity and powers; that security services may intercept emails and other communications, or monitor website usage, to combat perceived threats; that governments may fingerprint, profile, and track arrested citizens or visitors to the country to ensure against abuses of national laws, etc. Measures such as these have more support within societies where people feel highly threatened than in societies with strong traditions of democratic pluralism and participation, but most people in most societies would agree that there is a need to balance two priorities – privacy and security – both of which they value.

Foundations of privacy

Privacy laws and protections have often been developed in response to specific circumstances rather than on points of general principle. For example, laws restricting communications surveillance often emerge following experience of abuse of surveillance by authorities; while laws increasing oversight of financial transactions have been tightened because of international money laundering. In many cases, therefore, a piecemeal approach to privacy has emerged over time as a result of legislation or judicial precedent.

At the same time, however, privacy has come to be considered – formally and informally – as a fundamental human right.

The constitutional frameworks of many countries formally protect privacy, modelling their provisions on a number of recent international conventions, which themselves resulted from the experience of totalitarianism and conflict in the 20th century. The Universal Declaration of Human Rights of 1948 declares, for example, in Article 12, that no one should be subject to arbitrary interference with their privacy, family, home or correspondence. This right was later given greater substance in Article 17 of the International Covenant on Civil and Political Rights. Article 8 of the European Convention on Human Rights requires the governments of the 47 member states of the Council of Europe to protect privacy, and similar instruments have been agreed in other regions.

Many different instruments of privacy rights have emerged at a national level. For example:

- The German constitutional court ruled in the 1980s that the protection of human dignity, its most basic constitutional protection, required the government to protect the privacy of its citizens.
- The Irish Supreme Court has interpreted the right of privacy as inherent in the "Christian" and "democratic" character of the Irish state.
- In the United States, the right to privacy has emerged from within constitutional rights such as those to freedom of expression and to the inviolability of personal property (including correspondence).
- The Indian and Japanese Supreme Courts have considered rights to privacy to be implicit in the right to liberty.
- The Norwegian authorities consider privacy part of the general legal protection of "personality".
- In New Zealand, the right to privacy is inferred from the right to protection from search and seizure by the state.
- In Singapore it is protected under the "duty of confidence".

These varying legal protections for privacy are not inviolable, however. Unlike laws to protect against torture and capital punishment – which, under international law, may never legitimately be contravened – most internationally accepted rights are considered violable under certain circumstances. For instance, immediately after establishing the right to privacy, the European Convention on Human Rights clarifies:

> [T]here shall be no interference by a public authority with the exercise of this right except as in accordance with the law and as necessary in a democratic society in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime, for the protection of health or morals, or for the protection of the rights and freedoms of others.

The complex balancing of privacy protection in the face of societal needs is articulated through language such as this in national and international rights regimes. Derogations from privacy are, in effect, always permitted to combat crime and disorder, and to protect national security. However, rights regimes in democratic states generally stipulate that this must be done with caution. Any interference with privacy must be "reasonable" according to United States or Canadian law, for example, or "proportionate" and in accordance with law according to European rules; and it should protect against arbitrary and excessive invasions of privacy.

Continually, with the development of new laws and technologies, governments and citizens are reinterpreting and redefining their understanding of terms such as "national security", "reasonable" and "proportionate" in this context. These terms are not fixed in stone, just as the dynamic of privacy and security – the balance of opinion about where the balance of practice should lie between them – remains in flux. Attitudes, legislation and practice are likely to change as societies feel more or less threatened by internal and external security threats, from terrorism, organised crime, political violence and/or social disorder.

Privacy and technology

The nature of debates about privacy has been changing as a result of new technology. The potential for new technology to increase the surveillance power of the state has often been seen as a threat to civil liberty – for example, in literature such as George Orwell's anti-totalitarian novel *1984*. In fact, throughout history, privacy concerns have emerged with nearly every development of potential new surveillance techniques. The widely used definition of privacy as the right "to be let alone" emerged with the development, not of computers and the internet, but of the camera and its use by tabloid media. Later concerns emerged as governments began listening to private communications using the telecommunications network.

However, privacy concerns internationally have grown most rapidly since the near-exponential growth of computing capabilities began in the 1960s. The development of advanced databases and data analysis techniques such as data mining (extracting patterns of behaviour from available data) greatly reduces the ability of individuals to control the use of information about them by governments, businesses and (potentially) criminal organisations. These techniques, facilitated by increased use of electronic payments, mobile telephony and the internet, mean that very many of the actions that everyone takes in their daily lives in industrial societies today result in a transaction log which is held by financial companies, the telecommunications industry, government service delivery departments, tax authorities and other agencies. The relationships between citizen and state, and between consumer and business, are being markedly changed by technologies that track behaviour.

Technology, in this context, can enhance both privacy and security. All the systems mentioned in the previous paragraph can make use of advanced technologies to protect as well as threaten privacy, and these are likely to become more advanced as we continue to move into more technologically driven societies. For example, people can now secure their commercial transactions and communications using cryptography (their own or that of the businesses with which they interact) in ways that were previously unimaginable, giving powers of privacy protection to the individual that were once reserved only to the state. It is possible to devise means of transacting with companies and governments in ways that minimise rather than maximise the flow of sensitive information – increasing citizen and consumer confidence, while still reducing the risk of security breaches and fraud. Technology here is changing the balance of information and privacy, but not only in one direction. Changes will continue as technology and patterns of technology use continue to change themselves.

Information privacy and data protection

Constitutional protections such as those described above are statements of principle. Specific rules are required to translate them into arrangements that protect privacy in the context of actual information flows and data management around the world. The legal systems involved are commonly called "data protection regimes", and are primarily intended to protect individual privacy against abuse by either public agencies or private companies.

Data protection laws of varying standards are in place today in most industrial countries. The first modern data protection law was enacted in the *Land* (region) of Hesse in Germany in 1970. This was followed by national laws in Sweden (1973), Germany (1977), and France (1978).

Data protection rules hinge on what are known as "fair information practices". These were developed in the late 1960s in response to the risk of secret (government or business) databases being developed which could hold vast amounts of information about individuals without protections governing their accuracy or use. In simple terms, these "fair information practices" impose requirements on "controllers" (collectors of personal information) so that:

- Personal data should be collected only for specified, explicit and legitimate purposes.
- The persons whose data are collected should be informed about these purposes and the identity of the controller.
- Any person concerned should have a right of access to her/his data and the opportunity to change or delete data which are incorrect.
- Appropriate remedies should be available to put things right, including compensation through competent national courts where this is appropriate.

In essence, therefore, data should be collected with informed consent of the individual concerned. They should be processed fairly and lawfully, for limited purposes and limited use, and retained for a limited period of time. They must be accurate, kept secure, and not transferred to other jurisdictions (e.g. overseas) without adequate

protection. Individuals should be able to know what information is held on them, and to correct that information when it is inaccurate.

Standards based on these "fair information practices" are required within a number of international legal documents including the European Union's 1995 directive on data protection, the Organisation for Economic Co-operation and Development's (OECD's) Guidelines of 1980 and the Council of Europe's Convention of 1981. These standards require that data:

- Must be processed fairly and lawfully.
- Must be collected for explicit and legitimate purposes and used accordingly.
- Must be relevant and not excessive in relation to the purpose for which they are processed.
- Must be accurate and where necessary, kept up to date.
- Must be managed by data controllers who are required to provide reasonable measures for data subjects to rectify, erase or block incorrect data about them.
- Must be retained only for so long as necessary wherever individuals are identified.

Tighter regulations tend to apply to what are described as "sensitive data". In the EU Directive of 1995, this type of information is defined as "data relating to racial or ethnic origin, political opinions, religious or philosophical beliefs, trade union membership, data concerning health or sexual preference." In principle, under the EU directive, such data cannot be processed except under specific circumstances. These include the data subject's explicit consent to process sensitive data, the processing of data mandated by employment law, and circumstances where it may be impossible for the data subject to express consent (e.g. a blood test for the unconscious victim of an accident).

In addition, however, it should be noted that the implementation of these protections varies as a result of the dynamic or balance between privacy and security. Member states of the EU may exempt themselves from restrictions against processing sensitive personal data for reasons of substantial public interest. Such exceptions are permitted on grounds of national security, defence, the detection of crime and the enforcement of criminal law, or to protect the rights and freedoms of data subjects and others.

Data protection laws are also not universal. Variations between data protection requirements in Europe and the United States have caused problems, for example, in developing international regimes for electronic commerce. Within countries, data protection requires complicated regimes of law with powerful regulators that have the power to maintain data protection principles in changing circumstances. There has been criticism of the United Kingdom and Australian data protection regulators because they have been thought too weak to achieve their goals. There has also been reluctance to pass data protection legislation in the United States for fear of over-regulating the private sector and reducing economic choice. Many governments in Asia have considered data protection legislation but not yet brought it into effective implementation.

Government and the citizen: The challenge of security

The scope and range of security challenges to privacy have grown in recent years. There are many security reasons why public agencies such as the police seek to gain access to personal information, and to search people's homes, files, and computers. Many such reasons are regarded by the majority of people as necessary and legitimate to protect them and their personal rights and freedoms.

The increased fear of terrorism has raised national security concerns in many countries, but increased use of technology has also affected long-established challenges to authority and security, such as organised crime.

Many forms of illegal activity now involve technology in one form or another in industrial societies. Cyber crimes, including large-scale fraud, can be perpetrated against computer systems around the world without criminals leaving their offices in whatever country they see as a safe haven. The globalisation of child pornography makes it increasingly difficult for national police to protect children or to identify and prosecute offenders. From a policing point of view, even street theft and public disorder offences (such as assault) can be solved more easily with the aid of visual surveillance techniques such as closed circuit television (CCTV), while suspects can be identified by reviewing mobile phone usage in an area at the time of any incident.

Over the years governments and police authorities have established surveillance systems to combat threats to security and order. Now that they are dealing with new and differing forms of criminal activities, including a greater level of international crime, many governments have argued that they need new powers and new techniques to conduct surveillance, and that they need the capacity to act with speed and stealth. The following paragraphs list some of the most pressing surveillance issues arising from these circumstances:

Communications surveillance: Governments and police authorities are increasingly intercepting communications, and requiring that communications service providers enable and manage surveillance processes for them (for example, by maintaining data files on their customers' traffic). There is also evidence of an increase in

unsupervised and general, rather than incident-specific, surveillance around the world.

Transactional surveillance: Almost every transaction that is made in industrial countries today – whether it is in the form of a purchase, a phone call, or even a physical movement – leaves a transaction record on some log, in some system, run by some company. This information is valuable to security agencies as well as businesses, and many governments have sought increased access to it in recent years. In a good many countries, the police may now demand transactional information from businesses where an investigation warrant would previously have been required. In some cases, data protection law is changing to accommodate this: laws that previously required companies to delete transaction logs when the data they contain is no longer required are being changed to require companies to retain data for an extended period of time, in case at some point it becomes of interest to the police.

Identification and tracking of individuals: Anonymity used to be the norm in many circumstances. Increasingly, now, governments are extending their capacity to identify and monitor individuals. Biometrics – physical traits such as fingerprints, iris scans, and digital body scans – are beginning to be used in identity cards and passports. Governments are also collecting biometrics of visitors to their countries and storing them with biographic and behavioural information as part of their efforts to prevent terrorist attacks, asylum abuse and identity theft. With technologies like radio-frequency identification chips (RFID, see Chapter 14) and "smart" visual surveillance techniques such as CCTV, individuals may be traced and tracked as they move around buildings, cities, and even countries.

Centralisation of official data: Governments are increasingly seeking to accumulate information about individuals from private as well as official sources, and to consolidate these data in information files that can be shared by different agencies within government. Financial companies are required to introduce checks on new account holders and on major financial transfers and may be required to report to governments any "suspicious activities" they may detect amongst their clients, in order to combat money laundering and funding of criminal and terrorist activity. Travel companies are increasingly being required to report the personal details of travellers as part of efforts to prevent the movement of terrorists and major criminals across national borders. The personal tax, health and other information of millions of individuals is being centralised within government databases where they may be processed, or "data mined", either to provide better services to citizens (see Chapter 26 on e-government) or to identify trends, suspicious individuals, and potential threats.

New security initiatives are increasingly being established through intergovernmental agreements. Such agreements include the Council of Europe Cybercrime Convention, the International Civil Aviation Organisation's standards on biometric travel documentation, bilateral agreements between the United States and other countries concerning the disclosure of travel information on flights to the United States, and European Union rules requiring internet service providers to retain email logs for up to two years.

As discussed earlier, the views of citizens about these developments are often mixed. Most citizens welcome measures which are designed to increase their personal security, protection against fraud, safety on the street and protection against terrorist attack. They are often more hostile towards measures which they see as intruding into their own privacy. Much here depends on the circumstances of individual countries. So, for example, in the United Kingdom, the increased use of CCTV to manage transport systems and improve safety on the streets – which is probably more extensive than anywhere else in the world – is welcomed by many people as a contribution to personal safety; while the government's proposal to introduce a national identity card – common in many countries but never previously required in the United Kingdom outside wartime – is opposed by the majority. There has, however, been relatively little public debate in most countries about these trends in the relationship between privacy and security.

The company and the consumer: Commercial challenges

Privacy also poses questions outside the security policy domain, particularly where relationships between consumers and private sector businesses are concerned.

The private sector is often critical of new regulatory regimes, including privacy regulation, because of the administrative burdens and restrictions on commercial freedom which they entail. Data protection laws create onerous burdens for companies to follow and sometimes punitive fines for not adhering to complex rules. While companies are not necessarily opposed to privacy requirements – many companies actively support privacy protections – many would prefer the market rather than government regulation to take the lead.

The exchange of personal information is now integral to transactions in industrial countries which can be regarded as information economies. Many companies, for example, keep detailed records of customer behaviour – often promoting branded storecards for this purpose – and mine the resulting data in order to provide a more personal service, drawing individual customers' attention to products and offers that seem particularly likely to attract them. As with government services, many consumers find this helpful while also feeling some concern about the level of intrusion involved.

Internet advertising is the source of much of the money that funds the development of the online world, from faster internet connection to free access to news sites and the provision of free services. Companies like Google, Microsoft and Yahoo! are fighting an intense battle to earn the billions of dollars available from an online marketplace that thrives on the processing of personal information. If these businesses can track the behaviour of individuals online, and make use of that information to target advertising to individuals, then they are able to offer a much more attractive and profitable service to those who advertise through them.

The restriction of personal information flows is seen by some companies as a barrier to economic activity. The more that companies know about individual customers, on the one hand, the better the service they argue that they can provide to them. At the same time, many companies are finding that they need to build privacy protections into their systems in order to gain consumer confidence. They are responding to this challenge by devising tracking and profiling methods that do not process or retain personal information.

Consumers are increasingly aware of identity theft and other types of fraud – including online fraud – which threaten their security. Reports of the loss (by governments and businesses) of computer files including banking details, personal identifiers and preferences have led citizens/customers in many countries to demand increased protection for their data. In this sense, in particular, consumer security and privacy are closely tied together.

Conclusion

At the heart of the debate about privacy and security lies a desire, on the part of many people, for what might be described as "perfect security". This is not, in truth, achievable. No system can offer 100% guarantees that its security will not be breached, that lives will not be lost, that fraud will not leave its trail of victims. Policy in this area is largely about the search for a balance between privacy and security that optimises the dual return to citizens: that provides as much security as can be achieved without intolerable intrusion, and that offers as much privacy as possible without unacceptable levels of insecurity. The balance here is likely to vary considerably from place to place and time to time.

Information systems are also imperfect in themselves and, in particular, are prone to human error – for example, through the collection of inaccurate data and through systems failures which make data insecure. Data systems are vulnerable to hacking, on the one hand, but are also vulnerable to errors of judgement by data controllers, such as those in one UK case who sent personal data on millions of child benefit recipients through an insecure delivery network. The public, in practice, usually wants data to be held in forms that enable better service to be provided (whether by governments or companies) but in ways that are highly secure against inaccuracy, abuse and loss.

Terrorism is often cited as a principal reason for emphasising security, and illustrates these complexities. Most people would agree that governments should prevent known terrorists from boarding aeroplanes and, in order to do this, airlines and governments need to compare plane manifests with lists of known terrorists. Any list of terrorists is, however, likely to have many inaccuracies, and the use of such lists, together with the precautionary principle, has led to people being denied flights because they have similar names or backgrounds to those listed.

If we could perfectly identify individuals before they boarded planes, or when they used internet services, then it would be much easier to protect travellers and prevent illegal activities online. But the systems that are available are not capable of perfect identification. This has led to the use of profiling by governments in the hope that the habits of criminals and terrorists can be identified through data mining. However, this is equally fraught with difficulty, not least because of the high levels of error in the data that are mined.

In practice, errors of one kind or another are inherent in data systems, and so the best results that can be achieved from them are approximations. Citizens probably expect those approximations to be more highly accurate than is achievable, while many governments prefer to err on the side of caution, particularly where risks are perceived to be high.

In an information society, therefore, the dynamics between privacy and security are very complex. In the past, some have argued that privacy and security are essentially antithetical: that any increase in security is bought at the price of privacy, and vice versa. Most debates about these issues now are more sophisticated. Increasingly, the experience of security breaches and identity fraud, as well as potential abuses in security investigations, are suggesting that there are important ways in which – for example – personal security may be actually enabled through privacy, or national security sustained by decentralisation rather than centralisation of records. New thinking along these lines may have begun a movement towards a new dynamic of privacy and security, built around the risks and challenges associated with any new technology or form of data management. ■

Chapter 32
CONTENT AND CENSORSHIP

Lead author ***Dmitri Vitaliev***

The practice of censorship dates back thousands of years and has probably existed from the times when religious debate, political discourse and folklore first began. It can be found as early as the Old Testament – "Thou shalt not take the name of the Lord, thy God, in vain" – and in Plato's proposed ideal society in *The Republic,* where officials would prohibit the telling of stories that were deemed detrimental. The term "censor" is derived from the Latin *censere* and *censor*, denoting a Roman magistrate who took censuses and oversaw public morals.[1]

The 20th century abounds with examples of the censorship of literature, art and free expression. Examples include the burning of books in Nazi Germany, the blanket censorship of public opinion and publications in the Soviet Union and apartheid-era South Africa, and legislation such as the (originally 19th century and subsequently much contested) Comstock laws in the United States, which prohibited dissemination of any "...article of an immoral nature, or any drug or medicine, or any article whatever for the prevention of conception or procuring of abortion..."[2] These and other examples illustrate the significance of censorship in more recent as well as earlier times.

The growth of ICTs and the development of an information society have put issues of content and censorship at the forefront of debate about individual rights and the restrictions and limitations associated with them. For some, unrestricted access to information and free expression are critical components of an information society; but many would agree that regulation is needed to set boundaries to what is permissible. Governments and commercial agencies walk a fine line between these two positions, tasked with providing and at the same time filtering content that is at the core of this new society. As a result, policy makers and civil rights advocates today may define the reach and influence of content and censorship for the foreseeable future.

Defining censorship

There is no single definition of censorship that satisfies all criteria. Interpretations of its meaning are often entwined with emotional or ideological positions on freedom, repression and the relationship between the state and the individual.

In the broadest sense of the term, censorship can be described as influence exerted to modify or forbid an original message from being communicated. The word "censorship" is derived from *censor*, originally the title of an official who examined material that was to be published and suppressed parts considered offensive or a threat to security. This definition might be updated today to include restriction of access to content or by users within a particular network or nation-state.

Censorship generally coexists with self-censorship, the choice by authors and content providers voluntarily to exclude material which they believe may offend legal restrictions or social norms (whether of society as a whole or of constituent communities). The phenomenon of self-censorship is elusive and often invisible. It may be the psychological result of living in a society that accepts some forms of censorship, historical influence, pressure to abide by legislation and cultural norms. The growth and prevalence of surveillance in today's ICT infrastructure, as well as the influence of intellectual property and libel legislation, has made it more difficult to assess the effect and presence of self-censorship in modern publications and communication of content.

Narrowing the definition

The process of creating, disseminating or publishing content, and of ensuring that it reaches an audience, is referred to in this chapter as the "information cycle". Censorship is understood in this chapter to refer to the censorship of existing content and/or of the means to distribute it. The channel for communicating content is therefore the point at which censorship occurs.

Censoring the distribution channel can take place at two different points within an information cycle:

- It can occur pre-publication, when the original message is prevented from being disseminated. This includes self-censorship, legislation, and editorial or managerial interference with material to be published or made available to the public.
- It can also occur post-publication, when an audience is prevented from accessing a message or content communicated to it. Today, this includes access to internet websites and online services.

1 Online Etymology Dictionary www.etymonline.com

2 www.enotes.com/major-acts-congress/comstock-act

Censorship can refer to the blocking of an entire subset of content or of some parts of it. It may, for example, be that a book is allowed to be published, once an offending or possibly libellous passage is removed. At other times, an entire article or web domain may be banned or closed to access by citizens of a country. This chapter sometimes refers to the selection of content to be modified or banned as "content filtering", and the restriction of access to an entire subset of content more generally as "censorship". The distinction is necessary when defining and explaining the technology involved with censoring content on the internet.

The lack or denial of access to an entire communications technology or service is a problem in today's information society, but its description as "censorship" is subject to debate. Does the absence of particular transmission media such as internet access, short wave radio frequency or satellite television for an entire state or region constitute censorship or an issue of access rights? The presence of different media formats and information sources is a prime determinant in the availability of diverse content. However, there are a number of reasons why access may not be present – some of which are geographical and technological while others can be attributed to policy decisions. This chapter deals specifically with existing content and communication channels. Issues of universal access are discussed in Chapter 17.

Content censorship is also intertwined with issues of copyright, access to public information, internet governance and policy, broadcasting and communications rights. This chapter does not cover in detail policy and debates described elsewhere in this handbook, but the reader should be aware that discussion around censorship is strongly influenced by these issues. Please refer to Chapter 11 for more information about broadcasting regulations, Chapter 20 for internet governance, and Chapter 33 for intellectual property rights.

A framework for analysing content

The nature of content is made up of a number of distinctive elements, including the originator/author, time of creation, the message itself and its intended audience. One way to classify content when dealing with censorship is to analyse the censor's motivation. Understanding the elements that prompt censorship may help identify its purpose or define the accuracy and appropriateness of legislation permitting its use. If motivation is not explained or provided for in legislation, one may eliminate possible causes to determine the purpose.[3]

The originator and time of creation

Apart from computer-generated data, all content is created by people, either acting as members of a group or acting individually. Content is born in thought and reproduced in speech, through physical action, on paper or through media such as broadcasting and the internet. The originator(s) may be identifiable or anonymous, or they may use pseudonyms or maliciously misleading names.

In the past, the time of creation was often imprecise. Today, when originators/authors use ICTs, the time of creation is usually recorded and assigned to content automatically. Mobile phones, digital video and photography devices, personal computers and digital network devices operate with an internal clock. This is used to keep a log of activity or assign a time stamp to the created content.

Similarly, the majority of ICT devices have a unique identification number. This may be a product code, a part number or an MAC[4] and IP address for internet-connected devices. Content created or sent from these devices is likely to be identifiable back to its source. Governments often rely on these identifiers to assist with fighting crime, as is proposed by the European Union Data Retention Directive of 2006. The directive requires each member state to trace and identify the source and destination of a communication, as well as to identify:

- Its date, time and duration
- The type of communication
- The communication device
- The location of mobile communication equipment.

They are also required to keep these data for a period from six months to two years[5].

The OpenNet Initiative studies trends and technology of internet censorship and content filtering around the world. It has developed a list of agencies and information sources whose identity often causes the motivation for censorship, as follows:

> [A]cademic, blogs, chat and discussion boards, government, government media, international governmental organisations, independent media, individual, international NGOs, labour groups, locally focused NGOs, militant groups, political parties, private businesses, religious groups, regional NGOs.[6]

3 There may, of course, be instances where censorship exists for no apparent purpose and without any regulation affirming or allowing its use.

4 Media access control address.

5 Directive 2006/24/EC of the European Parliament and of the Council of 15 March 2006 eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006L0024:EN:HTML

6 Ronald Deibert, John Palfrey, Rafal Rohozinski and Jonathan Zittrain, eds. *Access Denied: The Practice and Policy of Global Internet Filtering* (Cambridge: MIT Press, 2008)

The message

The primary reason for censorship can be either the type or category of content involved or the purpose of the message contained within the content concerned.

The characteristics of a message that may be prohibited by censors include:

- Socio-cultural content or opinion. Examples are issues relating to the rights of women, minorities, freedom of expression, environmental and economic development issues, "hate speech" and interpretation of arts, history and literature.
- Religious content or opinion. Examples include insulting and offensive references and descriptions of deities, religious hatred, the promotion of religion, conversion/evangelism, commentary on and criticism of religious belief.
- Political content or opinion. Examples include political transformation and opposition parties, reform, governance, and discussion of legislation and international relations.
- Content which is believed to pose a threat of conflict or a threat to security, including material that is identified with terrorism, extremism, separatism and state secrets.
- Erotic content, i.e. text, images and audio/video material suggesting or portraying acts of sexual behaviour, "provocative" attire, pornography and references thereto, the nature of whose acceptability varies significantly between national jurisdictions.
- Licence restrictions and limitations regarding message content that is protected by intellectual property rights, whose use or distribution may require appropriate permissions and licences.
- Censorship circumvention tools or tactics, including internet and software tools, publication and broadcasting channels, as well as methods and suggestions for how to bypass existing censorship techniques and technology.

Examples of the purpose of content which can lead to censorship include:

- To provide an audience with information about particular facts or opinions, events or news items.
- To misinform an audience with false information, with unintended or malicious purpose. (Often it is the censor that decides the validity of the message in such circumstances.)
- To threaten or incite action in response to or because of a particular person, group, idea, race, sexual orientation, profession, opinion, organisation or government. This includes incitement to violence, protest, racial hatred, social action and civil disobedience.
- To defame a person or people, organisation or idea with statements, opinion or accusations intended to harm or destroy their reputation, status and credibility.

The intended audience

Content may also be censored according to its intended audience – for example, because it is targeted towards citizens of a particular nation, region, race or language group. In the context of modern ICTs, this may include the users of a particular network service or communications tool, such as receivers of television transmission, radio broadcasts and satellite streaming. Content created and disseminated on the internet is usually intended for a global internet-connected audience. Because of the technical difficulties involved in preventing content from reaching an internet platform, censorship of material on the internet usually occurs after publication.

The international framework

The disparity between the interpretation of rights of people – as opposed to citizens of a nation – is highlighted in the debate around censorship.

Articles 18, 19 and 20 of the Universal Declaration of Human Rights (UDHR)[7] declare that every person should have the right to freedom of thought, religion, opinion, expression and association, as well as to "seek, receive and impart information and ideas through any media and regardless of frontiers." Freedom of association has been defined as the individual right to come together with other individuals and collectively express, promote, pursue and defend common interests.[8] Although these instruments pre-date the internet, this freedom and the related right to seek and impart information imply a right to visit any website or internet forum, the digital equivalent of a commons. The right to receive and impart information through any medium has been used by some to argue that in the international framework all content censorship on the internet can be considered a violation of the UDHR, though this interpretation is highly contested. An important issue here is the question of whether behaviour which is illegal offline within any jurisdiction should be legal online (and vice versa), which would make technology rather than behaviour a prime determinant of legality.

The International Covenant on Civil and Political Rights (ICCPR),[9] which stems from the UDHR and aims to create concrete legal mechanisms to assist its implementation, has been ratified by 160 countries. Points 1 and

7 www.unhchr.ch/udhr/lang/eng.htm

8 Jeremy McBride *Foredoom of Association: The Essentials of Human Rights* (London: Hodder Arnold, 2005), 18

9 www2.ohchr.org/English/law/ccpr.htm

2 of Article 19 confirm the individual's rights to free expression and communication regardless of the location and the medium used to achieve these. These rights are tested in Sections a) and b) of Point 3 which clarify that, where there is felt to be a need to protect the rights or reputation of others or to protect public order and national security, then provisions to this effect should be established in national law.

Limitations in Article 20 – which prohibit unlawful attacks on honour and reputation, advocacy of racial or religious hatred and incitement to hostility and violence – can be interpreted as justification for attempting to censor communication of this type of material. The relatioships between different rights, and the extent to which rights may be competitive, are highly controversial. The few areas in which limitations to freedom of expression have been widely (but not universally) agreed include denial of the Holocaust, child pornography and paedophilia-related content.

Although it was written several decades ago, reviews by the Office of the UN High Commissioner for Human Rights and other bodies have agreed that the introduction of the internet should not require an update to the signed principles set out in the Covenant. The majority of countries that censor information do so according to national constitution and legislation. Thailand and Spain, for example, prohibit any act of *lèse majesté* (offence to the royal family), while Turkey bans all content that is deemed to insult Turkish nationhood or the founder of modern Turkey, Kamal Ataturk, as well as references to the Armenian genocide. Saudi Arabia bans the publication of internet content that "breaches public decency", "infringes the sanctity of Islam" and "anything contrary to the state or its system." Germany and France actively pursue and shut down (or censor access to) any publication which denies the Holocaust or makes available Nazi memorabilia.[10]

National implementations of content censorship

The availability and use of modern ICTs have radically changed the nature of publication and communications. Conventional publishers and registered media companies have ceased to be the primary source of published information available to the public. The traditional one-to-many distribution model has also been displaced, to a significant degree, by the many-to-many attributes of a decentralised internet.

National legislation regulating content and publication has proved to be ill equipped for the innovations of the internet, where material created in one jurisdiction can instantaneously be accessed in any country with internet access. Virtual chat rooms, forums and blogs are among the services that have enabled cross-cultural communication amongst millions of internet users, irrespective of national borders and laws.

Governments have responded to these changing circumstances in a number of ways, such as the extension of existing laws to cover internet services, digital broadcasting, streaming and internet telephony, including the extension of surveillance and log keeping in these areas. Media regulations have also been extended in some national jurisdictions to cover internet publications. Anyone wishing to create a blog in a particular country may be required, for example, to register as a media company, enabling existing laws covering broadcasters and print media to be applied across the blogosphere.[11] On the face of it, this approach may ease the legal considerations for controlling online content, but a blog often represents a single person's opinion, does not undergo editorial process and is often published without regard to the physical location of website servers (i.e. to the law governing content in a country) and to the sensitivities of readers.

The following are diverse examples of legislation affecting access to digital media content, which raise again the relationship between the regulation of behaviour online and offline. Some are concerned with content which is generally opposed (such as child pornography); others with restrictions on freedom of expression as it is understand within the international conventions.

- The Australian Broadcasting Services Amendment (Online Services) Bill 1999, which establishes the authority of the Australian Communications and Media Authority (ACMA) to regulate internet content. Web content hosted on Australian and foreign servers is classified by the Office of Film and Literature Classification. Hosts of content classified as prohibited may be issued with a take-down notice if located in Australia or a website may be added to official internet filtering software lists.[12]
- The Chinese Provisions for the Administration of Internet News Information Services define online news content as "...information, reports and comments on current affairs, politics, economy, military affairs, diplomacy, public emergencies and other public affairs..." Article 5 of these provisions requires any website or bulletin board wishing to publish content that has not already appeared on official websites, to be subject to the examination and approval of the Information Office of the State Council.[13]

10 More information about issues of communications rights can be found in Chapter 5.

11 Institute for War and Peace Reporting "Internet Hit by Media Law Change" 30 January 2007 www.iwpr.net/?p=buz&s=b&o=328926&apc_state=henh

12 Electronic Frontiers Australia www.efa.org.au/Issues/Censor/cens1.html

13 Law Info China www.lawinfochina.com/index.asp

- The Vietnamese Decree on Cultural and Information Activities subjects those who disseminate "reactionary ideology" including revealing (party, state, military and economic) secrets, who deny revolutionary achievements, and who do not submit articles for review before publication, to fines of up to 30 million dong (about USD 1500).[14]
- The Internet Watch Foundation, an independent self-regulatory body of internet service providers (ISPs) which was established in the United Kingdom in 1996, runs a hotline for members of the public to report what they believe is illegal child pornography. Working with law enforcement and government agencies, the Foundation sends "take-down notices" to its member ISPs advising which online content should be blocked to customers.[15]
- India requires within its ISP licence agreement that ISPs "... ensure that objectionable, obscene, unauthorised or any other content, messages or communications infringing copyright, intellectual property rights and international and domestic cyber laws, in any form or inconsistent with the laws of India, are not carried in his network," and that ISPs should take all necessary measures to prevent this.[16]

Content censorship in practice

As previously discussed, content can be censored throughout the information cycle. The method and technology used largely depend on the chosen channel for disseminating content. A censor's intervention can take place prior to publication and/or *post factum*. The phenomenon of self-censorship is not easily classified and factors leading to its presence can be discussed in theory and through consideration of past examples.

ICTs offer many opportunities, through the use of broadcasting and telecommunications networks, to distribute content irrespective of geographic boundaries or prior connection between originator and recipient. The internet allows all users to publish content to the network itself. The lack of a technical and political hierarchy on today's internet provides the ability to stream existing content on the network without preconditions.

Two common technical methods exist to communicate content over the internet and with modern ICTs. One involves the use of a central server to receive and disseminate content. This applies to the majority of website publications, to email and instant messaging exchanges and to mobile telephony. It is also the most likely (and technically most feasible) model on which to implement censorship technology. The majority of content censorship systems are installed on servers and networking devices. This is discussed in more detail below.

It is possible on the internet to create and use private communications channels that do not rely on a central server. This model is known as peer-to-peer networking and it allows users to create custom connections between one another using the internet. Currently it is commonly used for file sharing (including music downloads) and internet telephony (e.g. Skype).

Another possibility is the use of virtual private networks (VPN), sometimes known as intranets, to share content and communication irrespective of national boundaries. Secured by encryption, these networks can be imagined as operating on top of the existing internet or telecommunications infrastructure and are therefore not affected by standard censorship and filtering mechanisms.

Self-censorship

Precedent often creates the primary reason for self-censorship, perhaps the most widespread yet least apparent form of censorship. The music and software industries, among others, have initiated several high-profile "example cases" to persuade others not to violate their intellectual property rights, though with variable success.[17] A number of countries have jailed writers and journalists for posting opinions and calls for democracy on the internet. Others have been successful in identifying and prosecuting individuals disseminating paedophile material on the web.[18] The cases of these individuals are widely publicised and serve as a deterrent to others.

The technology of content censorship on the internet and digital networks

A basic technical grounding in internet architecture and addressing is required to understand how censorship of digital content is implemented on ICT infrastructures, the possibilities for error that go hand-in-hand with this technology, and other methods utilised to censor access to online content. These issues are discussed in Chapter 18, and briefly summarised below.

The internet is a "network of networks" that consists of millions of private and public, academic, business and government networks with local to global scope.

14 OpenNet Initiative, Research Profiles, Vietnam opennet.net/research/profiles/vietnam

15 Internet Watch Foundation www.iwf.org.uk/public/page.31.htm

16 Government of India, Agreement for Provision of Internet Services www.dot.gov.in/isp/licence_agreement.htm

17 On 30 January 2007, Alexander Ponosov, a school principal in eastern Russia, was sued for USD 10,000 by the Russian authorities for purchasing fourteen computers that were running an illegal version of Microsoft Windows for his students. The Recording Industry Association of America has filed suits against hundreds of students for sharing music online.

18 Reporters Without Borders www.rsf.org/rubrique.php3?id_rubrique=119

National carriers and large corporations have direct connections to the internet backbone, commonly referred to as the Tier-1 and Tier-2 networks and operated by private companies around the world. There are several methods of distributing internet access from the backbone to end-users, but that which is most relevant to this chapter involves the dissemination of access to ISPs within a given country. These ISPs form their own networks of users, which comprise the majority of the world's internet-connected population. Users connect to their ISPs from home, public spaces, mobile telephones and office networks.

Generally speaking, every connection to the internet is made through a hierarchy of nodes, hereafter referred to as gateways. The primary gateway is the software application used to transmit content from the computer to the secondary gateway. It can be an internet browser, instant messaging tool, email client or internet telephony software. If the user is located within an office or internet café environment, the secondary gateway will be that network's infrastructure. Thereafter, information is relayed to the ISP and further on to the national gateway. This will become the final access point before content is transmitted to the internet backbone. The pathway may now be reversed in order to arrive at the recipient's computer or at the destination website.

One of the exceptions to this description concerns national network traffic. If the user requests to see a website or other internet service that is located within the same country, it is the ISP that will become the final gateway directing the information route.

Another exception involves the use of a satellite internet connection. In such cases, the second or third gateway (the one that forwards content beyond the computer's physical location) will be a satellite in orbit. Content will probably be transmitted back to earth in a different national network or directly onto the internet backbone.

Filtering of content sent to the internet and censorship of website access requests may occur at any of the gateways described above, including at the application level, office network, ISP, national gateway and so on. This is described in further detail later in this chapter.

Website censorship

Websites can be blocked from access using one of three common methods: IP address blocking, tampering with copies of the domain name system, and blocking of URLs. In simple terms this means that websites can be blocked according to their internet address, their name, or the system that translates their name into an internet address.

In some countries, website censorship exists primarily at the behest of the computer user – for example, a parent blocking access to some categories of website on a child's computer – or a network manager. This is implemented through the installation of content filtering software on an individual PC or network gateway.

The majority of governments that censor websites because of content have designated ISPs as those responsible for installing and running censorship software (filters). Some, however, have chosen to place filters at the gateways to the internet backbone. In such cases, all traffic must pass through these national filters before it reaches the internet proper. China and Pakistan are countries that have implemented filtering software, with various aims and consequences, at both levels of the national internet infrastructure.[19]

Banned lists and DNS tampering

Although they vary in costs and point of installation, all website censorship systems operate on a similar principle. Requests made by the user for a particular website are checked against a list of banned URLs. If the match is positive, the request is denied. Similarly, banned lists may contain IP addresses of servers and deny requests to the address when the URL has been translated by the DNS.

This is the most widespread method of censoring websites on the internet. Another method to prevent users from visiting banned websites is to tamper with the locally (ISP) stored copy of the DNS. Requests for a specific URL may be translated to an alternative IP address rather than that where the real site resides. This censorship technique may be circumvented, however, by users specifying one of the root servers as their DNS point of reference, rather than the local copies stored by their ISPs.

A recent example of this practice occurred during the August 2008 war between Russia and Georgia, when the Georgian government ordered the country's main ISP – Caucasus Online – to block all websites in the .ru domain. This meant that any website registered in the Russian .ru domain was not accessible for users receiving their internet through this ISP.[20]

Keyword filtering

A relatively new method of censorship, which was gaining strength and widespread implementation at the time of writing (early 2009), is keyword filtering. This involves the banning of certain words or phrases, either in a URL or a page's content. The system allows for broader ability to censor websites and internet communication by

19 Deibert et al., eds. *Access Denied*

20 Civil.ge www.civil.ge/eng/article.php?id=19284 and Reporters Without Borders www.rsf.org/article.php3?id_article=28167

content, as well as enabling the blocking of a particular page within a website rather than the entire site. However, keyword filtering can be crude, and is likely to prevent access to innocuous as well as intended target sites.

For example, a keyword filter might be set to ban the request for any URL containing the phrase "women's rights". This would leave the "www.apc.org" domain accessible, but would block the "www.apc.org/reports/womensrights.html" page. Similarly, such a filter might be programmed to deny any requested website that contains the banned phrase in its title or within any sentence of the site's content. URL keyword filtering has been noticed in the Chinese, Iranian and Yemeni internet infrastructures.[21]

Filtering content for banned keywords can also be performed at the application level. An example of this practice is the Chinese version of the Skype messaging and telephony tool, TomSkype. When a user types a banned keyword or phrase into the chat window, TomSkype prevents the message from being displayed on screen and will log the offending phrase and the user's IP address to a separate server.[22]

Access denial and error messages

When requests to access a website are denied by filtering software, a response is usually generated to the user. Some configurations present a page that confirms the website as forbidden for access from a particular network or country. At other times, the user may be offered the opportunity to fill in a form requesting the removal of a website from the filtering blacklists, as is the case in Saudi Arabia. It is also possible that users may receive a standard browser error message as if the website's URL were misspelled or such an address simply did not exist, as seen in Tunisia and Uzbekistan.

Filtering and censorship software

Software used to block websites and filter keywords in internet requests has been developed by private companies and in-house government ministries. WebSense, Content Watch and Fortinet are examples of filtering software companies whose products are used in educational, corporate and national network environments. SmartFilter, a product of Secure Computing, categorises its self-researched URL lists by topic, including, for example, "Abortion, Adult Material, Education, News & Media, Illegal or Questionable",[23] allowing customers to add URL addresses they have identified to the existing lists.

Governments have also been known to develop their own customised filtering software and lists of banned URL and IP addresses. China is reported to have thousands of internet "police", whose role includes the search for websites to add to these banned lists.[24] Similarly, search results may be modified by filters. In Iran, a search made in Google for a banned keyword or phrase may return a "no articles found" result.

Geolocation and reverse filtering

Another trend in content filtering is based on the geographical location of the user. Websites determine the user's location by the originating IP address of the request. Since this information is publicly available, a website can easily determine which country the user is in and modify or deny provision of content.

At the time of writing (early 2009), YouTube had began to implement a country-based restriction for displaying certain videos. For example, video with content considered illegal in Thailand, specifically *lèse majesté*, carries the "TH" tag in the YouTube page code and is unavailable to users in Thailand.[25] The Sun Microsystems Java download site abides by US export control laws and restricts downloads for users located in embargoed countries.[26]

When accessed from China, Google will present different search results when queried upon specific topics, such as "Falun Gong" and "Tiananmen massacre", than when accessed from another country. A message will be displayed at the bottom of the result screen stating that "To comply with local laws, regulations and policies, some search results are not displayed."[27]

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21 Deibert et al., eds. *Access Denied*

22 Nart Villeneuve *Breaching Trust: An analysis of surveillance and security practices on China's TOM-Skype platform* (Information Warfare Monitor/ONI Asia, 2008) www.nartv.org/mirror/breachingtrust.pdf

23 Secure Computing, Secure Web SmartFilter www.securecomputing.com/index.cfm?skey=86

24 See for example John Markoff "Surveillance of Skype Messages Found in China" *New York Times* 1 October 2008 www.nytimes.com/2008/10/02/technology/internet/02skype.html?_r=1&pagewanted=1&sq=china%20internet%20police&st=cse&scp=5

25 The Nation "Thailand Ban on YouTube lifted after deal: Website to block clips offensive to Thais or that break Thai law" *The Nation* 31 August 2007 nationmultimedia.com/2007/08/31/headlines/headlines_30047192.php

26 Bureau of Industry and Security, US Department of Commerce "Regional considerations" www.bis.doc.gov/policiesandregulations/regionalconsiderations.htm and Sun Java licence agreement java.com/en/download/license.jsp

27 Rough translation from Mandarin: 据当地法律法规和政策，部分搜索结果未予显示。

The accuracy of content censorship and filtering models

Past experience has shown that under-blocking and over-blocking is inherent in content censorship and filtering systems. It is virtually impossible manually to find all content targeted by the filtering agenda, in all desired languages, to add to the banned lists, especially as it is easy for content providers to migrate their locations in order to avoid banning. Likewise, it is difficult to process and include newly published websites as they appear online. This results in the majority of governments that use filters relying on updates to lists from software vendors and adding customisations of their own.

URL keyword filtering will often result in websites being added to banned lists when their content is irrelevant to the censor's agenda. If, for example, the word "sex" is included in the filter's definitions, all URLs containing it will be banned. Health education websites and support groups for the sexually abused are among those that will be included in the ban.

Banned lists containing IP addresses of banned websites may also result in over-blocking. As mentioned previously, a webserver with a single IP address may host many other websites. For example, if the IP address hosting the "www.apc.org" website were banned, this would also prevent users (within the same network or jurisdiction) from reaching 32 other websites including "www.takebackthetech.net" and "www.genderawards.net" which are among those hosted on this server.

Digital barriers to web resources

Governments have been known to restrict external (international) internet traffic during national emergencies and elections. Government ministries or corporations that control internet backbone gateways have been instructed to shut them down. Only satellite internet connections, if any, remain operable in such cases.

Restricting the bandwidth capacity of an internet backbone gateway, whether to a specific IP address range or across the entire system, will drastically reduce the number of successful website requests able to get through to the internet. The majority will simply time out, without the usual evidence of a website being blocked by censorship software. The use of this technique was suspected during the 2006 elections in Belarus.

Distributed denial-of-service (DoS) attacks have been used to overwhelm a connection to a website's hosting server with a flood of requests. Websites hosted on servers with a bandwidth capacity lower than the amount of data being requested will become unavailable to most users. A DoS attack would normally be perpetrated through a botnet (thousands of computers controlled by a single operator, most likely as a result of their infection by a virus or malware) and can be directed at a single website or even a range of national internet resources, as appeared to occur in Estonia in 2007.[28] ■

28 Bobbie Johnson "Virtual Warfare" *guardian.co.uk* 17 May 2007 www.guardian.co.uk/commentisfree/2007/may/17/virtualwarfare

Chapter 33
INTELLECTUAL PROPERTY

Lead author ***Achal Prabhala***

Introduction

Intellectual property (IP) refers to creations of the mind. The World Intellectual Property Organisation (WIPO) – the principal multilateral institution that governs IP rights, in conjunction with the World Trade Organisation (WTO) – defines the term as meaning "the legal rights which result from intellectual activity in the industrial, scientific, literary and artistic fields."[1] In practical terms, intellectual property rights confer a temporary, fixed-term monopoly on the exploitation, use and proliferation of a particular creation, in exchange for which commercialisation of the creation is mandated or implied.

In the case of inventions particularly, the intellectual property system is also designed to spur innovation – broadly speaking – as it provides incentive and protection for disclosure of the details of an invention, thereby enabling further inventions to result on the basis of full knowledge of those preceding them.

Legally and intuitively, intellectual property can only exist in so much that the creative concept in question has been expressed in some tangible form. An idea that stays in an individual's head, thereby, cannot qualify. The tangible form of expression can be varied, depending on the nature of the exercise. The work of authors, artists and musicians, for instance, will usually be protected by copyright. Scientists and engineers, on the other hand, will typically have their inventions protected by a patent. Corporations which have invested in creating a brand are protected by trade marks, while their business plans could possibly be protected as trade secrets. The work of product designers falls under a system known as industrial designs.

It is important to clarify the meaning of the word "protect" in the context of intellectual property. In traditional English usage, the word means to safeguard, to prevent from pilferage, to hold and treasure as one's own. To a certain extent, this meaning applies to intellectual property as well. Those protected in this case are the creators – who may be individuals or corporations – who have invested mental, physical and often financial effort in producing a work of artistry or invention. However, in the legal context of intellectual property, protection is also offered to the consumer and the public at large – the intended beneficiaries of such intellectual property. Intellectual property rights thus not only imply that the creator requires a legally sanctioned economic incentive in order to create, but also that the user requires access to such creations through mass production; and that in fact, the two seemingly competing interest groups are linked together by their dependence on one another in order for a market to exist.

The contrast between intellectual property and physical property is worth noting. Physical property is generally governed by a wholly different set of principles and laws. If, for instance, one were to own a house, the presence of several unwanted people in that house would restrict one's ability to enjoy it. In an analogous manner, consider an apple: it is amply clear that each piece of it can only be eaten by one person at a time. Intellectual property is, however, what economists term a "non-rival" good, by which they mean that one person's enjoyment or consumption of it does not restrict or prevent another's – even if the different consumptions occur simultaneously. For example, several people can enjoy a film at the same time, in different places, without taking away from one another's enjoyment of it.

As will become clear later in this chapter, this difference is important in considering the intention and deployment of laws and policies related to intellectual property – particularly in the context of a consuming public, and also in the context of information and communications technologies (ICTs). Since many of the debates surrounding intellectual property are based on a creator/user tension, it becomes necessary to resist the temptation to think of this tension in the frame of the owner/interloper, as one might in matters concerning physical property.

A brief history of intellectual property

The origins of intellectual property cannot be precisely traced to any one particular event or society. However, there are several indications from history that something similar to what we know as intellectual property today existed long before the 19th and 20th centuries – when, for all practical purposes, it was codified and expanded globally.

Two landmark 19th century agreements set the tone for the intellectual property regulation that exists today. The 1883 Paris Convention for the Protection of Industrial

1 For more information, see the website of the World Intellectual Property Organisation at www.wipo.int/about-ip/en/iprm/index.html

Property[2] was originally signed by governments from eleven countries in Europe and South America. Subsequently, it went through several revisions, updates and expansions, and today 174 countries in the world are signatories. The Paris Convention – as its full title suggests – is primarily concerned with patents, trade marks and industrial designs. The Berne Convention for the Protection of Literary and Artistic Works,[3] convened in 1886, is to copyright what the Paris Convention is to patents – and likewise, it is globally prevalent today, with 164 countries being parties.

The impetus for both the Paris and Berne Conventions lay in the rapidly industrialising, visibly interconnected context of 19th century Europe, and the trade links then developing between Europe, European colonies and other territories. It had become clear by that time that protection of intellectual property was not merely a national matter, and that a global framework was required.

The work of the Paris and Berne Conventions was to be completed in the 20th century with the establishment of WIPO in 1967, and the creation of the WTO in 1995. Today, it is these two Geneva-based organisations that set the global agenda for intellectual property.

WIPO, in theory, is responsible for intellectual property as a whole. In practice, however, it is the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) – a trade rule at the WTO – that is now the overarching regulation on this issue.

There is some contention as to why the WTO stepped in to regulate a facet of the economy for which an existing organisation already had responsibility. Indeed, several prominent commentators have suggested that the inclusion of intellectual property rights into the trade agenda has been a stumbling block for global trade negotiations.[4] Regardless of the origins of TRIPS, every member country of the WTO – the overwhelming majority of sovereign states in the world[5] – is bound to follow it. TRIPS is an updated, expanded and modified amalgam of the Berne and Paris Conventions. In some cases – as in recent debates on patents and access to medicines, and concerning whether flexibly interpreted patent rules help improve public health by rendering medicines cheaper – the WTO has provided interpretive and legislative guidance within TRIPS. In other cases, aspects of the Paris Convention are simply referred to or incorporated as is. In terms of governance and compliance on every major aspect of intellectual property, including both patents and copyright, TRIPS is the standard to which countries are now held.

WIPO, on the other hand, while still significant in the global patent system, is of more consequence in the area of copyright. In particular, two WIPO treaties have set the agenda as to how copyright is to be regulated in the age of the internet. These are the WIPO Copyright Treaty (WCT) and the WIPO Phonograms and Performances Treaty (WPPT), both of 1996, which are collectively – and colloquially – known as the WIPO Internet Treaties. These treaties have received a mixed response around the world. Industrial countries have been fairly quick to sign up to them, especially in Europe and North America; in the United States, the national legislation that has been implemented in compliance with both treaties is known as the Digital Millennium Copyright Act (DMCA). Within the developing world, there has been some hesitation to sign up to these treaties, in part because of the relative lack of an internet focus within some countries (itself often a consequence of low levels of internet access), but also because of concerns about over-regulating ICTs in a manner that may hamper future development.

Intellectual property in the age of ICT

The arrival and rapid growth of the internet, in particular, but also other important communications technologies – such as community radio, niche broadcast media, and interactive media – took the copyright system unawares. Up until the 1990s, the copyright system was designed for a world which communicated in certain predictable ways – on paper, on television, and on established radio frequencies. Digital media created an unprecedented problem. From a developmental perspective, the relatively cheap and interactive possibilities offered by the internet were, and are, seen as opportunities. The copyright system is well cognisant of such opportunities too, but it also sees a threat.

Two examples of new interactivity, seen in the light of one important aspect of the copyright system, will serve to highlight the problem. These two examples are commonplace to many users of the internet: the blog and the peer-to-peer sharing site. The aspect of copyright that is critically tested by these consists of a set of principles that are known as "fair use" or "fair dealing". Broadly taken, fair use is what allows users of copyrighted works to be able to engage in reasonable debate, discussion and analysis of such works. Fair use is what allows a research student, for example, to quote sections of published (and copyrighted) texts in a doctoral thesis. It is what allows a broadcast media analyst to run short clips of newsworthy events (even if from another channel, or by another analyst)

2 For the full text of the updated document and history of amendments, see www.wipo.int/treaties/en/ip/paris/index.html

3 For the full text of the updated document and history of amendments, see www.wipo.int/treaties/en/ip/berne/index.html

4 For one among several strong opinions offered on the role of intellectual property at the WTO, see Jagdish Bhagwati "From Seattle to Hong Kong" *Foreign Affairs* December 2005 www.foreignaffairs.org/20051201faessay84701/jagdish-bhagwati/from-seattle-to-hong-kong.html

5 There were 153 member states in July 2008, with Russia the most significant exception.

in order to comment upon an aspect of the news. Fair use, in other words, provides a set of safeguards against what would otherwise constitute copyright violation.[6]

Consider a blog that reproduces an article from an online newspaper, in full. From an intuitive perspective, it is open to question whether this is "fair". On the one hand, it is probable that the blogger is making no explicit commercial gain by the use of the article. On the other hand, traffic to the website of the newspaper that originally published the article – or any advertising that is associated with it – is being diverted or lost. There are several nuances even in a situation as seemingly simple as this. Is the newspaper gaining in publicity what it is losing in direct traffic? Is the author of the article (who may not be the copyright holder, e.g. may have assigned rights to the newspaper) actually benefiting out of such a situation in terms of readership? How is this different from reading out an article in full to a friend, within the confines of one's home? The issue here is that the digital medium throws up an infinite number of possibilities that do not have a clear path within the copyright system.

Much has been made of peer-to-peer exchange on the internet, though the idea of sharing a book or a CD in the offline world is hardly controversial. What makes such sharing different in the online world is the amplification that the internet facilitates, the vast and simultaneous sharing that an electronic exchange enables, including the impact this can have on the viability of established business models for creative work. Again, the copyright system – broadly – fails to grasp the scope of this possibility, having never anticipated in full clarity the possibility of such amplified exchange developing.

The problem with fair use and with purported "transgressions" of the blog and/or the peer-to-peer site is that the mismatch is, in many countries, yet to be clarified. In those countries where an attempt at clarification has been made (such as in the United States, with the adoption of the WIPO Internet Treaties and the implementation of the DMCA), it has proved difficult to make many clauses within the updated law workable in practice.[7]

Current debates on the relationship between intellectual property and ICTs

The current state of the debate as to how intellectual property will shape the future of ICTs can be summed up in this key question: how can ICTs continue to create knowledge opportunities for users while yet rewarding and growing the group of creators of such knowledge?

It should be noted here that the word "knowledge" is a composite of several disparate layers. It can apply equally to music and film as to more traditionally identified markers of knowledge such as books. It might also be prudent to state, at the outset, that this question – like the field of intellectual property and ICTs itself – is constantly evolving, with interests and goals being frequently realigned and redefined. Thus, the answer to the question is much like the evolving fields of ICTs itself: a work in progress.

One might best set about identifying a potential answer by examining a set of case studies. The first example to be considered here is that of technological protection measures (TPMs), a feature of new media that is increasingly prevalent and already protected by law in several countries.

TPMs – originated in and by the commercial media industry – enable manufacturers of certain media goods (like film, music or text) to lock the digital files that contain such items so that they only operate in certain circumstances. For instance, a TPM could prevent an .mp3 music file from playing on more than one computer (thus making it impossible to transfer the file between computers); or it could prevent sections of an e-book from being copied and pasted into another document. In some cases, a TPM could even prevent ordinarily permissible applications of fair use (see above), such as, for example, having the text-to-speech facility activated for use by print-disabled persons. Yet TPMs are not essentially designed to restrict use but to grow the use of a media product equitably.

The WIPO Internet Treaties render legal the use of TPMs. In countries where the WIPO Internet Treaties have not been adopted, their use and legality are more ambiguous.

TPMs provide a good example of how copyright law for the internet can sometimes be disconnected from copyright law as such. If the digital domain were to be treated as just another medium of communication – alongside television, radio, print, etc. – and existing fair use provisions were applied to it, then many of the "internet-age" copyright regulations would not allow for regular fair use to be transacted.

Another good example lies in the domain of video-sharing technology, where new formats and hosting services are enabling the proliferation of homemade video. This technology offers great value in areas such as teaching, education and general dissemination and sharing of expertise, for example, in development work. However, sovereign copyright law (both of the country in which a video is created, and that of countries where it is viewed) is applicable to any film product regardless of its commercial application, and indeed, often poses a significant barrier in producing and disseminating instructional video. In part this is because all media – and film in

6 For a summary of likely provisions that qualify as "fair use", see the Commonwealth of Learning Copyright Audit 2006 at www.col.org/colweb/webdav/site/myjahiasite/shared/docs/COLCopyrightAudit.pdf

7 The Electronic Frontier Foundation has been compiling information on the effects of the DMCA since its inception; see www.eff.org/deeplinks/2008/10/dmca-ten-years-unintended-consequences

particular – tend to rely heavily on pre-existing media. For instance, an instructional video on politics might need to use clips of broadcast news coverage of an election; such clips will be the copyright of the news agency or television station that produced them and thus – typically – only available to other users for permitted use with an associated fee.

A paradox of the internet and digital communication is that, while it makes the use and integration of several media sources much easier, it also makes copyright violations more easily detectable. While much of the focus on copyright in the internet age tends to be directed towards the digital domain, it is a fact that in the majority of countries in the world, internet access is as yet comparatively low. In the developing world, the exchange of information by media still – largely – occurs through the printed word and broadcasting.

Books are usually considered to be static physical entities. However, this view ignores several technological applications that make the contents of a book today far more widely accessible (and accessibly produced) than was previously the case. For instance, in South Africa, a group of students at the University of Cape Town collaborated some years ago to produce better science textbooks for schoolchildren. Their experiment, the Free High School Science Textbooks (FHSST) project,[8] is now the object of international attention and acclaim. The way in which copyright is integrated into such a project is interesting. FHSST does claim that the authors who contribute to the book have the "moral right" to be identified as authors. However, beyond this, FHSST makes few claims for their exclusive right to use and deploy the textbooks – in fact, it allows anyone at all to use, print, even sell (at profit) or modify the texts at will (as long as the modified text is also similarly available to the public at large).

FHSST and other producers of collaborative content – such as Wikipedia, the free online encyclopaedia – can mould their own version of copyright as they best see fit by deploying the GNU Free Documentation Licence,[9] one of a range of internet-friendly innovations in copyright which allow for individuals or groups of producers to control the direction of the work they produce, of which perhaps the best known is the Creative Commons suite of licences.[10]

The work of more user-friendly copyright licences is by now well documented. The need that they seek to address is the incompatibility, described above, between different existing systems of copyright (in terms of national law, international law and general practice). Their basis is a simple one. Copyright is usually referred to as a bundle of rights – which is to say, it includes several different exclusive rights, such as the right to make a profit by selling, the right to translate, the right to change format, etc. While copyright once seemed like a "one-size-fits-all" model, it has turned out not only that the one size was not fitting all in practice, but also that there was no strict legal reason not to break the bundle of rights down into its constituent parts, and let the producers of content decide for themselves exactly what parts of the bundle they wanted to use and what parts they were willing to give away.

Conclusion

The history of intellectual property suggests that it is an idea encoded into law with the purpose of helping both the user and the producer of work that has intellectual value. However, with respect to one form of intellectual property, copyright, and the opportunities made possible by the internet, there has been an upsetting of both groups' interests and requirements. Users have been empowered by the practically possible (if transgressive) opportunities available in the digital domain, and producers have been cautious about adapting their business models to this domain, while yet zealously policing transgression.

In summary, therefore, a key debate at the intersection of intellectual property and ICTs concerns whether – and how – the world of enhanced communications opportunities afforded by the internet will continue to reward producers of content. Thus far, the debate has been sustained under the assumption that on one side of the fence lie "users" and on the other lie "producers". While this is still largely true, the emergence of collaboratively created content has seen a shift in thinking towards the idea of the user and producer often being one – or, to put it another way, of the user *as* producer. Another distinct observation is that not all producers of content have the same goals. Some may desire commercial viability; others merely readership or viewership; yet others may want some combination of revenue and popularity or recognition. Currently, the copyright system provides few alternatives in this direction, and hence, we observe the rise of the more do-it-yourself copyright options to be found in flexible copyright licences.

What does emerge as a pattern, however, is that practitioners of new media – in the development sector and beyond – still continue to use the opportunities available regardless of how legally ambiguous they are. In doing so, they give new direction to the course of national and international copyright law regulations that needs to follow such practice. ■

8 For more information on FHSST see www.fhsst.org

9 For the text of the licence and more information on it, see www.gnu.org/copyleft/fdl.html

10 For more information on Creative Commons licences, see www.creativecommons.org

Chapter 34
ICTs AND THE ENVIRONMENT

Lead author ***David Souter***

Environmental issues became increasingly significant in international policy discussions during the last quarter of the 20th century. In particular, the need for "environmental sustainability" has become an established part of policy development. This implies approaches to long-term economic growth and development which do not deplete resources or restrict opportunities for future generations in order to achieve current or short-term growth. Climate change has also become a major concern, particularly in the early years of the 21st century.

This new concern for the environment has resulted from growing understanding that human activity in the industrial period has had a significant impact on the earth and its ecosystems. Until the Industrial Revolution, human impact on these had been limited: population growth was relatively slow – rising from around 300 million in the year 1000 to around 900 million in 1800; agriculture made use of organic rather than chemical inputs; and, while industrial production did affect local environments, it was on too limited a scale to have widespread impact on land use, air and water quality.

The Industrial Revolution, which began in the 18th century, changed this context substantially. Industrialisation has involved much more widespread use of resources, particularly minerals, to manufacture goods and provide services, with substantial impacts on land, air and water; it has reached beyond manufacturing into agricultural production, which is now supported by chemical rather than organic inputs; and it has greatly extended the exchange of goods outside local markets, so that many products and services are now traded globally rather than locally.

Industrialisation – and the increased scientific understanding which has accompanied it, for example, in medicine – has also played a part in changing human society. Two changes are particularly important. The period since the Industrial Revolution has seen:

- **Unprecedented increases in population.** Overall human population has risen from around 900 million in 1800 to over 1.5 billion in 1900, 2.5 billion in 1950 and around 6 billion in 2000. As things stand, human population is expected to reach over 9 billion by 2050. The resource requirements to sustain this increased population – particularly in land, food and water, but also in manufactured goods – have been and will continue to be dramatic.
- **Substantial increases in prosperity.** Development agencies focus much of their work on efforts to support those living in "absolute poverty", which the United Nations has defined as "a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information, … [which] depends not only on income but also on access to services." It is estimated that around 15% of the world's population today lives in absolute poverty. This is, however, much less than the proportion of the world's population living in absolute poverty before the Industrial Revolution or, indeed, up to and beyond the Second World War. Estimates of historic poverty levels suggest that as many as 80% of people then experienced this level of deprivation.

The period since the Industrial Revolution has therefore seen very substantial increases in both population and prosperity. However, this has been accompanied by, and substantially achieved through, the use of natural resources – ranging from fossil fuels (coal, oil), through other minerals (copper, tin) to wild produce (fish, land and water) – at rates which exceed their natural rate of replenishment or recovery. It has also become increasingly clear that this use of natural resources has altered the environment in other, less visible, ways (pollution, climate change). Together, these outcomes imply that it is not sustainable to maintain current approaches to resource use – and so to industry, transport and production – in the longer term. This understanding lies at the root of today's environmental concerns.

Policy makers in this area are confronted by a triangle of experience and expectations, which includes:

- Continued high rates of population growth
- Public expectations for continued economic development and growth
- Environmental sustainability.

Some environmentalists question whether all three are sustainably compatible. In particular, they question whether the power generation and energy use requirements of economic growth for a growing population can be achieved through sustainable energy sources (particularly renewable sources such as solar, wind and wave power).

The aspiration to achieve economic growth and environmental sustainability in a period of high population growth

underpins international negotiations on the environment in the early 21st century. Inequalities between countries which have benefited most from industrialisation (which typically have high levels of prosperity and low rates of population growth) and developing countries (which typically have low levels of prosperity and high rates of population growth) complicate these negotiations.

There are four principal concerns in environmental policy today. These are:

- Resource depletion, i.e. the use of natural resources at a pace which cannot be maintained by future generations, and which will lead to shortages of resources in the short or medium term. This is a particular issue in respect of fossil fuels (coal, gas and oil), minerals which are critical for some industrial processes (such as copper), land suitable for food production, water, and some foodstocks (particularly fisheries).
- Pollution, i.e. the deterioration in air, land and water quality resulting from industrial, manufacturing, chemical and agricultural processes.
- Waste management, i.e. the disposal of pollutants (including the waste products of manufacturing and energy production, including nuclear waste) and of the high levels of waste generated by all – and particularly by industrialised – societies (from packaging to obsolete electrical equipment including computers).
- Climate change, i.e. the impact of the "greenhouse gases" (principally carbon dioxide) emitted as a result of human activity on the global climate, principally global warming. This is a particular concern regarding industrial manufacturing, power generation and transport, but is also affected, for example, by the increased conversion of forest land for agricultural purposes (which reduces natural absorption of carbon dioxide).

The following sections of this chapter are concerned with the relationship between ICTs and two of these areas, waste management and climate change.

E-waste

There has been growing concern in recent years about the large amounts of waste generated by the ICT sector. This includes, in particular, the terminal equipment used for computing (PCs, laptops), broadcasting (televisions and radio sets) and telephony (fixed and mobile phones), as well as other peripherals (fax machines, printers, scanners, etc.). The United Nations Environment Programme has estimated that "e-waste" weighs in at some 20 to 50 million tonnes worldwide, and that this figure is increasing by between 3% and 5% a year, faster than any other waste source.

One of the major problems with ICT waste is the rapid turnover of equipment. The pace of change in computing technology is exceptionally rapid, with the capacity of many key components doubling every two or three years. Much the same is true of other equipment, such as mobile telephone handsets. As a result, users replace computers and mobile phones with newer, more capable models on very short timescales – often as little as two or three years. This pace of change is encouraged by improvements in software, which is regularly upgraded to take advantage of new hardware capabilities, requiring users to upgrade their hardware too if they want to gain from the latest software versions.

Almost all ICT equipment (like other electronic equipment) is difficult for waste managers to handle because of its construction and complexity. While hardware might normally be crushed, much ICT equipment includes small amounts of toxic materials whose disposal needs to be managed carefully if it is not to endanger public safety. These toxic materials are costly to extract and treat safely.

Waste disposal regimes vary substantially between different countries, with higher standards of regulation found in industrial countries. Recycling generally requires high-technology facilities which are expensive to implement, and absent in most developing countries (along with relevant legislation). In developing countries, too, a good deal of waste is handled in informal rather than formal waste disposal businesses – where standards are either lower, not applied or non-existent.

The quantities of electronic waste being dealt with in all countries are increasing, because of the increasing use and range of ICT devices, but this is particularly true in developing countries where ICT access and use is growing most quickly. In addition, it is clear that significant amounts of electronic waste have been shipped from industrial countries to developing countries for disposal using less environmentally responsible procedures such as incineration.

The challenge of e-waste is likely to grow as the reach of ICTs extends further in society. Remedies which have been proposed include standardisation and regulatory measures to increase the lifecycle of equipment before it becomes obsolete, to enable more efficient extraction of toxic components, and to require recycling by both consumers and equipment vendors.

ICTs and climate change

Environmental sustainability and climate change are among the most important challenges facing the world community. Climate scientists are almost unanimously agreed that significant global warming is occurring and will continue to occur because of the emission of "greenhouse gases", principally carbon dioxide, that results

from human activity. Their perceptions of the risks resulting from climate change are now accepted by most governments, and provide the background to international negotiations – notably those surrounding the Kyoto Protocol which was signed in 1997 and came into force in 2005, and negotiations for its successor which were ongoing at the time of writing (mid-2008).

Measuring the potential impact of changes in complex ecosystems is difficult, and there is quite a wide range of opinion among scientists about the pace and extent of changes that are likely to result from climate change. It is, however, commonly agreed by scientists that current levels of greenhouse gas emissions are not sustainable, and will have significant effects on the environment for future human life; and that these impacts are certain to increase unless significant action is taken urgently to reduce their level.

Among the most important impacts which concern decision makers are:

- The rise in sea level that will result from warming of the oceans and melting of ice caps, which will flood heavily populated low-lying areas in countries such as Bangladesh and the Netherlands and thereby lead to large-scale (planned and unplanned) migration.
- Increased climate and weather instability, including higher risk from typhoons and other extreme weather conditions.
- The shift in local climatic conditions that will make current agricultural land unproductive and reduce the viability and yield of important crops.
- The economic impact in terms of lost production, lost assets, reconstruction requirements, the need to restructure transport and infrastructure, and the need to support individuals and families losing their homes, land and work as a result of climate change.

The problem is particularly acute because of rising energy demand from increasing populations and from industrialisation and rapid economic growth in some developing countries, especially highly populated Asian countries and above all China and India. If current trends in greenhouse gas emissions continue, these developments are expected to lead to a rise in emissions from 40 gigatonnes of carbon dioxide in 2002 to 53 gigatonnes in 2020. By contrast, it is suggested, long-term sustainability requires a reduction in annual emissions to no more than 20 gigatonnes. Of current emissions, some 24% are estimated to arise from the power sector, 23% from industrial production, and 14% from transport.[1]

The relationship between ICTs and climate change is twofold:

- On the one hand, ICTs themselves contribute significantly to greenhouse gas emissions, particularly through their use of electric power which is generated by burning fossil fuels. The contribution which ICTs make to emissions is growing rapidly as they become more widespread.
- On the other hand, ICTs can enable alternative ways of undertaking some activities which have the potential to reduce emissions in other economic areas, for example, by substituting for the use of transport.

Analyses undertaken in the middle of the first decade of the 21st century have suggested that ICTs are responsible for a little over 2% of greenhouse gas emissions. This is slightly larger than the figure attributed to the airline industry, which has been widely condemned as a major contributor to climate change. In the case of ICTs, emissions are primarily due to energy use: the IT industry and ICT use are estimated to account for some 10% of global use of electric power.

As with airlines, emissions from ICTs are expected to grow, both in raw numbers and as a proportion of total emissions from all sources.

The latest figures on this at the time of writing were contained in a study published by the ICT industry-funded Global e-Sustainability Initiative in 2008.[2] Thus study suggested that the carbon footprint of the ICT sector has grown from 530 megatonnes of carbon dioxide in 2002 to 830 megatonnes in 2007, and that it will grow to 1,430 megatonnes by 2020 – an annual growth rate of 6%. Of these totals, about a quarter is due to "embedded carbon", i.e. to emissions due to the manufacturing of equipment and management of networks, and the remaining three quarters to use of ICTs (including data centres, business and personal use).

Figures 34.1 and 34.2, taken from the Global e-Sustainability Initiative report, illustrate this expected growth by geography and type of use. As they show, the majority of the growth is expected to take place in developing countries, as a result of increased access to ICTs, particularly personal computers and their peripherals. By 2020, the study estimates, developing countries will account for 60% of carbon emissions due to ICTs. Data centres, managing the ways in which ICTs use information, will also grow their emissions substantially, though from a much lower base than usage.

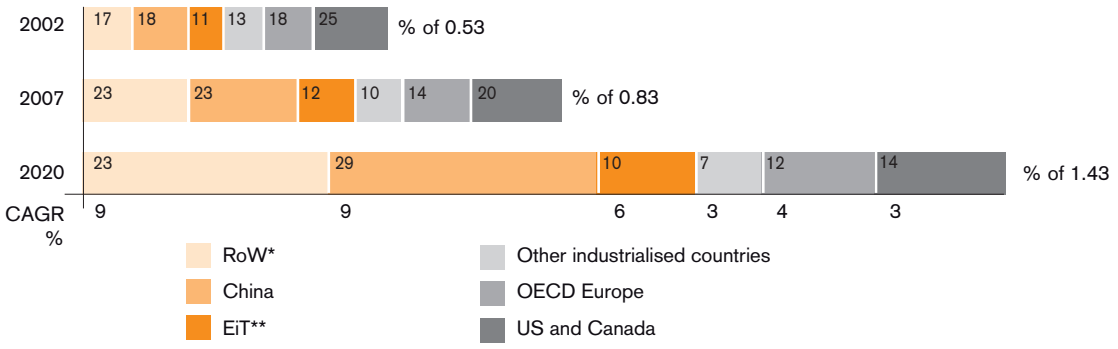
As for technology platforms, the carbon footprint of mobile telephony is expected to increase from 66 megatonnes per annum in 2002 to 179 megatonnes in 2020, and that of broadband networks from 4 megatonnes in 2002 to 49 megatonnes in 2020.

The overall implication of these data is that the contribution of ICTs to global emissions will grow principally as

1 The Climate Group *SMART 2020: Enabling the Low-Carbon Economy in the Information Age* (Brussels: Global e-Sustainability Initiative, 2008)

2 Ibid.

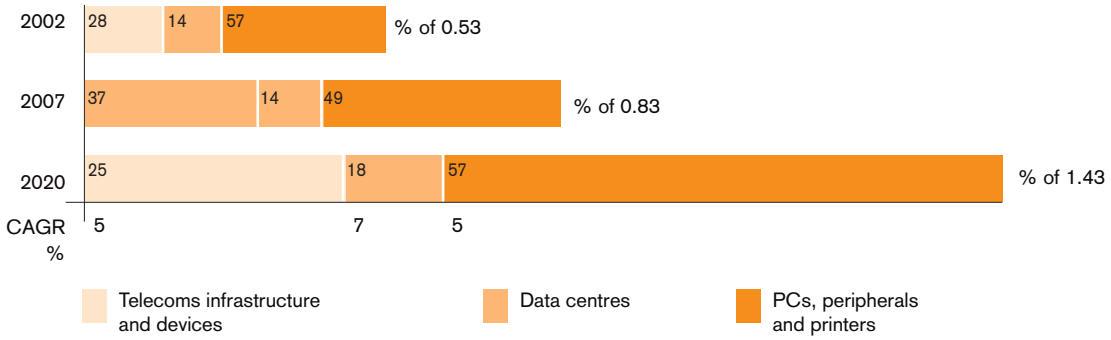
Figure 34.1: **The global ICT carbon footprint by geography** (% of GtCO2e)



* RoW - Rest of the world, includes India, Brazil, South Africa, Indonesia and Egypt.

** EiT - Economies in transition, includes Russia and non-OECD Eastern European countries.

Figure 34.2: **The global ICT carbon footprint by subsector** (% of $GtCO_2e$



* Printers were 11% of the total ICT footprint in 2002, 8% in 2007 and will be 12% in 2020.

a result of increased access to ICTs in developing countries and amongst those with lower income levels. In other words, increased access, which is highly desirable for reasons discussed in Chapter 17 of this handbook, also has a cost in terms of climate change. How much of a cost is involved depends on how ICTs, particularly new ICTs, are used: in other words, does the ICT sector in general, and ICT use in particular, enable savings in carbon emissions that would not otherwise occur?

It is important to distinguish, in this context, between individual use of ICTs and the use of ICTs by large organisations.

The majority of the projected increase in carbon emissions from ICTs in the period to 2020 results from the wider availability of ICT devices, especially mobile phones and PCs. We have, at present, too little information about how access to and ownership of ICTs affects behaviour – for example, about the extent to which it substitutes for travel (and so affects emissions due to the use of vehicles). This will obviously have implications for the net impact of increased ICT access on climate change. It will also be difficult to disentangle the impact of ICTs from the impact of growing prosperity in countries with high economic growth rates, such as China and India, which is likely to lead to higher emission levels resulting from higher consumption of many goods and services.

It is easier to anticipate some of the ways in which ICTs might reduce carbon emissions in large-scale business

and other organisational contexts. The Global e-Sustainability Initiative has identified five areas in which reductions in emissions might result from innovative use of ICTs. These are as follows:

- "Dematerialisation", i.e. the use of ICTs and virtual technologies to substitute for higher carbon alternatives – for example, the use of videoconferencing to substitute for face-to-face meetings (which require travel), of electronic billing to substitute for paper bills, and of teleworking to substitute for office working. (Experience to date with dematerialisation has suggested that it takes longer to become widespread than had been anticipated; in particular, videoconferencing and teleworking have not yet become widespread in industrial country business practice.)
- More efficient use of power in industry. In particular, information technology can be used to improve the energy efficiency of both power generation and industrial processes.
- Transport and logistics management. Similarly, information technology can be used to improve transport and logistical efficiency, for example, by ensuring that freight lorries are fully loaded in what are usually very fragmented freight distribution networks.
- Better building design, supported by ICT monitoring of energy and efficiency requirements.
- More efficient power generation, managed and monitored by information technology.

There are significant barriers to adoption in all of these areas. If fully implemented, the Global e-Sustainability Initiative believes they could save up to 7.8 gigatonnes of emissions each year by 2020 (and EUR 600 billion, around USD 765 billion at late 2008 values), about five times the additional emissions which it anticipates will be generated by increased ICT access and use. However, it should be noted that:

- The increase in emissions from access and use is more or less certain to take place, while the savings suggested are potential savings, highly dependent on business decisions that may or may not be made, and on cultural changes in business and consumer practice which may or may not be achieved.
- The savings suggested do not result from increased access and use but (almost entirely) from the use of information technology in large industrial and government processes – steps which could be taken whether or not access and use increase.

As things stand, the evidence suggests that increased ICT access and use, in the mass market, will generate significant additional carbon emissions without achieving significant countervailing gains in carbon reductions from changes in the behaviour of those gaining new or greater access and use.

Most attention has been paid to date by industry and governments to potential large-scale savings (as described above). If the carbon impact of mass ICT access is to be reduced, however, this is likely to require more attention to the equipment and usage patterns of individual users. Examples of relevant initiatives to minimise the carbon cost of ICT use, which have been suggested, include the incorporation of high-efficiency and low-carbon criteria in equipment standards; improved energy efficiency and prolonged battery life for devices such as mobile phones; greater use of solar energy to power equipment; greater temperature tolerance in equipment (reducing the need for fans in PCs and other devices); and disabling (or discouraging people from using) standby features on PCs, televisions and other personal equipment. ■

Appendices

Appendix 1 ORGANISATIONS INVOLVED IN ICT POLICY

This appendix provides brief background information on some of the more important organisations involved in ICT policy making. It is not intended to be detailed or comprehensive, but provides organisational URLs from which official information can be obtained.

Internet Assigned Numbers Authority (IANA)

See under ICANN (below).
Website: www.iana.org

Internet Corporation for Assigned Names and Numbers (ICANN)

ICANN is a non-profit private sector corporation which has responsibility, at a global level, for managing the Internet Protocol (IP) addressing system which enables access to the internet (i.e. the domain name system and the numbering system which underlies this). ICANN was created in 1998, establishing greater distance between the domain name system and the government of the United States, which had previously overseen it. Its status as a corporation registered in the United States – and so, potentially, in the eyes of some, susceptible to US government intervention – remains controversial, and the Joint Project Agreement between it and the United States Department of Commerce – a key instrument of ICANN governance – was under highly contentious review at the time of writing (mid-2009). ICANN has a Board of Directors representing different stakeholders, and a highly complex set of arrangements for the involvement of different constituencies and interests. A Government Advisory Committee (GAC) provides input from governments.

ICANN manages IANA – the Internet Assigned Numbers Authority – which oversees global IP address allocation, root zone management for the domain name system (DNS) and other aspects of IP management.
Website: www.icann.org

Internet Engineering Task Force (IETF)

The IETF describes itself as an "international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet." It has no membership arrangements. Anyone who wishes to participate in the IETF's work, particularly standard setting, may do so, through groups which work both online and in regular meetings (the latter being seen as part of work that is primarily organised online). Although many participants work for governments or businesses, they participate in the IETF as individual experts. Standards are developed through a process known as "rough consensus and running code" (see Chapter 20).
Website: www.ietf.org

Internet Governance Forum (IGF)

The IGF was created by the United Nations Secretary-General on the recommendation of the World Summit on the Information Society, to provide a space for discussion of issues concerned with internet governance (and, in practice, wider internet policy). It meets annually, and has no decision-making responsibilities or powers. Uniquely within the United Nations family, it has a fully multi-stakeholder character, without special or distinct arrangements for governments within its structure. Its small secretariat is assisted by a Multi-stakeholder Advisory Group (MAG).
Website: www.intgovforum.org

Internet Society (ISOC)

ISOC is a non-profit organisation which was set up in 1992 "to provide leadership in Internet related standards, education, and policy." It is a membership organisation, which has local membership chapters in many countries; a clearinghouse for information, education and capacity building; and a forum for discussion of internet policy and technical issues. It provides an organisational home for the Internet Engineering Task Force (see above) and the Internet Architecture Board.
Website: www.isoc.org

International Telecommunication Union (ITU)

The ITU is the United Nations agency for telecommunications, and now describes itself as "the leading United Nations agency for information and communication technologies." In the first years of the 21st century, the ITU was lead agency for the World Summit on the Information Society. ITU membership is held by national governments, but private sector organisations (and perhaps others, there is some ambiguity) can become "sector members", enabling them to work alongside governments in one or more of the ITU's three sector

bureaux, concerned with radiocommunications, including radio spectrum management (the Radiocommunication Bureau, ITU-R), standardisation (the Standardisation Bureau, ITU-T), and the development of telecommunications (the Development Bureau, ITU-D).
Website: www.itu.int

Number Resource Organisation (NRO)

The NRO is the association of Regional Internet Registries (RIRs) (see below).
Website: www.nro.net

Regional Internet Registries (RIRs)

RIRs are the organisations which oversee the allocation of IP numbers (delegated to them by IANA, see above) at a regional level. There are five RIRs: AfriNIC (Africa), APNIC (Asia-Pacific) ARIN (North America and part of the Caribbean), LACNIC (Latin America and part of the Caribbean) and RIPE NCC (Europe, Middle East and Central Asia).

World Intellectual Property Organisation (WIPO)

WIPO is the United Nations specialised agency charged with maintaining intellectual property agreements which have been reached by nation-states, including issues such as copyright and trade marks. As well as addressing IP issues, it plays a leading role in domain name dispute resolution. WIPO is based in Geneva.
Website: www.wipo.int

World Trade Organisation (WTO)

The WTO is an intergovernmental organisation which promotes free trade, and the intergovernmental body which regulates and polices trade between nation-states, including dispute resolution. Trade in services is governed by the General Agreement on Trade in Services (GATS), which was signed in 1995. Specific WTO agreements of relevance to ICT policy include the Basic Telecommunications, Value Added Services and Information Technology Agreements. The WTO is based in Geneva.
Website: www.wto.org

The telecommunications and information technology agreements can be found at **www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_e.htm** and **www.wto.org/english/tratop_e/inftec_e/inftec_e.htm.**

World Wide Web Consortium (W3C)

W3C, which was founded by the World Wide Web's designer Tim Berners-Lee, emerged from the IETF in 1994 as "an industry consortium dedicated to building consensus around Web technologies," and so to developing vendor-neutral standards for the World Wide Web. Its role is comparable in many ways to that of the IETF, but it is structured around formal organisational membership arrangements and full-time technical staff.
Website: www.w3.org

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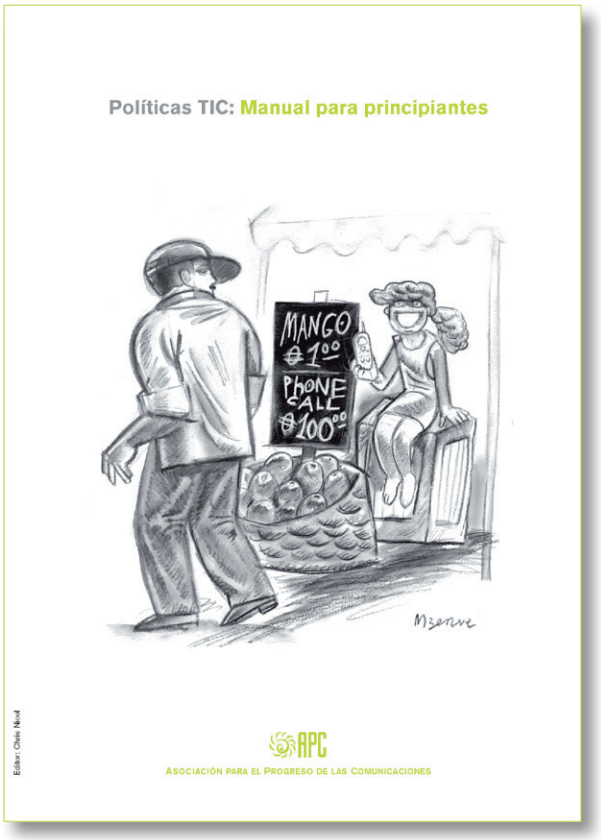
About the publisher – the Association for Progressive Communications

APC's mission is to empower and support organisations, social movements and individuals in and through the use of information and communication technologies (ICTs) to build strategic communities and initiatives for the purpose of making meaningful contributions to equitable human development, social justice, participatory political processes and environmental sustainability.

APC's strength lies in the fact that we don't get excited about technology for the technology's sake. We are committed activists who want to use it to make the world a better place.

We help people get access to the internet where there is none or it is unaffordable, we help grassroots groups use the technology to develop their communities and further their rights, and we work to make sure that government policies related to information and communication serve the best interests of the general population, especially people living in developing countries.



In 2003, APC launched our first ICT policy handbook "for beginners" to critical acclaim. ICT policy was a relatively new area and very few really understood what was actually involved. The APC handbook was the first comprehensive guide for non-technicians. We are delighted to be publishing an entirely rewritten second edition free and online for anyone to download.