Information society : agenda for action in the UK : report / Select Committee on Science and Technology.

Contributors

Great Britain. Parliament. House of Lords. Science and Technology Committee.

Publication/Creation

London : HMSO, 1996.

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HOUSE OF LORDS

SESSION 1995–96
5th REPORT

SELECT COMMITTEE ON
SCIENCE AND TECHNOLOGY

INFORMATION SOCIETY:

AGENDA FOR ACTION IN THE UK

REPORT

Ordered to be printed 23 July 1996

LONDON : HMSO

£14.40

HL Paper 77

22501831051

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INFORMATION SERVICE
12 SEP 1996
Wellcome Centre for Medical Science
WA
HOUIL
8849.

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FIFTH REPORT

23 July 1996

By the Select Committee appointed to consider Science and Technology.

ORDERED TO REPORT

INFORMATION SOCIETY: AGENDA FOR ACTION IN THE UK

CHAPTER 1 INTRODUCTION

PREFACE

1.1 This report, which is the first Select Committee report from either House of the United Kingdom Parliament to be published electronically,[1] is about one of the most important technological developments of this century. Directly or indirectly, the digital and communications revolution will affect us all. Previous studies[2] have focused on the infrastructure which will be needed to build the Information Superhighways[3] in the UK. As the physical infrastructure develops, the focus of attention needs to move on to what the superhighways will carry. Our enquiry concentrated on the applications of the superhighways in society. For the purposes of the enquiry we took the term Information Superhighway to mean a publicly accessible network capable of transferring large amounts of information at high speed between users. The terms of reference of the enquiry are printed in Appendix 3 below.

1.2 The report is divided into six chapters. Chapter 1 discusses the technology behind the development of the information superhighways, and the infrastructure in the United Kingdom. Chapter 2 discusses national information infrastructure policies. Chapter 3 discusses some of the approaches which other countries, and the European Union, are adopting to the Information Superhighways, with a view to seeing what lessons the United Kingdom can learn from these international perspectives. It also outlines current parliamentary developments, including those in the House of Lords. Chapter 4 discusses the views of witnesses. Chapter 5 discusses the Opinion of the Committee and its key recommendations.

1.3 Our most important recommendations are repeated in Chapter 6, which outlines a 40-point agenda for action in the UK. Our recommendations include the setting up of an Information Society Task Force in the UK, similar to that which has operated successfully in the US. We recommend fundamental changes to the regulatory framework. We recommend specific actions to be taken by Government, including the promotion of electronic publishing to facilitate widespread access to Government publications. We also make recommendations on the subjects

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1 The Internet reference is http://www.hmsoinfo.gov.uk/hmso/document/inforsoc.htm
The Committee's e-mail address is as follows: hol.science&tech@parliament.uk

2 Particularly, in the parliamentary context, the Report by the House of Commons Trade and Industry Committee on *Optical Fibre Networks* (HC 285–I, Session 1993–94, July 1994).

3 The term 'superhighway' was used by the US Vice-President Al Gore to describe an infrastructure by which information could be transmitted electronically. The principal feature distinguishing a superhighway from existing telecommunications networks was that it should be capable of handling the two-way delivery of text, pictures, sound and video (ie multimedia).

of universal access; education; health care; environmental benefits; electronic publishing and archiving; encryption and verification; and grants.

1.4 Our enquiry lasted for five months, beginning at the end of January 1996, during which we heard 16 formal sessions of oral evidence. We also received a large number of written submissions for the enquiry. The Committee took evidence on the state of development of the information superhighway in the United Kingdom and the rest of the world, and paid particular attention to the barriers to be overcome *en route* to the creation of an Information Society. We concentrated on services and applications, how the information superhighway could and should be used, the impacts which are likely to result, and the role to be played by Government. Central to the role of Government were the themes of leadership, promotion and inward investment, standards and compatibility, security of payment, access to Government information, verification of information, and regulations including copyright law, data protection, confidentiality and censorship. The enquiry also took a broad-based approach and considered all of the above in relation to the following main sectors: public information, commerce, finance, education, industrial training, health, social services and entertainment. We are grateful to everyone who helped with our enquiry, including those who submitted formal evidence, who are listed in Appendix 2. Most of the oral and written evidence has been published in two volumes which are available separately from this report.

1.5 The Committee carried out a number of visits, which convinced us that the technology needed to build the Information Superhighways already exists in the UK. Two members visited NYNEX cable communications company. The minutes of the Committee's visits to the British Telecommunications (BT) and Nortel Technology laboratories are printed in Appendices 5 and 6. The minutes of our visit to Acorn Online Media, St Matthew's Primary School and Netherhall School in Cambridge are printed in Appendix 7. We also visited the computer department at University College London, for a demonstration of video-conferencing using Super-JANET[1] and the Institute of Physics for a demonstration by Institute of Physics publishing. In addition, the Committee visited Boston (Massachusetts), Washington DC and Raleigh (North Carolina). The minutes of our US visit are printed in Appendix 8. We acknowledge our thanks to all who helped arrange these visits, and for the large amount of information which was provided during them.

Introduction

1.6 The world is undergoing a technological revolution and entering the age of the Information Society. The combination of information technology and high speed communications is breaking down the traditional barriers to the movement of information (distance, location, time and volume) at an unprecedented rate. Information technology is becoming widely accessible and as a result a vast new range of applications and opportunities is arising. As the Bangemann Report[2] said "this revolution adds huge new capacities to human intelligence and constitutes a resource which changes the way we work together and the way we live together". The potential technological, economic, and social upheavals resulting from the information revolution could be of the same order of magnitude as those arising from the shift away from an agricultural to an industrial economy.

1.7 Although the information superhighway is only one component in the move to an information society, it is as important to the movement of information as dual carriageways and motorways are to the movement of cars. The information superhighway thus has a central role to play in the new information revolution and as such it was taken as the starting point by the Committee. For the purposes of this enquiry we have defined the information superhighway as a publicly accessible network capable of transferring large amounts of information at high speed between users. This broad definition transcends the physical nature of the technology employed.

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[1] Appendix 4 contains a list of acronyms.

[2] *Europe and the Global Information Society. Recommendations to the European Council* by the High-Level Group on the Information Society (26 May 1994).

1.8 The most public face of the information superhighway of the future is the Internet, which is a global network of computers linked mainly via the telephone system and the academic, research and commercial computing networks. The Internet is a fledgling superhighway network which is limited by the rate at which the network components can transmit and handle data. The Internet is not a genuine superhighway because it does not offer the basic capability of two-way real-time video transmission and interactivity. It is, however, widely available and highly functional as an information exchange and electronic mail service. The Internet also provides a useful prototype from which a full information superhighway might evolve. Part of that evolution has been the development of a user-friendly interface in the form of the World Wide Web (WWW). The WWW only became a functioning part of the Internet in 1990 but the growth in the number of computer hosts[1] connected to the Internet since then has been exponential: a few tens of thousands of hosts in the late 1980s, one million hosts by 1992, three million by 1994, during 1995 the five million host mark was passed[2] and in January 1996 the world total was 9,472,224.

TECHNOLOGY

1.9 A key reason for the rapid growth in Internet use has been the ease of use of the World Wide Web (WWW). The WWW allows access to a global network of computers by millions of people with no formal training in computer technology. "Surfing the net"—moving from one part of the network to another—has already become a popular leisure activity, displacing television viewing.[3] It is not necessary to learn a series of difficult commands, nor to understand the highly complex technology which lies behind it, and which is outlined in the following paragraphs.

1.10 The first important step in the route towards the modern Information Society and the information superhighway was the ability to represent data in digital form as binary digits (or bits).[4] These bits could then be stored electronically, and be transmitted either as electrical or light pulses over a physical network or by broadcast signals between sites. Almost all sectors involved in information in some form (including the broadcast media, music industry, telephony, photography and film making) are now converging on digital technology. Digitisation allows text, images, sound and graphics to be stored, edited, manipulated and interacted within the same format, and this in turn has led to the development of the multimedia industry. Access to huge volumes of digital information is already available through the use of compact discs (CDs, and CD-ROMs[5] for computers) and other digital storage media. Transmitting this information from one site to another, or gaining remote access to information available elsewhere is the critical next step in the development of the Information Society.

1.11 Digital data are already transmitted over traditional telephone lines (a pair of twisted copper cables with a standard capacity of about 64 Kbits per second (64 Kbit/s)) although the rate of transmission is slow, and it is often slowed down even further by the rate at which many computer modems work and by the amount of traffic carried. The telephone network is thus often described as being 'narrow band' because of its limited capacity. The telephone network does, however, have the advantage of being the most widely available network (in the United Kingdom and around the world) over which information in digital form can be transmitted. An improvement on this is ISDN (Integrated Services Digital Network) which is a digital service standard that can effectively double the 'bandwidth' (transmission rate) of a copper twisted-pair connection over distances of up to a few kilometres. ISDN also permits direct connection of a personal computer

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[1] A host is a computer or computer system providing a service to users (e.g. storing World Wide Web pages) over a network.

[2] Data on Internet hosts from *The Economist*, 1 July 1995.

[3] Nicholas Negroponte, *Being Digital* (paperback edition, 1996), p 58, estimates that "by the year 2005 Americans will spend more hours on the Internet (or whatever it is called) than watching network television."

[4] A bit is a single binary digit (1 or 0), two to the power ten bits (approximately one thousand bits) is a kilobit (Kbit), two to the power of twenty bits (approximately one million bits) is a megabit (Mbit), and one gigabit (Gbit) is ten to the power nine bits (one thousand million bits). For comparison one second of a fax transmission might contain 64 Kbits, and one second of broadcast quality TV around 140 Mbits.

[5] Compact Disc Read Only Memory.

to the telephone network using an ISDN terminal adaptor. The greater bandwidth (128 KBit/s) makes ISDN suitable for rapid transmission of text, data, voice and still images.

1.12 The transmission of moving images (e.g. video and television pictures) is considerably more data-intensive and requires a different set of solutions: either alternative physical connections (e.g. fibre optic or coaxial cables), and/or digital compression technology (see below). The term 'broadband' is used to describe a network infrastructure capable of carrying information in any format (e.g. video, images, sound and text) and having the capacity for two-way flow of this information (and thus interactivity) in real-time.

1.13 Copper coaxial cables (e.g. those used for TV aerial connections where a solid inner conductor is surrounded by a dielectric[1] and a tubular outer conductor) are capable of carrying broadband signals at least over a few kilometres before signal attenuation becomes a problem. Coaxial cables are currently used by cable television companies to deliver at most a few tens of standard (analogue) television and radio channels to their customers. With digital signals and compression the number of channels available could be significantly higher. The coaxial cables are not, however, being used for two-way interaction. This is provided to a limited extent by using phone lines (usually installed along side the TV cable) as the return path of information to the cable company (with a modem if a PC is involved in the interaction). A full 'symmetrical' return path via the coaxial link, to allow the user to send a video signal of good quality, would require the user to have the use of a cable modem. In the United Kingdom the Joint Academic Network (JANET) which links university and other higher education sites is based on coaxial cable and twisted-pair technology. Data transmission rates over JANET range from 9.6 Kbit/s to 2 Mbit/s where the network has been upgraded.

1.14 The greatest capacity for rapid data transmission lies with optical fibres. These are fibres made from high purity glass with a high refractive index core and a lower refractive index sheath. Data are transmitted along the fibres as high frequency pulses of light and the fibres operate because there is total internal reflection at the interface between the core and sheath.[2] The fibres are cheap to produce, can operate in the Gbit per second range, and suffer little signal attenuation over long distances. The only drawback to their widespread use is that of the optoelectronics required for the interconversion of electrical and optical signals. At present the optoelectronics are both complex and expensive.

1.15 With digital compression technology the volume of data which can be transmitted over a network can be greatly increased. Software is used to reduce the data required to represent the information, for example by recording changes in the information rather than every item of data. With this technology it is possible to compress a video-quality signal into about 2 Mbit/s and broadcast quality TV signals into about 6 MBit/s. The technology of digital compression and the way in which the data are sent over networks is advancing rapidly and it is now possible to achieve limited broadband capabilities with a twisted-pair connection. The table below is reproduced from the House of Commons Trade and Industry Committee report on *Optical Fibre Networks*, HC 285–I, Session 1993–94, July 1994 and lists the bandwidth capabilities of various cables using digital transmission, at that time. During the Committee's visit to British Telecommunications' (BT) research and development laboratories at Martlesham Heath,[3] we were shown that the bandwidth of a twisted-pair cable could now be increased to 25 Mbit/s over 1 km, thus offering the possibility of multiple broadcast-quality TV channels being made available (and two-way broadband interactivity) over the existing telephone network.

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[1] A dielectric is an insulator. In coaxial cables air or plastic is usually used as the dielectric.

[2] Definition from *The Larousse Dictionary of Science and Technology*, 1995.

[3] See Appendix 5 for the minutes of the visit.

Table

Approximate bandwidth of different cables using digital signals (July 1994)

Type of cable	Over 1 km: Mbit/second	Over 3 km: Mbit/second	Over 10 km: MBit/second
Twisted-pair (copper)	6	2	0.5
Cable TV coaxial	1000	150	25
Optical fibre	>10,000	>10,000	>10,000

1.16 In addition to digital compression the way in which data are transmitted over a network affects the nature of information (low or highly data intensive) that it is possible to send. Most types of information (including computer data) do not need to be sent in a continuous stream and instead can be sent over a network in short packets: the technology is called packet switching. Telephone conversations, for example, customarily include pauses that are long in relation to the time scales of packet switching and this opens the possibility of transmitting a number of different data streams at the same time. The network exchanges direct the addressed packages of information from many users along a single inter-exchange cable and then onto the appropriate receiving users. The advantage of this is that space over the network cable connections is not being wasted during the pauses when a computer is processing the information that it has received. A refined version of this technology is called Asynchronous Transfer Mode (ATM). The ATM standard uses data packets of uniform size to guarantee a transmission rate for the connection and this makes it possible to packet-switch high data-intensity information such as real-time video pictures. The packets used in ATM are 53 characters[1] long: the first five contain the address information and the remaining 48 are the data.

1.17 Access to the prototype information superhighway is at present through computer terminals and, in some places, interactive television connections. These are principally at academic and research institutions, business locations and, increasingly, at schools and in the home. Although the equipment required is becoming more widely available and cheaper, the present distribution of access has the potential to polarise the population into technology 'haves' and 'have nots'. The predominant interface with the information superhighway is currently the personal computer and this in itself may be sufficient to alienate many potential users. A consortium of companies has announced their collaboration to develop low cost, user-friendly interfaces, based on the television set. A key feature of these user-friendly developments is that only limited computing power is needed in the interface device. The main computing requirements (e.g. processing, and data storage) are carried out by very powerful computers serving a local area and the user connects to these computers via a network (so called network computing). If the connection between the user device and the main computer serving the network is broadband then network computing has the potential to be as fast and powerful as using a personal computer directly.

Information superhighway infrastructure in the United Kingdom

1.18 In the United Kingdom the basic infrastructure for the information superhighways of the future is expanding rapidly with major investments being made by telecommunications operators, with cable companies currently taking the lead.[2] At present, the sheer volume of traffic for some

[1] 424 bits.

[2] An excellent review of the United Kingdom infrastructure for the information superhighway can be found in *Information Superhighways: the UK National Information Infrastructure*, a report by the Parliamentary Office of Science and Technology (May 1995). The subject was also covered in depth by the House of Commons Trade and Industry Committee in *Optical Fibre Networks* (HC 285–I, Session 1993–94).

services and applications (e.g. access to the Internet) is a major problem, and the data transmission rates that are generally available over standard (twisted pair) telephone lines make downloading of pictures and video slow or impractical during much of the day. A wider use of optical fibres and copper-based links with digital compression technology could alleviate some of these problems. At the high bandwidth end of the spectrum in the United Kingdom, nearly 90 sites (mostly universities) are now linked to a greatly enhanced version of the Joint Academic Network (JANET) known as 'Super-JANET', and it is anticipated that all universities in the United Kingdom will be connected to this network over the next three years. Super-JANET uses optical fibres and state of the art digital switching technology to offer two services: a 34 MBit/s service for text and data with limited video and voice capability, and a service being up-graded to 155 MBit/s (and possibly to 2,480 MBit/s in the future) for carrying real-time interactive video and voice traffic in addition to text, data and images. Six institutions in Edinburgh have already taken the lead in developing a 'Metropolitan Area Network' to link all their sites across the city, and give them access to Super-JANET. There are also plans to extend the network to local schools, colleges, libraries and the national museums of Scotland.[1]

1.19 The Department of Health recently announced that it had awarded major contracts to British Telecommunications (BT) and Mercury to provide the health service with its own dedicated broadband superhighway. The network would be fully interconnected allowing traffic between General Practitioners, hospitals, dentists, and Health Service Authorities etc. within and across regions. Access would also be possible to news and bulletin boards, national and international databases, central libraries, the Prescription Pricing Authority, and the Central Register. Similar 'intranets' are now also being installed by many companies and Government Departments.[2]

1.20 Separate from the academic and sector-specific superhighways are networks currently being laid for domestic use, principally by cable companies. These networks use a hybrid of all three cable transmission media: typically optical fibre from the cable company to local distribution nodes, coaxial cable into the home and, in many cases, a traditional copper cable providing a telephone service. As discussed in the previous section this telephone link can also be used for a narrow band return signal to the cable company. Broadband return communications are not yet available,[3] but if public demand for high quality video-telephones increased then this would almost certainly change.

1.21 The most extensive fibre optic networks in the United Kingdom belong to the telecommunications companies. In addition, ISDN connections have been made to over 8,000 business premises, but the cost of the terminal electronics, which until recently was high, has made the take-up rate of ISDN connections to the home much lower in the UK than is the case in Germany, for example. Because of telecommunications regulations set out in 1991, BT and the other national telephone operators are restricted in the services they can offer: they cannot convey broadcast entertainment until at least 1998, when the situation may be reviewed; and they cannot provide their own broadcast entertainment services (e.g. video on demand) until at least 2001. From April 1994, however, the national public telephone operators (including BT and Mercury) have been allowed to own cable TV franchises. A Command Paper on 'Creating the Superhighways of the Future'[4] said: "If these companies bid successfully for new LDO [Local Delivery Operator] licences, the Government will also be prepared to issue these companies with Telecommunications Act licences which enable them to supply entertainment services within the franchise areas".

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1 *Times Higher Education Supplement*, 10 March 1995.

2 In the USA, however, the Committee heard that companies would rather use the Internet for long-distance network use instead of installing their own networks - and thus adequate encryption was required to make the Internet secure (see Appendix 8).

3 Two-way broadband communication trials are underway in the United Kingdom and the Sub-Committee visited what claims to be the world's largest public trial of the technology in Cambridge, England. See Appendix 7 for minutes of the visit.

4 "*Creating the Superhighways of the Future: Developing Broadband Communications in the UK*" Cm 2734 November 1994.

CHAPTER 2 NATIONAL INFORMATION INFRASTRUCTURE POLICIES

2.1 In 1994 in the European Union (EU), the telecommunications industry had a turnover of 133 billion ECU, and employed 1.2 million people; the hardware and software industries had a turnover of 113 billion ECU and employed one million people; whilst the information content industries had a turnover of 150 billion ECU and employed two million people. Any National Information Infrastructure (NII) depends on the successful development and implementation of four different economic sectors; telecommunications, hardware and software, and content. There are potential disadvantages, for example, in having an outstanding British telecommunications infrastructure if the hardware, software and content industries are dominated by other countries. It has been argued that the European Commission's pioneering work to develop a Europe-wide packet switching network (EURONET) in the 1970s merely resulted in greater exports of US information content to Europe and the subsequent relative decline of the European information content industry.[1] This was because the European Commission had no policy in place at that time regarding the development of information content. The need to take due regard of the needs of all four sectors is a key theme of this Report.

2.2 An NII policy can have two major effects on the economy. First, it affects the growth of the information industries themselves. These include the semiconductor and computer hardware industries, the software industry, the publishing (both traditional and electronic) industries, and the telecommunications and broadcasting industries. These industries account for an important proportion of British GDP and GNP. For example, it is predicted[2] that the IT, electronics and communications sector will account for 10 per cent of United Kingdom GDP by 2005. Indigenous development of such industries means that we have at our disposal access to the tools and services required to exploit electronic information resources effectively.

2.3 Secondly, and arguably more important, policies can be implemented which determine the extent to which all sectors of the economy and society use electronic information resources. Effective information exploitation, within both the public and private sectors, can have a significant multiplier effect on the economy as a whole. This is recognised for example by the European Commission whose 1993 White Paper stated that "the wealth of nations is increasingly based on the creation and exploitation of knowledge". Similar statements are to be found in the US National Information Infrastructure's *Agenda for Action* and Singapore's policy document *IT2000*.[3]

2.4 There are many ways in which information policies can be classified.[4] One can distinguish the policies by the audience they are meant to affect (central government, local government, the health service, manufacturing industry, citizens, etc.) This is the approach taken by Moore and Steele.[5] Alternatively, one can divide policies into the type of instrument used to make them happen. Using this approach, six policy approaches can be identified:

(i) Legislation: the passing of specific legislation which directly or indirectly impinges on information handling and the information industries, for example data protection, computer misuse, defamation, freedom of information and copyright legislation.

(ii) Regulation: policies that determine the degree and form of regulation that will be applicable to particular industries or a range of commercial activity. Regulation is

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1 B Mahon, Developments in European Information Policy, *Perspectives in Information Management*, (1989) 1, 63-88.

2 Technology Foresight Panel.

3 For which see paragraphs 3.4 and 3.21 below.

4 For general background, see V Montviloff, *National information policies: a handbook on the formulation, approval, implementation and operation of a national policy on information* (UNESCO, Paris (PG1-90/WS/11) 1990) and M W Hill, *National information Policies and Strategies* (Bowker Saur, 1994).

5 N Moore and J Steele, *Information Intensive Britain* (Policy Studies Institute, 1991).

particularly associated with, for example, the telecommunications and broadcasting industries, and with the development and implementation of standards.

(iii) Infrastructure development: this can range from the development of national and international telecommunications infrastructures, to the encouragement (through for example fiscal policy or direct subsidy) of particular information industries such as the software industry.

(iv) Service provision: policies here range from issues concerned with the development and delivery of government information resources to policies that encourage the private sector to exploit government information resources, or develop new information services. There can also be policies in place to encourage the public and private sectors and citizens to use electronic information.

(v) Education policies: these are necessary to ensure a supply of professionals to develop or exploit information resources. Other policies could include those to develop a more general information literacy and ability to manipulate information resources among the population as a whole.

(vi) Cultural information policies: these relate to the preservation, dissemination and protection of a nation's culture and include policies relating to national libraries, public libraries, museums and broadcasting. Such policies need to take into account the growing importance of electronic information.

2.5 The development of a NII can only take place in co-ordination with similar developments in other countries. Electronic information travelling along telecommunications networks is no respecter of international boundaries, and is rarely affected by the niceties of differences in local laws and regulation. Increasingly information is transmitted internationally, and much of the traffic is created or received by multinational organisations. All of this reflects the globalisation of information activities. It is therefore essential that the United Kingdom maintains its cognisance of developments elsewhere; plays its full part in developing the policies needed in international fora; and resists any temptation to develop national policies that are incompatible with policies and consensus developing around the world. These issues particularly affect areas such as copyright, pornography, defamation, technical standards, the protection of cultural heritage, and transborder data flows, but potentially cover any policy area. Increasingly, the European Commission is actively developing its information policy. For example, in September 1996 a Commission Green Paper is expected on access to information (Freedom of Information). This Green Paper is likely to influence the debates in this country on this topic.

2.6 Government is probably the biggest collector, analyst, provider and disseminator of information in the United Kingdom. The extent to which government adopts computing and telecommunications technologies to handle this information will affect the overall efficiency and effectiveness of government. Governments are major procurers of information technology products and services and therefore potentially wield influence in the market place. Governments can set an example to other sections of the community by becoming leading edge technology users, introducing electronic procurement procedures (thus facilitating the development of electronic commerce), becoming major purchasers and users of electronic information, becoming significant providers of information on the World Wide Web, or requiring adherence to national and internationally backed standards such as Open Systems Interconnection (OSI). The European Union places particular emphasis on the adoption of standards and recognises that the interoperability and interconnection of networks between the administrations of each Member State will be a significant mechanism for the long term integration of the Community as a whole.[1]

[1] Commission of the European Communities, *Europe's way to the Information Society: an action plan*, COM(94) 347 final.

2.7 A second area of policy relating to government information is in the provision of such information to the public. Key questions that such a policy must address include: what information does the public want? By what means can it be distributed? How can everyone who needs access have access to this information? Many countries have placed government created information on the Internet, especially on the World Wide Web. In the United Kingdom, the policy has been cautious.

2.8 A third area of policy relating to government information concerns the extent to which government information resources are, or should be, available for third party exploitation. There can be a policy dichotomy, something which is not at all unusual in information policies. First, the Government wishes to encourage the development of the tradeable information sector by allowing the private sector to exploit government information resources through policies to encourage this synergy between the public and private sector. The European Union is particularly keen that such synergies should be developed amongst all Member States. Secondly, the Government wishes to exploit the information for itself, using any income generated to offset the costs of running Government.[1] Thirdly, there is an argument that government information is the property of the taxpayers who paid for its collection and that the Government is under a duty to provide this information equitably, at a fair price (and possibly free of charge and of copyright) and efficiently to the public at large. These three approaches are clearly incompatible, and any policy must represent a compromise between them.

2.9 A final area of policy about government use of information is the question of electronic democracy. Whilst current developments have the ability to empower individuals to make better economic decisions, to undertake lifelong learning, etc., there is an implication that the citizen or consumer will simply be a passive recipient of information passed to him or her. Many observers argue that untrammelled development of the information society along free market lines is unlikely to result in individual empowerment, as both information and the method of communicating it could be left in the hands of the private and public sector elites. There is increasing interest by governments world-wide, led by the USA and Canada, in how electronic information and the telecommunications networks for its distribution can be employed to extend participation of citizens in the democratic process at local, regional, national and supranational levels. This participation can be enhanced by the provision of materials produced by Government in electronic format to those citizens with ability to access it in this way (with the concomitant continued provision in print form for those who do not) combined with electronic mail (e-mail) facilities to permit citizens to communicate with legislators and decision makers at all levels of Government. New technologies offer the potential for electronic voting systems, increased participation of the electorate in decision making and in debating issues, direct e-mail access between elected and electors, and improved access to public records of all kinds.[2]

Telecommunications and Broadcasting

2.10 Over the past decade the telecommunications industry has become one of the most dynamic industries world-wide. The telecommunications sector can be divided into a number of distinct markets, for example, customer premises equipment, the network itself, value added network services and mobile communications. Telecommunications policy is primarily directed toward issues connected with the development of the telecommunications infrastructure and with the regulation of the different market sectors that comprise the overall telecommunications industry. In the United Kingdom the regulatory regime has changed significantly in recent years, and a

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[1] There is an argument that the increase in Government revenues through taxation which could result from increased economic activity resulting from a policy of abolishing Crown Copyright would exceed the loss of revenues to Government from the exploitation of Crown copyright. It is worth noting that in the USA, where Government has put information free of charge (and free of copyright) on the Web, and the same information is available in added value form from a commercial supplier, also on the Web, the number of accesses to the commercial pages far exceeds the free accesses. (Evidence from EDGAR, the US equivalent to Companies House data).

[2] See, for example: D Ward, *Rewiring democracy: the role of public information in Europe's information society* Mclellan Ward Research, 1995; G Allen, come the revolution, *Wired (UK)*, September 1995, 46–47; and J Roche, *Politics and the Internet*, Bow Group, 1995.

number of policy documents have reflected the Government's thinking about the future shape of the telecommunications industry.[1] In particular, since 1984, when the Telecommunications Act was passed, the UK telecommunications industry has been liberalised.

2.11 Competition has resulted in improved service, price reductions and a range of new telecommunications products and services for both business and domestic users. The power of corporate users has increased as they now have choices in what equipment, services and network carrier to buy or use. The telecommunications infrastructure is now clearly the province of the private sector. The US, Japanese and European Union plans to develop information superhighways emphasise this point and there is international competition between rival alliances of telecommunications companies as they seek to develop global networks.

2.12 Technological advances in cable and satellite mean these can be used for a wide range of services as well as television. Coaxial and fibre optic cabling give broadband systems the capability of carrying large numbers of channels and opens the possibility of introducing a wide range of interactive services to the home and to businesses. These technological trends pose new issues for policy makers to contend with.

2.13 Policy in this area is also characterised by debates about media ownership. The mere presence of legislation and regulations on this subject implies that the Government believes that newspapers and television are so powerful in forming opinion that their ownership has to be carefully restrained. This principle appears to be applied to all forms of media, including radio, terrestrial television, cable and satellite as well as newspapers. As information sources converge, mergers, take-overs and consortia will become more commonplace among all forms of media. In the past, the lines of demarcation among different media types were clear but technological changes are increasingly blurring the boundaries and forcing a review of the issue.

Supporting the Development of Electronic Information Services

2.14 One of the most important ways by which the government can influence information policy is by means of the explicit or implicit support it gives to the United Kingdom's information industries. Information industries are usually taken to encompass print publishing, multimedia publishing, electronic publishing, databases,[2] online hosts,[3] audiotex services, consumer online services,[4] videotex services and other value added information services which supply information to satisfy personal, business or professional needs. For the purposes of this discussion, they do not include software and hardware manufacturers and suppliers, television broadcasters, the mass media or computer games suppliers.

2.15 The United Kingdom print publishing industry is well established, and although not without its difficulties, such as the extremely fragmented nature of the industry, and the challenges of new technology, it is generally left by Government to fend for itself. The electronic information industry, in contrast, has been, and in many countries still is, the subject of implicit or explicit assistance from Government. This assistance can take a number of forms. It can involve: one off, or ongoing subsidies to online hosts; policies to ensure that government created information is free of copyright[5] and therefore can be exploited widely; setting up or subsidising information services aimed at Small and Medium Enterprises (SMEs); promoting the importance of information; training people to use and exploit electronic information, starting in schools; an obligation on government departments to offer their information to the electronic information industry for licensing; funding

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1 See, for example, *Competition and Choice: Telecommunications Policy for the 1990s*, HMSO, 1991, Cm 1461, and *Creating the Superhighways of the Future: Developing Broadband Communications in the UK*, HMSO, 1994, Cm 2734.

2 Such as scientific and professional databases, e.g. those produced by the Institution of Electronic Engineers and the Royal Society of Chemistry.

3 Such as the FT Profile or Blaise-Line.

4 Such as CompuServe and Europe Online, both of which have United Kingdom offices.

5 The term "free of copyright" is used here to mean that copyright does not exist in relation to these works.

for research in library and information science: subsidies to assist database producers: the development of policies to encourage use of the Internet; or an obligation on Government to make maximum use of commercial electronic information services internally.

Privacy and Data Protection

2.16 Data Protection laws regulate how personal information, i.e. that relating to individuals, may be collected or processed, and it gives those individuals certain rights to inspect records relating to themselves, to demand that errors be rectified, to sue if errors have caused them damage and, in some countries, to object to the processing of data about them. The European Community recently passed a Directive on Data Protection[1] which will require significant adjustments to current United Kingdom legislation[2] in this field. In particular, the Directive extends data protection to manual systems. In addition, it states that personal data shall be processed only if the data subject has given unambiguous consent, or for a few other clearly defined reasons, such as that the processing is necessary to protect the vital interests of the subject—e.g. medical records. The Directive requires that processing of sensitive personal data, such as trade union membership, health or sex life may not be carried out except under exceptional circumstances, and processing of information relating to criminal offences may only be carried out by official bodies. Under the Directive, the controller must supply a data subject details of the controller and the purposes for which the data are being collected. Other information may also have to be supplied. The data subject can object to any processing by a data controller on "compelling legitimate grounds". In addition, a data subject can object to data being used for direct marketing. The data subject can also insist that any third party to whom the information has been passed is informed of any amendment or erasure, unless this is impossible to achieve or involves disproportionate effort. Transfers of data to countries with inadequate data protection legislation will be forbidden under the Directive, except under special circumstances. Whilst most of the provisions of the Directive are to come into force three years after its passage, i.e. 1998, some of its provisions have a longer timetable before they take effect. The Government is currently evaluating the implications of the Directive for United Kingdom legislation.

2.17 In a networked environment such as is envisaged in the Information Superhighway, the possibilities for tracing individuals' reading and viewing habits, financial transactions, and interests increase significantly. The European Commission has proposed a new draft Directive on data protection and telecoms[3] which would supplement the Data Protection Directive. Key areas include: data processing for billing purposes, itemised billing, privacy of callers and subscribers, call forwarding, recording of calls and unsolicited calls for promotional purposes.

Copyright

2.18 Developments in networks (especially the Internet) and other areas of information technology have exacerbated the well-established tensions between copyright owners and those who wish to use works subject to copyright. The copyright owner has the right to prevent others from making copies of, or doing certain other things, to all or a substantial part of the work without permission. There is a common misapprehension that material on the Internet is not subject to copyright. Just because it is widely available free of charge does not, however, change the legal position.

2.19 Copyright law has changed over the years in response to technological changes. Copyright attempts to satisfy both the wish of users to have simple and easy access to information, and the wish to protect the commercial and other interests of the creators (or their representatives, the publishers). A networked environment gives users access to large quantities of material for inspection, downloading, printing and redissemination. However, the ease with which people can

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[1] Directive 95/46/EC of the European Parliament and the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

[2] Data Protection Act 1984.

[3] COM(94) 128.

copy and forward electronic data puts traditional copyright law under strain. The ability to manipulate and amend materials also leads to potential infringement of moral rights.

2.20 The copyright owners have responded to these problems in two ways. On the one hand, they are relying on the development of technical mechanisms, such as ECMS (Electronic Copyright Management Systems) to log peoples' use of copyrighted material and to control what they can or cannot do with it for viewing it, printing it, downloading it or forwarding it. On the other hand, they are pressing governments to update copyright law to make browsing on screen and transmitting over a network without permission infringement, and/or to abolish defences such as fair dealing in a networked environment. Electronic Copyright Management Systems are already starting to appear.

Public and National Libraries

2.21 Public libraries are a key resource for the general public, allowing access to information they need to fulfil their professional and personal ambitions and priorities. At a time of increasing costs, particularly for access to networked information services, there is debate on what public library services should be offered free and what should be charged for. This is exacerbated by the trend towards electronic information. If users have to pay for electronic access to what they hitherto received freely in print form, they will question whether they need that information at all, and their usage may decline dramatically.

2.22 There are concerns about an increasing gap between "information rich" and "information poor".[1] The idea of Internet access in public libraries to help narrow this gap in the United Kingdom has entered public debate following Labour Party statements[2] referring to this idea, and the bid by the Library Association to obtain Millennium Funding for such a project. Much of the work of public libraries and the Citizens' Advice bureaux is assisting the information poor obtain the information they need on such matters as welfare rights and health questions. If this information is only available electronically, and is charged for, the gap will widen. Access to the information superhighway through public libraries could provide citizens with equitable and ubiquitous access; access that is affordable; access to government information; training and assistance locally; and access to information worldwide.

2.23 The role of the British Library and the other National Libraries,[3] together with the other legal deposit libraries[4] is central to the entire United Kingdom library and information system. Their role will become increasingly international, allowing researchers world-wide access. These libraries, taken together, are the major depository of the cultural, scientific and technical heritage of this country, and are a key resource for academic and scholarly research in all disciplines. These libraries are also key players in conservation policy. One of the most important facets of their role is the legal deposit system. Increasingly, however, material is no longer produced in print form, but is only available in machine readable form, or else is available in both forms in parallel.

2.24 Some countries, such as Norway, have introduced legislation to ensure that machine readable data created in that country are also deposited with the national library. In other countries, such as the USA, a limited voluntary deposit scheme has existed for a while. There is already a real danger that some of the early machine readable materials have been lost. The question therefore arises of whether a national archive of machine readable data should be established. Such a policy would have major implications for the financial and technical resources needed to maintain, refresh and read such machine readable data. Selection policies would need to be developed, especially for peripheral material such as bulletin boards. Questions of who would be allowed access to such

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[1] T Haywood, *Info-Rich Info-Poor: Access and Exchange in the Global Information Society* (Bowker Saur, 1995).

[2] Labour Party, *Communicating Britain's Future* (1995), available on-line at http://www.poptel.org.uk/labour-party/

[3] Of Wales and Scotland.

[4] In the Universities of Oxford and Cambridge, and Trinity College Dublin.

a national archive would also need to be addressed, for example, could people gain access from a remote terminal, or would they have to visit the national archive.

CURRENT PROBLEMS INHIBITING INTERNET USE

2.25 The first problem is retrieval and navigation software. At present, the Internet is an anarchic mix of services and information, and it can be difficult for new users to find their way to what is required. There is a variety of software tools to assist. These search and retrieval tools are often slow and inefficient, especially in the afternoon United Kingdom time because of competition for computer resources from North American users and limited bandwidth.[1] These search tools may also produce results which are unusable, because the sites have changed their coverage, have moved, the information is only accessible to internal users at the sites, the same item appears several times, or the information has been mis-indexed. One potential solution to this problem is the development of "intelligent agents". These are programs operating within the networks that help users with their routine information tasks and take into account their personal habits and styles. Typical tasks performed would include filtering electronic mail, undertaking searches in an intelligent manner, scheduling appointments, making travel arrangements, etc. Such agents would not just filter incoming information; they will actively seek out information they think their owner will need, and deliver it to the individual wherever he or she is. They will reformat the material they find to suit their user's computer facilities; they will carry out their actions pro-actively without waiting for instructions. They would also assess the urgency of incoming material and alert their patron accordingly. They would offer convenient user-friendly access to real time and historical information, sorting the output in order of relevance, whilst removing duplicates. Some experts have argued that there is a danger of "traffic jams" on the information superhighway because of the proliferation of intelligent agents. The information superhighway could end up as a gridlock, and international agreements may be needed to curb the proliferation of the agents.

2.26 The second problem, which is particularly acute for business users, is security. By its very nature, the Internet has been designed to be an open system for free exchange of materials. There is therefore the concern that if an organisation offers a WWW home page, or if an organisation has routine networked access to the Internet, third parties may then be able to slip across into other computer systems maintained in the organisation containing sensitive data.[2] Security issues include: potential virus infection; erasure of data or programs; third parties obtaining unauthorised access to a computer; taking of information, whether that involves physical removal or not; unauthorised use of computer time and facilities; malicious or reckless corruption or erasure of data or programs; use of computers to gain advantage to which a third party is not entitled, e.g. banking fraud; and unauthorised interception of communications between computers.[3] The area is not well covered by traditional legal ideas. Firewalls and other security measures should help prevent these problems, but there is uncertainty about how reliable some of the possible technological solutions are. Businesses are therefore attracted to the idea of using cryptographic techniques to make their material secure. However, the US government is anxious that certain third parties cannot communicate with each other without it being able to eavesdrop. Its stated concern includes the Mafia, terrorists, drug smugglers and money launderers. It has therefore banned the export of highly secure cryptographic softwares. The United Kingdom Government has stated that it recognises the need to balance the needs of business and individuals to have techniques to safeguard financial transactions and intellectual property, with the need to prevent encryption techniques hampering law enforcement. The inability to employ high quality cryptographic techniques at present will inevitably reduce the attractiveness of the Internet for commercial

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1 It has been reported that Yahoo, one of the WWW's search databases, is developing localised directories for the European market. The British directory, to be launched in summer 1996, will contain between 6,000 and 8,000 listings, with links where appropriate to the much larger US site. This will mean that, for example, looking up "government" on the British site will find Her Majesty's Government rather than the US; *New Scientist*, 15 June 1996, p 23.

2 See, for example, *Information Security and the Internet* (DTI, 1996) issued as part of the Information Society Initiative.

3 See, for example, I Lloyd, *Information Technology Law* (Butterworths, 1993).

purposes. The British Standards Institution (BSI) has issued a standard on information security.[1] The European Commission has recently published a Green Paper on encryption.

2.27 A related issue to security is verification. There is a need for both business and citizens to have confidence that the information or data they receive or transmit has indeed come from, or gone to, the person or organisation intended, and that it has not been altered or copied in transit. So-called digital signature techniques are already being used on the Internet to secure such transactions, but at present there are no standards, either *de facto* or *de jure*, for such techniques.

2.28 The fourth problem is that the quality of the information on the Internet is extremely variable. This is a problem which applies to all users of electronic information. This problem is compounded by constant addition and deletion of sources and sites. There is too much information, much of which is redundant or inaccurate. There is no centralised control on the Internet. The individual information providers themselves, often amateurs or academics rather than commercial organisations, decide what information is made available. Over time people will probably come to recognise the good sources and ignore the poor ones, and quality assessments, like a BSI kite mark, or the Automobile Association rating system for hotels, will mature.

2.29 The fifth problem is illegal and "undesirable" material. A number of news reports and studies claim to demonstrate that there is a considerable amount of undesirable material available on the Internet, and that some of this material is falling into the wrong hands. Although some of these reports have received wide publicity, prosecutions for handling such material on the Internet are relatively infrequent, and it is difficult to be certain of the exact scale of the problem.[2] What is clear is that much of the offensive material is created in countries, such as the USA, whose laws concerning freedom of information and traditions of free speech are more tolerant than in the United Kingdom. Screening software has recently been developed in response to this problem.

2.30 A related problem is legal uncertainty in the position of certain consumer online suppliers. Many consumer online services claim they are simply a "common carrier", and take no more responsibility for the potentially defamatory or pornographic content of the material placed upon their services than the Post Office takes responsibility for materials it delivers, or British Telecom takes responsibility for what transpires over a telephone line. The counter argument is that such consumer online services are in a position more akin to a shop that develops photographs for clients, and which accepts responsibility for the content of the photographs it develops, and may, for example, refuse to develop photographs that it considers may break the law.[3] The defences consumer online services currently have available may be crude and extreme, as shown by the CompuServe case in Bavaria. CompuServe withdrew a large range of its services from its entire European market for a period because of threatened legal action in Bavaria. Uncertainty in the legal position of consumer online services is causing anxiety, both amongst the services themselves and their clients.

2.31 The final problem is payment. The Internet has in the past been primarily associated with academics and researchers, but since the mid 1990s, it has been increasingly used by business.[4] However, commercial services, i.e. those that involve payment for goods or services, on the Internet will not become a major business until the issue of digital cash is resolved. Many adults do not hesitate to quote credit card numbers over the telephone, even though they know this information could be abused or the call intercepted. Many adults are happy to use an automatic

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1 BS7799 *A Code of Practice for Information Security Management.*

2 For example, although the number of accesses to newsgroups may be logged, there is no way of telling how many of the accesses, especially to the more notorious newsgroups which have received considerable publicity, are by researchers, journalists, consumer groups or politicians.

3 These issues are discussed fully in: H Kaspersen, "Liability of providers of the electronic highway", in Legal Advisory Board, *Convergence between telecommunications and audiovisual: consequences for the rules governing the information market*, European Commission DGXIII, 1996, pp 39–45.

4 Academics may no longer be the largest group of users of the Internet if the latest statistics on the number of e-mail and domain addresses with "com" or "org" in them rather than "edu" or "ac" in them are to be believed.

telling machine hole in the wall even though they are entering a password into a network that might be intercepted. Few adults so far appear to be willing to type in their credit card number on the Internet. The question is one of risk perception; peoples' fear of quoting a credit card number on the Internet may not be justified by the statistics, but it is real enough. What this means is that business on the Internet where money changes hands is far less than one might expect considering the numbers of people using the Internet. The work undertaken by companies such as Digicash in developing safe, robust and trusted methods of transferring money over the Internet is therefore crucial if the Internet is to be used for buying and selling information or other services or products. Other developers have been working on systems to protect financial transactions, and a number of products have already emerged. It may, however, be some time before this market reaches maturity and standards are agreed.

CHAPTER 3 INTERNATIONAL PERSPECTIVES

3.1 The importance of being able to learn from other countries' lessons in developing Information Superhighways projects and activities has been underlined by the establishment of the G7 Global Inventory Project, being led by the European Commission. In the United Kingdom the national inventory is being developed by the Central Computer and Telecommunications Agency (CCTA). Its professed aim is to "allow contacts to be established amongst the Information Superhighway community, to facilitate the exchange of information and experience, to avoid unnecessary duplication of work and to promote the development of UK information areas".[1] Australia, Canada, Germany, Italy, Japan and the United States also have a national inventory on the Internet. Until recently the Internet has been driven largely by North American and Western European interests. At the end of 1995 97 per cent of its users were based in the high-income countries which account for only 15 per cent of the world's population. This pattern is changing, however, and in October 1995 Internet connectivity was directly available in 96 economies world-wide and indirectly in 77 other countries.[2]

USA

3.2 The Internet started in 1969 as a research project by the US Defense Department's Advanced Research Projects Agency to allow its researchers to share computer resources. The network was then known as the ARPANET and was first demonstrated to the public at the first International Conference on Computer Communications in 1972, by which point 37 computers were connected. ARPANET continued to grow and in 1983 the military part of the network was separated off to create MILNET. The resulting system of networks became collectively known as the Internet. In 1986 the US National Science Federation (NSF) launched a plan to create a network linking its researchers to its supercomputer centres. The scope of the National Science Foundation Network (NSFNET) was widened to include the whole education community in 1987, and went on-line in 1988. NSFNET has continued to grow and has since been connected to networks introduced by NASA (NSINET) and the US Department of Energy (ESNET).[3]

3.3 In developing a unified and highly-articulated vision of a National Information Infrastructure (NII) as one of the key themes of the Clinton Presidency, the United States has positioned itself as the world leader of the Information Superhighways of the future. At present the United States enjoys dominant global positions both in the development of a NII and in the industries supporting it, from equipment provision, through service and network provision to content, and this is starting to have a pervasive effect both on the US society and its economy.

3.4 In September 1993 the US Administration published its Agenda for Action. This stated that the private sector would lead the deployment of the NII, but that the government had an essential role to play, in particular by complementing and enhancing the benefits of private sector initiatives. The Agenda for Action set out nine guiding principles and goals, as follows:

(i) "Promote private sector investment, through tax and regulatory policies that encourage innovation and promote long-term investment, as well as wise procurement of services.

(ii) Extend the "universal service" concept to ensure that information resources are available to all at affordable prices. Because information means empowerment, the government has a duty to ensure that all Americans have access to the resources of the Information Age.

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1 http://www.open.gov.uk/govoline/niphome.htm

2 Inter-Parliamentary Union Report of the Consultative Committee of Experts, *Use of Modern Computer Technologies, Such as the Internet, for Inter-Parliamentary Communications* (Geneva, 1 December 1995), p 2.

3 *Information Superhighways*, House of Commons Library Research Paper 94/133.

(iii) Act as catalyst to promote technological innovation and new applications. Commit important government research programmes and grants to help the private sector develop and demonstrate technologies needed for the NII.

(iv) Promote seamless, interactive, user-driven operation of the NII. As the NII evolves into a "network of networks", government will ensure that users can transfer information across networks easily and efficiently.

(v) Ensure information security and network reliability. The NII must be trustworthy and secure, protecting the privacy of its users. Government action will also aim to ensure that the overall system remains reliable, quickly repairable in the event of a failure and, perhaps most importantly, easy to use.

(vi) Improve management of the radio frequency spectrum, an increasingly critical resource.

(vii) Protect intellectual property rights. The Administration will investigate how to strengthen domestic copyright laws and international intellectual property treaties to prevent piracy and to protect the integrity of intellectual property.

(viii) Coordinate with other levels of government and with other nations. Because information crosses state, regional and national boundaries, coordination is important to avoid unnecessary obstacles and to prevent unfair policies that handicap US industry.

(ix) Provide access to government information and improve government procurement. As described in the National Performance Review, the Administration will seek to ensure that Federal agencies, in concert with state and local governments, use the NII to expand the information available to the public, so that the immense reservoir of government information is available to the public easily and equitably. Additionally, Federal procurement policies for telecommunications and information services and equipment will be designed to promote important technical developments for the NII and to provide attractive incentives for the private sector to contribute to NII development."

3.5 The White House formed the Information Infrastructure Task Force (IITF) to articulate and implement the Administration's vision for the NII. The Task Force consists of senior representatives of the Federal agencies which play a major role in the development and application of information and telecommunications technologies. Its Fact Sheet states: "working together with the private sector, the participating agencies will develop comprehensive technology, telecommunications, and information policies and promote applications that best meet the needs of both the agencies and the country. By helping build consensus on difficult policy issues, the IITF will enable agencies to make and implement policy more quickly and effectively." The Task Force operates under the aegis of the White House Office of Science and Technology Policy and the National Economic Council. IITF Committees have been established on Telecommunications Policy, Information Policy and Applications and Technology.[1]

3.6 The National Information Infrastructure Advisory Council (NIIAC) was established by President Clinton in 1993. It had 36 members, appointed by the Secretary of Commerce, including representatives of private industry; state and local governments; community, public interest, education and labour groups; creators and distributors of content; privacy and security advocates; and leading experts in NII-related fields. The NIIAC focused on defining the roles of the public and private sectors in building the NII; protecting intellectual property while serving user needs; generating strategies for developing applications in commerce, manufacturing, education, health care, government information and services, and public safety; maximising connectivity of networks; and issues of security. Documents released by the NIIAC include the *KickStart Initiative*, which

[1] The IITF's home page, which includes lists of committees and working groups, press releases and other documents and a calendar of events open to the public, is at http://iitf.doc.gov/

provides a blueprint for bringing technology's full benefits to schools, libraries and community centres, and *A Nation of Opportunity*.[1]

3.7 The National Information Infrastructure Virtual Library Home Page[2] has three purposes; to serve as the US entry point for the G7 Global Inventory Project; to help the public understand the benefits of the NII, demonstrating what is possible today, how it works and how it is evolving; and to collect and disseminate information about product development, research efforts and partnerships for NII-related developers. It includes a collection of online NII-related reports, over 1,200 links to other NII-related sites, examples of online government services information, links to academic and industry NII servers, an inventory of activities related to NII applications and links to standards activities.

3.8 The economic benefits of an accelerated deployment of an effective NII have been estimated in the US "Agenda for Action" as enabling productivity to increase by 20–40 per cent by the year 2007, resulting in an increased GDP of 194 to 321 billion US$. Sophisticated infrastructure has also helped to attract new businesses to particular locations, as has been the case in North Carolina, where the local Information Network has helped to attract high-tech companies to that State.[3]

3.9 The US Government has emphasised the job creation prospects offered by the Information Superhighways, and the benefits which they can offer the ordinary citizen. One example of this policy is the provision of Internet access to America's Job Bank (AJB), whose computerised network links the 1,800 state Employment Service offices. AJB "provides job seekers with the largest pool of active job opportunities available anywhere. For employers it provides rapid, national exposure for job openings. The 'nationwide' listings in America's Job Bank contain information on approximately 250,000 jobs. There is no charge either to employers who list their job vacancies nor to job seekers who use the service.[4] In June 1995 the US Government set up a freephone number to answer citizens' questions about the NII initiative. This is part of a public education campaign to urge Americans to "Get Connected to the Information Age."[5]

3.10 The USA has the most successful electronic information industry in the world. Under the Paperwork Reduction Act of 1995 government agencies are restricted from regulating the use, resale or re-dissemination of public information or the levying of user fees that exceed the distribution cost (p 286). The USA has in the past used R&D funding to help develop the world's major online hosts (notably those known originally as DIALOG and ORBIT). In February 1995 the IITF published a policy document entitled *The Global Information Infrastructure: Agenda for Cooperation*. This document recognised that technological and regulatory choices made in one country can affect those made in neighbouring countries, creating a multiplier effect for the development of the Global Information Infrastructure. The US Government proposed five core principles to help guide this development: private investment, competition, open access, a flexible regulatory environment, and universal service. The US telecommunications industry is, however, considerably less open to competition than is the case in the UK.[6]

3.11 M Robert Verrue, Director General of European Commission DGXIII, said that there were two main lessons which the EU could learn from the American experience in addition to the US policy of deregulating its telecoms industry. First, "on quite a number of legislative issues the

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1 See paragraph 5.4 below.

2 http://nii.nist.gov

3 Parliamentary Office of Science and Technology (POST) Report, *Information "Superhighways": the UK National Information Infrastructure* (May 1995), Annex 2.

4 http://www.ajb.dni.us/about-ajb.html

5 NTIA press release "Citizens can call 1-800-NII-8818 for information on the Information Superhighway" (1 June 1995).

6 The Assistant to the President for Science and Technology told the Committee that he "wished we were as far along as the United Kingdom on open competition and regulations" (See Appendix 8, paragraph 32).

Americans have ... for quite some time ... accepted a fairly strong responsibility at the federal level". This had created a situation in which "the legal and regulatory environment is less diversified and perhaps more predictable for economic operators". Second, the US had a dynamic sector of new firms in content and new programme management. The structure of the small business capital market, in particular venture capital, was a major advantage to American companies (Q 650).

3.12 The Agenda for Action is perhaps not so target driven as the Information Superhighway initiatives adopted by some other countries, such as Japan. But it does contain target dates for the administrative changes needed, and exudes a sense of purpose and urgency: "the time for action is now".[1]

CANADA

3.13 As a result of Canada's large size and dispersed population its communications infrastructure is very important, and is already well developed. Ninety-nine per cent of households have telephones and 75 per cent have cable connections (Q 806). In Canada the 1994 Speech from the Throne led to the establishment of the Information Highway Advisory Council (IHAC) in March 1994. The 29–member Council was appointed by the Minister of Industry, and included representatives of a wide range of organisations and interests involved in the development and use of information technology and addressed a broad range of issues dealing with the economic, social and cultural impacts of advanced communications and information technologies.[2]

3.14 In May 1996 the Canadian Government published its response to IHAC's final report. *Building the Information Society* highlights four main tasks for Government. The first is to create a policy and regulatory environment which encourages industry to build Canada's information highway. This is to include a comprehensive policy on the convergence of the telecommunications and broadcasting industries to allow them to offer competing services in local markets. Second, the Government is committed to increasing Canadian content on the Information Highway, for example by continuing the process of digitizing the large collections of libraries, museums and galleries with the aim of making them available to Canadians nationwide. The third task is to realise the Information Highway's economic and social benefits, including the development of "a national access strategy involving policy, regulatory and other measures to ensure affordable access by all Canadians to essential communications services", and reviewing the Canada Labour Code to ensure that Canadian workers continue to enjoy appropriate protection in the emerging information highway workplace. Finally, the Canadian priorities for "Getting Government Right" are taking the required steps to ensure that electronic commerce becomes the preferred means for the federal government to conduct its business; introducing a common electronic infrastructure within federal government departments and agencies to permit seamless public access to government services and programmes; implementing government-wide security services such as key management and electronic authorization and identification; and developing, in co-operation with United States agencies, intelligent transportation border crossing systems to accelerate customs and immigration processing at border stations.[3]

3.15 The Canadian Network for Research, Industry and Education (CANARIE) is similar to SuperJANET, except that CANARIE includes industry as well as education. There is a heavily-funded SchoolNet initiative to provide all Canadian schools with Internet access. Most public libraries have terminals with Internet access and as in the USA, there are FreeNets, community networks with local corporate sponsors (QQ 806, 813–816, 829).

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[1] The National Information Highway Advisory Council of Canada also identified a need for urgent action (Q 807).

[2] The Committee is indebted to Dr Mary Dykstra-Lynch, Professor at Dalhousie University, Halifax and a member of IHAC, for giving evidence to its enquiry. We have also benefited from the long-established tradition of exchanging information with the Canadian Senate, and welcomed the Chairman, the Honourable Donald Oliver, and members of the Standing Senate Committee on Transport and Communications to the first meeting of the enquiry.

[3] The document is available on the Internet at http://info.ic.gc.ca/info-highway/ih.html

New Brunswick

3.16 The information highway in the Canadian province of New Brunswick is particularly well advanced, and is believed to have attracted some 3,300 new jobs over a five-year period. On 1 May 1995 the New Brunswick Minister of State for the Electronic Information Highway said that "while efforts in other parts of the world are being focused on setting up an infrastructure to support the heavy traffic on the information highway, New Brunswick already has a fully operational infrastructure, and we are working actively to introduce new applications."[1]

3.17 The revised mandate of New Brunswick's Information Highway Secretariat has seven headings; "(1) to create in New Brunswick a truly information technology-friendly society; (2) to ensure that our technology infrastructure is world class; (3) to promote the evolution of call centres and attract new IT investment; (4) to grow the New Brunswick information technology sector; (5) to ensure an appropriate regulatory environment; (6) to ensure that the Province has the required human resource development to attain these goals; (7) to ensure balance in the accessibility of technology infrastructure throughout the Province."

3.18 The Information Highway Secretariat aims to "develop and implement a long–term public advocacy program to promote the advantages and opportunities offered by the information highway for all New Brunswickers." It has a planned work programme, including work with the Federal Government and community groups to provide public access to, and training for, the Internet, with emphasis on rural New Brunswick. Six pilot access points were developed in 1995, 30 more communities are targeted for 1996 and a further 40 in 1997. The NetLearn project is working with educational institutions, libraries, rural and community groups to develop New Brunswick content in both official languages and make that content accessible in every community by 1998.[2]

JAPAN

3.19 In February 1996 14.7 per cent of Japanese households had personal computers. This level, which is low in comparison with the USA, is expected to rise to 21.6 per cent by 1997. The ratio of modem users (not holders) among all PC holders is 12.9 per cent. 44 per cent of PCs, including those for business use, are networked. Modems are not widely used at home, because taking out a new telephone line costs about £500. In January 1996 the total number of Internet hosts in Japan was 269,327, 2.84 per cent of the world total of 9,472,224. The number of Internet hosts per 1,000 population was 2.2. According to the Ministry of Posts and Telecommunications (MPT) the biggest reason for the low level of Internet use in Japan is the language barrier presented by English being the common language of the Internet. There are comparatively few Japanese home pages, services and databases, and the high commission fee charged by Internet service providers and the limited information available on the Internet in Japanese are further discouraging factors.

3.20 The Advanced Information and Telecommunications Society Promotion Headquarters was launched in 1994. It is chaired by the Prime Minister with the participation of all cabinet Ministers, and meets every two months. In terms of regulations, there is no barrier to new service providers. Companies have simply to notify MPT of a new service, rather than having to apply for a licence.[3] The Japanese Government is committed to a vision of broadband cable covering 20 per cent of the country by 2000 and 100 per cent by 2010 (Q 313).

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[1] In an address to the Montreal Chamber of Commerce.

[2] New Brunswick's Information Highway Secretariat, http://www.gov.nb.ca/edt/infohigh/mandate.htm

[3] Information supplied by the British Embassy Tokyo, based on consultations with MPT and the Ministry of International Trade and Industry.

SINGAPORE

3.21 Singapore National Computer Board's[1] IT2000 Vision of An Intelligent Island was published in March 1992 after a study covering the eleven major economic sectors of Singapore. The IT2000 masterplan "aims to transform Singapore into an Intelligent Island, where the use of information technology is pervasive in every aspect of its society—at work, home and play. Singaporeans will be able to tap into a vast well of electronically stored information and services which they can use to their best ends—to improve their business, to make their work easier and to enhance their personal and social lives. Singapore, the Intelligent Island, will be a global centre for science and technology, a high-value location for production and a critical node in global networks of commerce, communications and information."

3.22 Singapore aims to be among the first countries in the world with an advanced nationwide information infrastructure in place by 2010. This infrastructure "will interconnect computers in virtually every home, office, school, and factory. The computer will evolve into an information appliance, combining the functions of the telephone, computer, TV and more." The National IT Committee is chaired by the Minister for the Environment and Second Minister for Defence, with the Deputy Prime Minister as its Adviser. Its 13 members include the Chairman of Singapore Broadcasting Authority, the President of Singapore Telecom and the Chairman of Singapore International Media, in addition to academics and government officials.[2]

3.23 The NCB works closely with the public sector to "re-engineer government processes and exploit IT to bring about new levels of efficiency and productivity."[3] The IT2000 Report stated that "the full economic and social impact of government information systems are being realised through very significant productivity improvement, the increasing availability of government database services to the public and the provision of one-stop services in government departments. An audit done in 1988 showed that the CSCP[4] had reduced or avoided the need for some 5,000 posts in the government. In addition, the government obtained a return of $2.71 for every dollar spent on IT in the CSCP."[5]

3.24 In June 1996 Singapore's Minister for Communications announced the development of a multimedia broadband network to be called Singapore ONE.[6] Phase 1 of this project is planned to run from 1996 to 2001 and to result in the deployment of a core broadband network with a number of services and applications focusing on government, education, home and businesses. In the area of government applications the objective is to bring public services closer to the people through full-function distributed government offices using video-conferencing and interactive technology. These virtual government offices, which can be reached through interactive kiosks, will enable users to carry out multiple transactions like applying for various permits or paying bills. "What distinguishes this system from present telephone enquiry or transaction is its ability to allow visual response as well ... In the pilot phase, these one-stop government offices will be located at high human traffic areas ... Users will be able to interact live with government services representatives without having to physically visit their offices. Eventually such services could be brought to the home."[7]

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1 The National Computer Board's (NCB) mission is to drive Singapore to excel in the information age by exploiting IT extensively to enhance its economic competitiveness and quality of life.

2 National Computer Board, Singapore: http://www.ncb.gov.sg/ncb/it2000.html

3 NCB, *Transforming Singapore into an Intelligent Island*, p 2.

4 Civil Service Computerisation Programme.

5 NCB, *A Vision of an Intelligent Island: IT2000 Report*, p 8.

6 One Network for Everyone.

7 Speech by Mr Mah Bow Tan, 3 June 1996, also published on the National Computer Board's web site. We are grateful to the British High Commission, Singapore, for providing information.

EUROPEAN UNION INITIATIVES

3.25 The European Commission has been very active in promoting the idea and development of the Information Society.[1] The Bangemann Report on Europe and the Global Information Society highlighted 10 applications which might launch the widespread development and use of a European superhighway:

> Teleworking; distance learning and continuing professional development; telematic services for small and medium-sized companies (e.g. video conferencing and electronic mail); road traffic management; air traffic control; health care networks to link all General Practitioners, hospitals and social centres; electronic tendering; a trans-European public administration network; and city information highways supplying video on demand, home banking and tele-shopping.

The summary of recommendations in the Bangemann Report now forms the basis of an EU 'Action Plan for the Information Society'.

3.26 The above applications are equally applicable to the United Kingdom on a national basis as for the European Union (EU) in general. Each of the applications takes advantage of the fact that the information provided over the information superhighway can always be the most up to date that is available; decisions can thus be made in real-time, and new developments can be exploited by a larger audience without the lengthy delays sometimes encountered with traditional media. The report suggested that if regional administrative bodies or other organisations were encouraged to participate in these applications then they would soon attract the critical user mass necessary for them to be seen as viable, and this in turn would bring private sector investment to extend their availability. Government subsidies and additional public expenditure were not thought to be necessary: instead, existing resources, such as those funds allocated in the Framework Programme, could be refocused.

3.27 A European version of ISDN (EURO-ISDN) was seen as the first step towards a standardised broadband superhighway across Europe, and the Bangemann Report called for an extension of access to this network as a priority. The Report also recommended a review of the European standardisation process and regulatory frameworks. Standardisation policies should ensure that all parts of the infrastructure, and all services offered on it, are compatible. To this end it was suggested that the EU standards bodies establish priorities based on market requirements, and identify and adopt standard specifications that the market had originated. A similar conclusion was drawn at the G-7 Information Society Conference held in Brussels in February 1995.

3.28 The Commission's immediate aim is to achieve the complete liberalisation, including legislative and regulatory reform, of the telecommunications sector in all 15 EU Member States by 1 January 1998. Among the key Directives under discussion at present are those on Licensing, Interconnection, the revision of the Open Network Provision framework and on Telecommunication Terminals and Equipment (QQ 646, 653). The Commission has also been particularly active in the area of intellectual copyright and copyright-related issues (QQ 644–645), discussion of the definition of universal service (Q 653) and in the organisation of digital signatures on a harmonised basis within the EU and the setting up of a system of so-called Trusted Third Party Services (Q 653).[2] It has also promoted attempts to stimulate the content industry in Western Europe (Q 648).

3.29 One of the programmes run by the Commission is INFO 2000. This is a programme to stimulate the development of a Europe wide multimedia industry, with a focus on information

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[1] The Committee is grateful to M Robert Verrue, Director General of DGXIII, for his invaluable evidence, printed on pp 409–422, which highlights some of the Commission's current and planned activities in this field.

[2] M Verrue defined this as a system whereby a third party in a communication between two people, firms or institutions, can intervene to guarantee the integrity of the text which is being communicated and, in particular, the signature.

content suppliers. Funding is available for projects in the field of geographic information, Europe's cultural heritage, and scientific, technical and medical information. There is a total budget of £55,000,000 for a four year programme starting in 1996.

FRANCE

3.30 In France Minitel terminals were given free to households in the 1980s. In October 1995 the Minister responsible for telecommunications, M François Fillon, announced that there should be a gradual move from Minitel terminals to multimedia, although an intermediate stage would be necessary when PCs, television and Minitel would all be in use. The French experience of using Minitel terminals could, however, be seen as an advantage as it had enabled most people to use a keyboard and screen to obtain information electronically. 1.2 million households in France have used Minitel regularly to buy things, compared with only 800,000 American households who have bought items via computer. Compared with the UK and the US, however, France has a low level of home computers.

3.31 In March 1996 the Minister announced that telephone tariffs would be changed so that everyone, throughout France, would be able to access the Internet for the price of a local call. 244 public interest pilot projects are being undertaken, and local authorities are active partners in more than a quarter of these. A help-line has been established for project participants to give them access to technical expertise. The telecommunications Ministry will set up a group to evaluate the experimental projects, with membership drawn from regional and industrial representatives as well as parliamentarians and professionals. The Minister also announced that within two years all Ministries would make Government information available in French on the Internet.

3.32 The French Government is keen to promote a French language presence in multimedia services. INRIA (*Institut National de Recherche en Informatique et en Automatique*) played a leading role in the development of the Internet, and remains active in Internet standards activities. INRIA is the only European partner in the WorldWideWeb. The Ministry of Culture has large databases accessible on-line including one on museums with 120,000 pages of text and images. The Louvre has its own separate Internet server. The Government is also keen to promote Internet use in schools. 700 educational establishments in 13 regional education authorities will be provided with connections to the Internet by the end of 1996, and secondary schools will be given cut price access to the France Telecom digital network. Major Government-funded projects will include provision of computers to schools and the development of on-line educational services.

3.33 By the year 2000 sales of goods via electronic means are expected to reach 20 billion francs (£2.5 billion) and to create thousands of jobs in marketing, the logistics of distance selling, payment mechanisms, security aspects and data exchange. The French Government attaches importance to the development of an appropriate cryptography regime.

3.34 The French Government has placed an obligation on Internet access providers to provide software for their clients which will enable them to block access to certain services while, at the same time, exonerating their responsibility under the law. The telecommunications law passed in June 1996 put in place a new committee, *Comité Supérieur de la Télématique*, to draw up recommendations on controlling material on the Internet. This law also included a decision to abolish the monopoly position of France Telecom from January 1998. The Minister for Telecommunications has said that if France had the tariffs of British Telecom the average French household telephone bill would be reduced by more than 30 per cent.[1]

[1] We are grateful to the British Embassy, Paris for supplying the information in this section.

GERMANY

3.35 In Germany the Council for Research, Technology and Innovation has been charged with the task of providing a comprehensive overview of applications, problem areas and spheres of activity in important fields of innovation and with making recommendations for action. Its deliberations take place on an inter–disciplinary and interdepartmental basis. The Federal Ministers for Research and Technology, for Economics and for Education and Science are permanent members. The Council met for the first time on 22 March 1995, when it was decided that "The Information Society" should be the first topic to be handled. Work included three working groups on "Research, Technology, Applications", "Legal Framework" and "Social and Cultural Challenges", and the Council reported in December 1995.

3.36 The Council's Report, *The Information Society: Opportunities, Innovations and Challenges*,[1] identified the following application fields as requiring particularly urgent action:

— industry and the service sector: an increase in productivity,

— private households: meeting the communication needs of the public; making access to information easier for everybody,

— education: creating powerful telesystems and software for research and education,

— public administration: increasing efficiency, flexibility and user-friendliness of services,

— telemedicine: improving health care including preventive health care, and

— telematics for traffic control: guaranteeing mobility by ensuring a safe, economical and environmentally-friendly flow of traffic.

3.37 In private households in Germany there are some 15 million cable TV connections and 8 million satellite receivers. In addition there are already more than 6 million PCs, but only about one million are attached to a telecommunications network. The report suggested that "private households can be the training ground for the information and communication technologies that will be required as interactive services in telecommuting and in telecooperation at work."[2] In discussing the possible benefits of "telecommuting", which it is estimated will affect 800,000 jobs after the year 2000, the report suggests that "on an overall economic and ecological scale, 800,000 telecommuters would mean a substantial reduction of road traffic (by saving around 3.2 billion motor vehicle-km per year)."[3]

3.38 The report emphasised the importance of educational applications. "The education sector ... has the task of preparing people for life with the new technologies and to provide individuals with the skill to handle these media thus enabling them to work with the new plethora of information originating from many different cultures in an active and responsible way. The competitiveness of Germany ultimately depends on how quickly and how effectively the separate institutions within the education system are enabled to meet these challenges." The report found that "in Germany the relevant technology and infrastructure (such as high-speed networks) is not as highly developed as in the USA and many neighbouring European countries, such as the Netherlands and the UK ... Germany's current deficit as regards the relevant infrastructure and provision of education institutions with the new information and communication technologies must be remedied quickly".[4]

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[1] Published by the Initiative Informationsgesellschaft Deutschland. We wish to thank Dr Klaus Wild, First Counsellor, Science and Technology at the German Embassy in London, for providing this report, and for his on-going assistance in informing the Committee on German policies.

[2] *The Information Society: Opportunities, Innovations and Challenges*, pp 14–16.

[3] *Ibid.*, pp 47–48.

[4] *Ibid.*, pp 40–42.

THE UNITED KINGDOM

3.39 In the United Kingdom, as in Sweden and Finland, the telecommunications market has been liberalised for several years.[1] According to the Department of Trade and Industry (DTI), the Government's lead department in this field, the Information Society is already big business in the United Kingdom.

> — "In 1995, the UK's cable companies alone invested more than £2 billion – that's £6 million a day – in developing infrastructure.
>
> — BT has announced a 10 year programme of work to install fibre-optic cabling to bring interactive multimedia services into homes nationwide.
>
> — Nearly 3 million personal computers were sold in the UK in 1995.
>
> — Over 2 million people in the UK accessed the Internet in the year to August 1995.
>
> — And the total market for information and communication technologies in the UK has been estimated at £48 billion per annum."[2]

3.40 The Government has a number of advisory committees to provide advice on policy making in this area, in particular, the DTI's Multimedia Industry Advisory Group, established in 1994. The term "Multimedia" is slightly misleading in this context, as their interest is far broader than the technology traditionally associated with multimedia, i.e., CD ROM, CD-I[3] and other stand alone discs for delivering a mixture of text graphics and audio to a PC. These advisory committees have submitted reports on intellectual property issues, interoperability standards and on opportunities in health and education. The Government's Technology Foresight Programme[4] brings together industry, academics and government in a collaborative effort to identify opportunities in technologies and markets likely to emerge in the next 20 years. Fifteen Technology Foresight Panels have delivered reports on various sectors and the Programme offers funding for innovative industry/academic joint proposals.

3.41 The Information Society Initiative (ISI)[5] was launched by the DTI on 13 February 1996. This is "a four-year programme in which up to £35 million of new money will be invested. It will help United Kingdom businesses to take full advantage of the opportunities offered by new information and communication technologies to boost their competitiveness. This new framework of support and awareness programmes is a partnership between industry and Government, addressed at all who work in manufacturing, service and creative sectors—particularly small and medium sized companies."[6] This support will be delivered locally, using 50 local support centres, and through professional and trade associations, and the DTI has produced clear, helpful, and jargon-free literature to promote the initiative. There is also funding available for developing a test bed in digital broadcasting, and other promising areas of technology, such as Virtual Reality, microelectronics design, and bar coding systems are being considered for special funding. Other programmes promote electronic commerce, multimedia in music, neural computing, electronic networking for business intermediaries, and electronic networking for small businesses. At present, the ISI has a heavy emphasis on assisting SMEs, but the longer term plans include studies on, and promotional activities for society as a whole.

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1 In all other EU Member States there is one operator with exclusive rights (Q 653).

2 Source: DTI *Information Society Initiative*.

3 Compact Disc Interactive.

4 Office of Science and Technology, *Foresight: first progress report 1996*; Sir Robert May, "Technology Foresight: reaching our goals", *Science in Parliament*, 1996, 53(1), 4-6.

5 Full details are available from: *http://www.isi.gov.uk*

6 House of Commons *Hansard* 13 March 1996, col. 660.

3.42 A small Central Information Technology Unit (CITU) was set up by the Deputy Prime Minister in November 1995. CITU's mission is: "To devise a set of strategies and policies which will enable Government to exploit the opportunities provided by information and communications technology in order to provide simple to use, integrated and rationalised services, which are tailored to the needs of businesses and the citizen, and are easily accessible when and where required". A Cabinet Office Press Release[1] announced that "The CITU will take a strategic view of the way IT is used across government, and will ensure that the opportunities IT offers are exploited to maximise efficiency within government and in its dealings with businesses and the citizen. It will also be responsible for ensuring that the Private Finance Initiative (PFI) is used to the full in funding Government IT projects".

3.43 In February 1996 the Prime Minister set up a Ministerial Group on IT, under the Chairmanship of the Deputy Prime Minister. On 3 June he was replaced as Chairman by the Lord Privy Seal, the Rt Hon Viscount Cranborne (Q 1054). Its members are the President of the Board of Trade, the Chief Secretary to the Treasury, the Secretary of State for the National Heritage, the Secretary of State for Education and Employment, the Chancellor of the Duchy of Lancaster, Minister of State, Foreign and Commonwealth Office and the Parliamentary Under-Secretary of State for Science and Technology. The Committee—known as GEN 37—has the following terms of reference: "To identify and take forward significant cross-departmental initiatives to ensure that developments in information technology are exploited to the full in the national interest."

3.44 Although the DTI is the lead Government Department, there is a wide range of activities to support the development and use of the Information Superhighway throughout central and local government. For example, funding has been provided for a local community information project (South Bristol Learning Network), and the Department for Education and Employment (DfEE) has taken initiatives in the use of the Information Superhighway in all levels of education.[2] The DfEE continues to support the maintenance and development of the highly regarded SuperJANET network for higher education, and is developing pilot application projects at primary and secondary levels.

3.45 CITU has been examining the use of Information Technology to "re-engineer government" (Q 1055). The Cambridge Childcare Project, initiated by Anne Campbell MP, provides an example of the potential for "one-stop-shop" terminals in the UK. The service, which is operational in Cambridgeshire as an Internet-based service using free public access points, aims to provide parents with information on childcare, jobs, training and benefits[3] in one convenient and easily accessible place. It has been developed with both public and private sector support, including the Citizens Advice Bureau, CambsTEC and Greater Peterborough Tec, Benefits Agency, the Employment Service, Cambridge Careers Guidance Ltd. and the City and County Councils. A prototype self-service touch-screen kiosk, using sound, graphics and video, has been developed by Andersen Consulting in association with the Cambridge Childcare project. This prototype kiosk makes no distinction between information usually provided by local or national organisations, nor between public, voluntary, or private provision.

3.46 Many government departments have shown enthusiasm for using advanced information technologies as a means of delivering information to the public. A consultation document issued by CCTA (at the time the leading proponent of use of the Internet within Government) in 1994[4] explored the use of the Internet as a means of delivering government reports and other information helpful to citizens. Since 1994 an increasing amount of selected Government information has been made available on the Internet. These include Press releases, texts of speeches, departmental

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1 22 December 1995.

2 DfEE, *Superhighways for Education: The Way Forward*, HMSO, 1995; DfEE, *Superhighways for Education: Consultation paper on broadband communications*, HMSO, 1995.

3 Including, where required, calculations of the impact work might have on benefit entitlement, which local research found to be particularly wanted.

4 CCTA, *Information Superhighways: opportunities for public sector applications in the UK* (1994).

reports, Budget statements, details of new HMSO[1] publications and a small—but rapidly growing—number of HMSO documents in full text. Initiatives spearheaded by CCTA include the establishment of the Government Information Service to test demand for electronic communication within Government, the pilot Government Telecommunications Network (GTNet) project for direct communication between civil servants and citizens and participation in the EU programme on the interchange of information between administrations. The G7 Ministerial meeting in February 1995[2] resulted in a commitment by participants to wider dissemination of Government material, and the United Kingdom is participating in some of the pilot projects endorsed by the Meeting, such as the Government OnLine project.

3.47 The UK Government is thus supporting the development of the Superhighways through a mixture of local and national initiatives, and through a number of different Departments of State. In some regards, however, its policy is out of step with other countries, for example the lack of a single focal group or Ministry driving the vision of the Information Society forward, and the continued maintenance of Crown Copyright. In the USA and Japan there are plans to link all schools to national two-way broadband infrastructures by the year 2000, but as yet the United Kingdom does not have an equivalent policy.

PARLIAMENT

3.48 The USA has led the way in using the Internet to disseminate information about, and to improve two-way communications with, its parliamentary institutions. The THOMAS Web server[3] is a joint project between the Library of Congress and the University of Massachusetts which went online in January 1995. It includes searchable versions of House of Representatives and Senate bills, searchable summaries of bills and legislative histories of bills and amendments, browsable lists of bills and searchable records of daily proceedings on the Floors of the House and Senate. The next major database to be added will be the full text of Committee reports. Of special interest to this Committee is the fact that the House of Representatives Science Committee, like other House Committees, has its own WWW page.[4] Members of Congress and Senators can be reached by e-mail, and the House of Representatives Home Page includes a heading entitled "Empowering the Citizen—links to government efforts to improve the government via citizen input". THOMAS has been heavily used by people from all parts of the United States, as well as many foreign countries. Between 6 January and 20 March 1995 there were 294,575 accesses to the THOMAS home page.[5]

3.49 Parliaments in several of the new democracies have been swift to recognise the potential of the Internet. For example, the Parliaments of the Czech Republic, Latvia, Lithuania and Romania all have their own WWW Home Pages. In some cases full text access to acts of parliament and the records of parliamentary debates is already available on-line—a considerable achievement given the pace and scale of legislative change in these countries.

3.50 Amongst Commonwealth parliaments those of Australia and Canada have been at the forefront in developing their provision of information on the Internet. The Parliament of Australia, with the assistance of the Australian National University, has undertaken a trial to provide information on public access requirements, resources and issues involved in providing public electronic access to parliamentary materials, including *Hansard* and the *Votes and Proceedings* of the House of Representatives and the *Journals* of the Senate. The Parliament of Australia Internet trial did not include parliamentary papers because of their number and size.[6] Most Australian

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1 Her Majesty's Stationery Office. The entry point is: *http://www.open.gov.uk*

2 *G7 Ministerial Conference on the Global Information Society*, Office for Official Publications, Luxembourg, 1995.

3 http://thomas.loc.gov

4 http://www.house.gov/science/

5 WB Croft, R Cook and D Wilder, "Providing Government Information on the Internet: Experiences with THOMAS", *Proceedings of the Second International Conference on the Theory and Practice of Digital Libraries*, Austin, Texas, June 11–13, 1995.

6 The answer to one of the Frequently Asked Questions of the Parliament of Australia Internet Trial states that in 1995 approximately 970 Parliamentary papers were published, many of which ran to hundreds of pages in length.

Commonwealth law and Australian Commonwealth regulations in full-text have been made available by the Australasian Legal Information Institute.

3.51 There is a growing interest in the use of the Internet to facilitate inter-parliamentary communications and in setting up a "node page" providing links between the home pages of parliaments either on a Western European basis or, ultimately, worldwide. The Parliamentary Assembly of the Organization for Security and Cooperation in Europe (OSCE) has set up the Parliamentary Assembly Network (PA-NET) to facilitate communication between OSCE member Parliaments which are online. It believes that "electronic links between Parliaments will enhance the communication between Members of Parliament, staff members and particularly between Parliaments in transitional states and their counterparts." PA-NET currently provides links to the home pages of over 20 other Parliaments, including Westminster.[1]

The House of Lords

3.52 The Westminster Parliament has not been an "early adopter" of Internet technology either in its use to promote the dissemination of a wide range of parliamentary information both to the UK electorate and worldwide, or in the use of e-mail to facilitate two-way communication and citizens' feedback. "The UK Houses of Parliament's Public WWW Service"[2] provides, *inter alia*, factsheets about the House of Commons, lists of members of the House of Commons and information about visits to its gallery and about House of Commons business. Although this home page at present makes no mention of the House of Lords, under the heading "weekly information bulletin" information is provided about the business of both Houses, including forthcoming business in the House of Lords and public meetings of House of Lords Select Committees.

3.53 The House of Lords is making arrangements to launch its own home page in autumn 1996, following its adoption of the following three principles on electronic publishing:

(i) the House should make its publications available free of charge in electronic form;

(ii) the medium for free distribution should be the Internet;

(iii) by a system of licensing, electronic material should be made freely available, on a non-exclusive basis, to commercial publishers who wish to process it and add value to it.[3]

3.54 The first phase will include Lords *Hansard* on-line, which will be launched before the end of 1996. Further developments, including Internet publication of Bills and Committee Reports, are planned for 1997. Some Acts are already available on the Internet on HMSO's web site, and this service is to be expanded.

3.55 There is an on-going programme to cable the Houses of Parliament. On present plans the cabling programme will be completed in the year 2002.

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1 http://www.centrum.dk/~oscepa/mem_parl.html#oscememb

2 http://www.parliament.uk/

3 *House of Lords Debates*, 2 April 1996, col. 142.

CHAPTER 4 VIEWS OF WITNESSES

THE CURRENT SITUATION

4.1 "The IT revolution and the information age is a reality and it is going to affect the way every business operates and the way every one of us leads our lives".[1] The technology for the information superhighways of the future is already in place. Local broadband networks are operating, in the United Kingdom in Cambridge and Ipswich,[2] and prove that the technology is there and it works (Q 580). The superhighways themselves, on the other hand, do not yet exist (Q 863, pp 191, 198, 300).

4.2 PC penetration per household is 37 per cent in the United States,[3] 25 per cent in the United Kingdom and only 7 per cent in Japan, although the Japanese market is growing rapidly. Twenty per cent of United States households have modemed PCs, compared with only 2 per cent in the United Kingdom and 1.4 per cent in Japan. There are 16 Internet hosts per thousand population in the United States, 12 in Sweden, 5 in the United Kingdom and 1.3 in Japan (Q 299). Worldwide, it is estimated that some 30 million people have access to the Internet. Most of these Internet users are limited to the text that can be squeezed down a traditional telephone, as only a small minority yet have access to high speed image transfers. By 2002 more than 200 million people worldwide[4] are expected to be connected to at least part of the Internet, with 150 million subscriptions to on-line services. The World Wide Web is doubling in size every three months. Approaching 100,000 Web sites were forecast by early 1996. Fewer than 300,000 British PC owners currently subscribe to either a Bulletin Board Service or have an account with an Internet Service provider. This represents a penetration of about three per cent of PC owners (p 244).

4.3 The United Kingdom Education and Research Networking Association (UKERNA) said that the challenge was to be ready for the information superhighway when it did arrive. UKERNA added that we did not yet know how to make the most of the new information technology developments because "our thinking is conditioned by many years of using narrow band telecommunications where long distance transmission capacity is characterised as a scarce and expensive resource" (p 301). The changes brought about by abundance could lead to developments of major social and economic importance.

4.4 The Internet (a global network of networks) was generally not considered by witnesses to be a superhighway (p 234), just "one, relatively slow, component" of it (p 191). The Institute for the Management of Information Systems (IDPM) described aspects of the Internet as "actively user-hostile" (p 235) and expressed concern over the resultant public perception of the information superhighway. The IDPM said that the "important task is to persuade the majority of users to upgrade from the "Internet" ... before the widely expected consumer backlash (against current content, response times and difficulty of access) does too much long term harm to the underlying concepts" (p 235).

4.5 Most witnesses were more up-beat. Microsoft described the Internet as "an extraordinarily successful, market-based, global network" (p 145), Heriot-Watt University said "the development of the Internet will fundamentally effect the way that education is provided" (p 228) and the Library Association described the Internet as a "treasure trove of information from many sources" (p 251). The Library Association also praised the development of the World Wide Web for being user friendly and enormously powerful for information retrieval. The University of Warwick said that most of the basic Internet standards were now well established and that most difficulties were

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[1] Evidence from Dr Alan Rudge of BT, Q 546.

[2] We are grateful to On-Line Media for enabling us to visit the Cambridge On-Line trial, and to BT for demonstrating the Ipswich trial at their Martlesham Heath Research Laboratories.

[3] The Committee received various different estimates of PC ownership, Internet usage, etc.

[4] Microsoft's estimate was that 200 million people would access the Information Superhighway by the year 2001 (Q 397). News International cited a similar estimate (Q 961).

associated with areas of active development where standards had not yet been fully defined and ratified (p 304).

Developments towards the superhighways

4.6 The British Computer Society (BCS), said: "it is highly likely that any future superhighway will have evolved from the Internet. It is the best available role model we have for how such a network might be used" (p 165).

4.7 Microsoft described the current state of the on-line market as "very small". They estimate that in the United States there are about 10 million users of the World Wide Web. In the United Kingdom there are about 500,000 users of the World Wide Web or commercial on-line services, and three million Internet e-mail users. Microsoft were one of a number of witnesses to refer to the fact that, unlike parts of the United States, where local telephone calls are free, in the United Kingdom local telephone calls are charged, and "it can be quite prohibitively expensive if you try and use an on-line service during the day" (Q 368). BT responded to this point by saying that whilst local telephone calls in some parts of the United States were free, service providers there tended to time (and charge for) Internet usage. They also added that "there is no such thing as a free telephone call! The package in the United States that you pay for on a monthly basis includes unlimited use in a very small area which is defined as your local area, and that is built into the package charge". BT believed that the large numbers of personal computers in US homes, where penetration was between 40–50 per cent, had been "probably the more significant enabler in terms of Internet traffic" (QQ 535–7).

4.8 Both BT and Microsoft talked about the natural progression to broadband services through medium band. Microsoft said that "we believe that ISDN is hugely important in terms of mid band because, in order for this to be a really captivating medium, we need much more richness in terms of graphics and sound and ISDN can provide that and give people the performance they need". They pointed out that ISDN was at present far too expensive for the average consumer in the United Kingdom (Q 368). New systems such as Java, where Microsoft and other companies are providing additional features including video sound, would greatly increase demands on capacity and necessitate universal access to ISDN "and through the years even broader band than that" (Q 402). CompuServe complained that although BT promoted ISDN for business use, its spread into UK homes was small, and particularly so when compared to its take-up in Germany, where ISDN lines were cheaper (QQ 757–761, 766–767).[1] Ian Taylor MP, Parliamentary Under Secretary of State for Science and Technology, said that "until this year 'ISDN' has meant 'it still does nothing' as far as BT is concerned" (Q 1008).

4.9 The Cable Communications Association (CCA) said that "the cable companies are building the networks as quickly as we can physically do it. The development of applications and services ... is therefore now the key question. It will be these applications and services that transform the networks that we are building into the information superhighway." (Q 52)

4.10 Many witnesses bore testimony to the abandonment of the fruitless search for a single "killer application" which, it was once imagined, would entice large numbers of people to use the superhighways of the future. In particular, only a few years ago it was assumed that video-on-demand services would be a principal business for cable companies, and this assumption has been proved false (Q 661, p 193). The Confederation of British Industry (CBI) said that currently the single most important use of information highways was e-mail, which had grown significantly as an inexpensive and convenient means of communication. It was believed that the United Kingdom was amongst the heaviest users of e-mail in the world and growth in its use by companies was likely to continue (p 193).

[1] When this report went to press, BT were offering, for a limited period, free ISDN connection to the Internet, and a special offer on ISDN subscription charges.

4.11 The CCA said that "you are not going to find one application which appeals to absolutely everybody. I think you may find two, three or four themes which are developing." They saw education, home working and games as the three most important current developments. Almost 1,000 schools had been cabled under the Cable in the Classroom programme, and the CCA estimated that by the end of the decade almost three-quarters of United Kingdom schools would have been cabled free of charge by cable companies. Cable companies were working on a number of projects with schools to develop applications for children to do homework (Q 54).

The United Kingdom

4.12 In February 1996 the new fibre optic network passed more than five million of the 16.2 million homes within the United Kingdom. Slightly over one million homes and businesses were connected, and some 500 schools were also connected (p 192). There are about 120 Internet service providers in the United Kingdom (Q 368). In February 1996 the United Kingdom had more Internet hosts per head than either France or Germany, with 7.8 hosts per 1,000 inhabitants as against 5.6 for Germany and 2.4 for France.[1]

4.13 Unlike the governments of some other countries, the UK Government has set no target dates for the installation of broadband infrastructure. Mr Taylor, the Minister for Science and Technology, said, however, that "the cable industry's own build rates in their franchises would mean that probably, even if we were not to let any more franchises, 73 per cent of the population would be covered by the year 2001, and I suspect that we will launch more franchises so our target is about 85 per cent.[2] For those regions which are not likely to get cable because of geography we have released some 10 gigahertz radio spectrum which is ISDN equivalent in terms of capacity. I think the Government is working to make sure that by the beginning of the next century the bulk of the UK population will have access to the potential to satisfy their demand for wideband and broadband technology" (Q 1012).

4.14 In 1994 a study of investment in networks in the United Kingdom and its major competing countries showed that the United Kingdom was first or second in all the major areas of network investment (Q 12). OFTEL said that the United Kingdom "is leading the world in liberalisation, particularly in infrastructure competition, competing networks; that the investment in networks is being made at a rate which exceeds almost anywhere else and arguably the United States as well, that the benefits are being delivered; and ... that the rest of the world is now following what some years ago was thought to be a rather eccentric UK approach." (Q 27). Microsoft said that "we certainly as an organisation have benefited massively from the deregulation of telecommunications in the United Kingdom" (Q 368). CompuServe took a similar view, saying that partly because of its deregulated environment, the company found it easier to operate in the UK than any other European country. "We definitely find it more attractive operating our business here in the UK than in France or Germany both from the legal point of view and the tax point of view and the employment perspective" (QQ 756, 771). Mercury Communications said that the UK telecommunications market was arguably the most competitive in the world (Q 872).

4.15 The Policy Studies Institute (PSI) said that a liberal telecommunications regime in the United Kingdom had led to a high level of investment in the infrastructure. "The fact that the work has been carried out by a number of different companies has, however, meant that the network is patchy and uncoordinated." (p 259).

4.16 The Association for Information Management (ASLIB) agreed that the United Kingdom had a head start for developing the information superhighway in terms of telecommunications deregulation and use of the English language, but were concerned that these advantages were

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[1] House of Commons Debates, 17 April 1996, cols. 705–6.

[2] The Director General of OFTEL thought that "the economics of the cable industry will restrict commercially sensible investment to perhaps 85 per cent" (Q 1034).

"going to be whittled away very fast indeed" by English-speaking competitors from countries including India and Canada (Q 140).

4.17 The Scottish Office (pp 287–289) and the Welsh Office drew attention to particularly note-worthy developments in their respective countries.[1] The Welsh Office listed the six main priorities for its role in developing the Information Superhighway in Wales, and said that "in addition to the potential benefits to Welsh business and society generally, it is worth highlighting the potential for the new technologies (for example, to enable teleworking) to put rural areas on an equal footing with urban zones in terms of both business development and service delivery. Potentially this could promote more even economic development within Wales and also between Wales and other regions of the UK or the world." There is a plan to ensure that at least 130 business parks in Wales are cabled over the next three–five years. The Welsh Development Agency-sponsored "Network Wales" has encouraged small firms to establish a presence on the Internet. Wales has a higher density of telecottages and telecentres than any other part of the UK. A pilot telemedicine project in Mid Wales links GP surgeries and hospital sites and allows remote diagnosis of dermatological conditions (pp 307–308).

USA

4.18 The position of the USA with regard to the information superhighways was seen as both a threat and an opportunity by different witnesses. UKERNA said "The US understands the role of Internet-type developments better than any other country and this will allow them to achieve dominance in the information superhighway market place if the United Kingdom and other countries do not take appropriate measures to strengthen their positions" (p 301). A particular threat highlighted by the Economic and Social Research Council (ESRC) was the trend in the USA towards packaging all types of education, entertainment and business information products together. The consequences for the industry were clear: "Those who create the most attractive bundles are also those who tend to operate on the largest scale" (p 212).

4.19 ICL said that "there are threats because of the sheer scale, speed and political commitment of the USA to the Information Superhighway. The UK could and should help to develop EU policies to counterbalance the potential domination of US products, ideas and culture" (p 232). ICL added, however, that "the US provides us with a window of opportunity" (p 231) for exploiting the United Kingdom's skills and innovation potential in publishing, broadcasting, distance education, animation, film and video technical capability, music and software. Europe could also use the opportunity to export its languages and cultures back to the multilingual USA.

4.20 Virtual Precincts Limited said that it was not a problem that the US dominated the software industry world wide and the cable industry in the United Kingdom because these were just enabling technologies: "What is important is that United Kingdom companies become successful service providers, since the successful service provider will have access to a global market through the information superhighway" (p 308). The Universities and Colleges Information Systems Association (UCISA) agreed and said that the United Kingdom already excelled in services (e.g. education) and should develop them further instead of trying to compete with equipment producers in the Far East or advanced products companies in the USA (pp 299–300).

Japan

4.21 Janice Hughes of Spectrum Strategy Consultants said that Japan had a highly controlled and centrally planned vision for the information superhighway. Current initiatives included the creation of a Telecommunications Council to co-ordinate cross-departmental activity in this field. "But unfortunately in practice the two key ministries ... are completely at loggerheads and a lot of organisations in Japan have to have two different regulatory advisers in their companies ... because they have to send different people to the separate ministries." The one Ministry was developing

[1] All Northern Ireland Departments were asked if there was anything unique to Northern Ireland which the Northern Ireland Office might wish to bring to the Committee's attention, and they all responded with nil returns (p 613).

content initiatives, whilst the other was trying to promote broadband networks, in which it had commercial shares, and video on demand trials (Q 313).

ACCESSIBILITY

4.22 The problem of individuals, sections of society or geographic areas without access to the information superhighway (the 'have nots'), and how these would be disadvantaged in comparison with those who did enjoy access (the 'haves') was raised by a number of witnesses. For example, the Office for Standards in Education (Ofsted) said: "A small minority of pupils, with access to the Internet at home, is advantaged over their peers" (p 256). The Library and Information Commission said that the 'have nots' were at risk of being left behind (p 247) and the ESRC said it was probable that the gap between the 'haves' and 'have nots' was already growing (p 213).

4.23 The Direct Marketing Association (DMA) used the phrase 'electronic ghetto', and called it a serious social issue requiring urgent evaluation by the Government: "the electronic ghetto describes a new arena for discrimination between rich and poor, the 'haves' and the 'have nots'. Recent years have seen further rapid polarisation between these groups in the UK in terms of income and opportunity, and the coming world of electronic communication presents yet another source of disadvantage" (p 202).

4.24 The National Consumer Council (NCC) predicted opportunities for those who could not at present fully participate in society, including disabled people, but said that "the very enormity of the changes could exacerbate the position of already disadvantaged consumers if they are excluded" (p 611). The DMA said that Government would need to make a conscious decision for the information superhighway to become a reality to such groups (p 200).

4.25 The Royal Academy of Engineering said that there had already been much research into public kiosks from which the "Information Superhighway" could be accessed, some of the work having been initiated by G7. Kiosks were being used to a good extent in Japan and there were early versions also in use in France and the United Kingdom, with advanced versions under development. Kiosk development was potentially important as their use was not confined to public information alone and could be viewed as "tomorrow's public telephone boxes" (p 276).

(i) Ease of access

4.26 The CCA said that "what we really believe is the answer to getting true service throughout the United Kingdom is allowing competing networks to build." They estimated that cable would pass 75 per cent of households in the country when all the cable franchising and building had been completed. Radio loops and emerging new technologies would allow the industry "to reach all parts of the United Kingdom with competing networks in an economic fashion". The geographical issues of universal service were, and would continue to be, addressed by rapidly evolving technology (Q 102). At present, radio worked well in areas of sparse population, but developed problems in congested areas. Cable, with its almost unlimited capacity resulting from its large bandwidth and its ability to connect "hundreds and thousands of customers to the cable network", was better suited to densely populated areas (Q 105).

4.27 The Royal Society of Edinburgh said that "the Local Loop,[1] and the facility of individual homes and small businesses to connect to the network is crucial to the development of the ISH.[2] In many cases it will be uneconomic for competition to exist in the building of this infrastructure, especially in rural areas. The Government should seriously consider non-market funding and ownership models, or alternatively regulation and policy frameworks that encourage local loop providers to support open communication standards and gateways to other networks. This is possibly the most socially valuable part of the network since in the long term it offers direct access

[1] The part of the telephone network from the home to the exchange.

[2] Information Superhighway.

to consumers, and offers citizens the opportunity to communicate and conduct business from their own locality." (p 285)

4.28 OFTEL said that radio spectrum at 2Ghz had been made available by the DTI to enable operators to provide fixed telephony services by that medium to remote rural areas of the UK. The designated areas were local authority areas where the average population per square kilometre was less than 50. This covered much of Scotland and Wales and a substantial number of local authority areas in England.[1]

(ii) Affordability

4.29 The National Consumer Council has recently concluded that "affordable access to new services for all in their own homes is probably unachievable in the medium term. To use them consumers need expensive equipment, such as a PC, or perhaps in future a PC/TV, and in the short to medium term, a modem (until communications links become entirely digital). Services themselves also need to be paid for. Even modest use of new services is unlikely to make a light user scheme an appropriate way to subsidise access for low-income households. New ways will need to be found of meeting demand for service among consumers who cannot afford the necessary equipment or line usage. The existing community service requirements included in BT's universal service obligation provide one model for this."[2]

4.30 The Department of National Heritage said that the idea of libraries forming the focus for public access to superhighways was gaining currency, and some libraries were already providing public access to the Internet. The Department and the Library and Information Commission were "investigating how best to encourage this access within the framework of a coherent IT strategy for libraries. The involvement and engagement of the private sector in this process will be critical" (p 589).

4.31 The National Association of Citizens Advice Bureaux (NACAB) saw themselves as being able to fulfil a key role in extending access to the Information Superhighway of the future. The 1,800 Advice Bureaux are, between them, used by 5 million people every year, and one in four of the adult population are thought to use the Bureaux at some point in their lives. NACAB said that "our clients on the whole are what we would term the have nots, who might be left behind in the information society ... the people who use us are largely poor, troubled, distressed, fallen on hard times, and they come to us for advice and information. So we have the confidence of the have nots, and that is the client group that uses us a very great deal. ... Citizens Advice Bureaux getting involved in the Superhighway means we can bring them aboard to some degree". As a voluntary organisation the Bureaux needed grants to enable them to fulfil this role. It also had no IT training budget for its 28,000 advice workers, many of whom were volunteers who might work for the CABx for a comparatively short time (QQ 606–7, 609).

4.32 The Citizens Advice Bureaux are currently dependent on a 70 volume paper database which is updated every month, using a considerable amount of staff time. NACAB thought that changing to an on-line database system would make it a much more effective tool (Q 611). They believed, however, that their main business over the next 10 years would remain person to person advice (Q 617).

4.33 The CCA were convinced that affordability "really is the critical issue for universal service"—to which they believed that competition would provide the main solution (Q 102). Another way of reducing start-up costs will be provided by the development of Network Computers (NCs), consisting of comparatively cheap terminals linked to servers which provide the memory functions, including for software (QQ 540–545).

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[1] Footnote to Q 1036.

[2] National Consumer Council, *The Information Society: Getting it Right for Consumers* (London, April 1996), 67–68.

(iii) User-friendliness

4.34 Mr John Harper addressed the future take-up of the Internet, and other services, in the home and expressed the need for a change in mind set away from delivery by the personal computer (PC) with its inherent problems of cost and usability: "If either the Internet or high-speed highways proper are really to catch on with the mass public the industry needs to come up with a new generation of terminals retailing for much less than a PC, which can be used by people who are not computer literate and which will fit in the living-room environment" (p 226). At present insufficient attention was being given to the development of such hardware in the United Kingdom.

4.35 A similar view on the need for user-friendly equipment was expressed by the IDPM: "Service standards will probably be driven by the recent US recognition that at least 80 per cent of the population will never pay for products that are more complex to handle than a TV Zapper and that such a device is probably all that is needed to handle the most profitable 80 per cent of applications" (p 236).

4.36 The universal experience of accessing the Internet seems to be that transatlantic traffic can be frustratingly slow, particularly in the afternoons when schoolchildren are doing their homework and the United States' working day is in full swing. As ASLIB put it, "if you want to get something on the Internet you can go away, have a cup of coffee, come back and it is still slowly downloading". ASLIB blamed this problem chiefly on the current lack of sufficient bandwidth (QQ 167–170). The Director General of the British Library agreed: "America just does not exist in the afternoon as far as the United Kingdom is concerned" (Q 229).

4.37 Microsoft said that they were building a data centre in Europe and in Asia to replicate the most popular sites on the Internet, which would avoid the need to access the information from the United States. "Ultimately one of the differentiators of one service versus another will be the level of performance they are able to provide a user for the majority of the content they want to get at. If you want to access a very specialist site on an unusual topic which ... is on a small PC in someone's bedroom in Guatemala ... when you eventually try to get to the person's bedroom in Guatemala, you will be going down a very thin pipe and it will be very slow but you can still get to it if you want to." They thought that Internet access would soon speed up, and ISDN would improve the speed of access still further (Q 400).

4.38 Another problem with the Internet is that, as the Newspaper Society put it, "it does take a degree of perseverance and at least two children to be able to understand how to operate it properly" (Q 359). ASLIB thought that although in the long term people would learn to navigate the information superhighway without assistance, over the next two decades the majority of people would be ""have nots" who would not be able to find their way through the information which is on the superstructure". An interface of professional advice and help would therefore be needed between the ordinary citizen and the global information infrastructure, which could be provided through the public library service[1] or community centres (QQ 128–129). The current generation of cataloguing and indexing tools was slow, tiresome and inefficient, but it would be "at least 20 years, maybe longer, until the computerised automatic indexing systems really come to fruition" (Q 134). Research was being carried out in the United States on the development of "intelligent agents", pieces of software which understood individuals' information needs and priorities and would seek out information on the Internet accordingly. ASLIB called on the Government to encourage further research into "intelligent agents" in the United Kingdom (Q 171).

[1] ASLIB pointed out that two-thirds of the population used public libraries already (Q 136). The Library Association said that public libraries had not had the same opportunities or funding for access to the Internet as had been available in the academic sector, and this had adversely affected public library access to information (p 252).

4.39 Another problem is the sheer volume of information on the Internet, much of which is junk. ASLIB recommended using a system of three-, four- and five-star information sites, "based on some sort of general understanding of what the quality of the information is" (Q 170).

(iv) Universal Service Obligation

4.40 The European Communications Network (ECN) considered that the Universal Service Obligation (USO) could be divided into a geographic part (dependent on where one lived) and a demographic part (dependent on who one was and whether one could afford to pay). "The geographic USO can be simply resolved by levying a licence fee on all operators to cover the cost of getting the network to remote areas ... The demographic USO is a political dilemma" (p 218). The National Consumer Council naturally put the consumer first and said that "The concept of universal service obligations should be extended to all consumers" (p 612).

4.41 Other witnesses held the view that universal access to the infrastructure rather than universal service should be the main concern (pp 222, 299). The Universities and Colleges Information Systems Association (UCISA) said: "The United Kingdom must proceed as soon as possible to the installation of universal infrastructure, priced at a realistic level, in order to allow use by all" (p 299).

4.42 To promote access and services in uneconomic areas the Federal Trust proposed the establishment of national universal service funds managed by the regulators.[1] The Federal Trust also proposed the establishment of a maximum level of service which EU member states could insist on. It recommended that the imposition of formal universal service obligations should be progressive, taking account of the cost and availability of new services (p 222). This would help Member States which might find it difficult to provide a full range of high level services to all areas.

4.43 The CBI, on the other hand, doubted whether it was necessary or relevant to extend universal service obligations to the information superhighway and, even if this were done, doubted whether the economic benefits of the information society would be forthcoming in the immediate future (p 194).

CONTENT

4.44 Many witnesses stressed the need to promote British content. Content was described as "the essential ingredient" for the information superhighway (p 161) and the DMA said that "in our view it is content and application that is critical not the technology" (p 207). In this field many witnesses (*eg* pp 243 and 259) suggested that the United Kingdom already had an important asset that should be exploited to our advantage—the English language.

4.45 The CCA said that "we all agree, as an industry, that the greatest need for content right now for our infrastructure is more good British programming as opposed to more important programming" (Q 53). ASLIB warmly supported the suggestion of a content foresight initiative "to ensure that the United Kingdom is at the leading edge of the global information infrastructure of the future" (Q 149). They wanted the initiative to run across government departments, and called on the Government to create a set of objectives to be achieved within a certain time frame (Q 142).

4.46 De Montfort University said: "Britain has immense collections of heritage information and intellectual property on which to base major media business of the future. Government can promote the digitisation of and access to this heritage and intellectual property by supporting key projects and demonstrators" (p 197). This view of "unlocking the nations archives" was also supported by ICL (p 231). The University of Oxford suggested that high priority should be given for access via the information superhighway to primary information (*eg* Hansard and legislation) (p 303).

[1] Ofsted supported a similar levy mechanism (p 257).

4.47 The Department of National Heritage said that as "content-rich" institutions, museums were well placed to exploit the possibilities of superhighways and take part in the developing new technology. The Museum Documentation Association (MDA), funded by the Department, develops standards for museums, advises them on the implications of the new information technologies, including developments in superhighways. The Department had made additional funding available to the MDA to enable it to carry out a special investigation into IT and museums. The Scottish Cultural Resources Access Network (SCRAN 2000) is the first recipient of an IT award (£7.5 million) from the Millennium Commission. SCRAN 2000 is a joint project by the Scottish Museums Council, National Museums of Scotland and the Royal Commission on the Ancient and Historical Monuments of Scotland. It involves digitising about 8 million items and 10,000 images from over 200 Scottish museums and institutions and will be widely accessible to schools and libraries (p 589).

4.48 The PSI and ICL considered that the Government had a key role to play in providing content with social applications. The PSI suggested services to provide a range of information needed by the citizen (*eg* social and political entitlements and responsibilities, so-called 'citizenship information') (p 262). Telecential Communications said that "Network operations are ill-equipped and disinclined to become suppliers of content" (p 294).

4.49 Microsoft stressed the need for content generally: "you can have the right price, the right infrastructure, the right technology, but without content neither would be possible. That content needs to be useful, it needs to be appealing, it needs to be relevant, and ... there is a role for government in protecting the work, the investment that is required actually to create this appealing, exciting content" (Q 368). CompuServe saw the future lying in specialist content areas. "One of the overriding trends in the industry is that it is becoming more segmented so that whereas in the past you might have joined CompuServe or America Online or MicroSoft, in the future you are much more likely to be joining Medics Online or Accountants Online". They foresaw the development of both professional and lifestyle sectors, for example catering for children or teenagers. "This product today is far too complicated for the broad market, but all our energies are being focused on addressing that issue, not on acquiring more content and not on necessarily even making it cheaper, but we are trying to make it easier to use." (QQ 744–745)

4.50 Mr Phillis, the Deputy Director-General of the BBC and Chairman of BBC Worldwide, said that the BBC's programme content was "the strongest asset the BBC has and can bring to the superhighways and the digital age ... it is an essential part of planning for the BBC's future strategy to ensure not only that that content and those programme services are available by the traditional means of broadcast delivery, but that we can extend the availability, the understanding, and the range of information and supplementary information that the on-line services of the superhighway will allow us to exploit. It is very much driven by the belief that irrespective of the technology in terms of the services to the citizen and to the consumer, it will be the content of programmes which will attract and stimulate and draw people to the new means of delivery" (Q 464).

Educational content

4.51 Many witnesses agreed that educational content was one area that the United Kingdom should develop and exploit (e.g. pp 224, 251). The view of the Further Education Development Agency (FEDA) was typical: "there is potential for growth in United Kingdom computer-based learning materials which reflect United Kingdom rather than US cultures and languages" (p 225). FEDA added that the main market for products might be with individual distant students and the wider community.

4.52 The National Council for Educational Technology (NCET) drew attention to the need to develop educational software in the United Kingdom, and suggested that a good place to start would be in looking at CD-ROMs which would address British curriculum requirements. There was, for example, no appropriate software targeted on mathematics and science for Key Stage 2, and "much of the software that is available in other curriculum areas and for the older age groups

is from America, even though ... some of it has been produced here, shipped out to America, packaged and re-sold back to us" (QQ 251–254).

4.53 NCET said that one of the main barriers to the development of educational software was funding. "While there is a tradition of paying for resources in terms of books, there is not yet a tradition of paying for resources that come over the wires in the digital domain. Those schools that have connected to the Internet at the moment ... are getting information apparently "freely" over the Internet and so in order for there to be a revenue stream for content producers education establishments are going to have to pay. Unless there is that change of culture at some point the big commercial operators capable of producing high quality materials will not come into the market" (Q 255).

4.54 The University of Oxford said that to realise the potential benefits of the information superhighway "there can be no doubt that we must move to the stage of inter-active technology" (p 303). The content would also most likely be delivered in a multimedia format, and De Montfort University highlighted the problem of cost: "Multi-media materials are typically one hundred times more expensive to prepare than traditional class materials and costs are front-loaded. These costs must be recovered through scaling up of market penetration via a pervasive high bandwidth network infrastructure" (p 197). De Montfort added that such a network did not yet exist outside the Higher Education institutions and that private sector finance would probably be required if it were to be developed.

SERVICE PROVIDERS

4.55 OFTEL defined service providers as "people who are not building their own networks but want to provide services over somebody's network." The Director General of OFTEL saw service providers as one of the main challenges for the development of the Information Superhighway (QQ 42–4). BT was keen to see "many thousands of service providers", claiming that it was in BT's interest "to encourage them by example, by help, by doing everything possible to get service providers up and running because without them our network investment is wasted" (QQ 509, 511).

4.56 Mr John Harper said that the dominance of the BT network, so that other companies were dependent on it for the bulk of their customers' traffic, was the single most important cause of problems. He proposed "a fundamental restructuring of the industry into wholesale (network) and retail (service providing) sectors ... for re-unifying network operations under a single regulated company; and for completely deregulating provision of services and throwing it open to all-comers" (p 227). He believed that such action would stop unnecessary and costly duplication of network facilities. A similar proposal was made by Cable and Wireless, which said that a separation of service and infrastructure providers would allow the "unencumbered creation of new services, products and players" (p 173).

4.57 Telecential Communications said that because service provision and network operation had, traditionally, been within the same company the development of both had been restricted. A free market for service provision would lead to new services and incentives for network operators to provide a high capability infrastructure (p 295).

4.58 Service providers indicated two main concerns in a recent OFTEL consultation exercise. First, that the network owners were also their competitors in service provision, and they were therefore looking to the regulators to ensure that there was fair competition. Some people had argued that to ensure fair competition there needed to be some degree of separation between BT's network and service provision activities. OFTEL did not agree, but considered that there was a need for a regulatory structure "to ensure fair competition for those entering the market just for service provision." The second main concern was that there was at present no significant distinction between the prices charged to a retail customer and to a service provider for use of the network, even though the latter might be generating a significant volume of business over the

network. OFTEL proposed that BT should develop a new series of charges for service providers so that they could access the network at lower rates (Q 44).[1]

4.59 BT pointed out that they had been the originators of many of the ideas which were being mooted for a specific service provision regime (Q 510) and considered that the "market could be further stimulated if there was greater pricing flexibility in the way that BT was allowed to charge itself and others for the provision of service". One of the reasons for BT establishing its own multimedia service provision activities, for which it paid the normal retail price to the BT network, was to allow it to experience buying from the network under the same rules as other service providers (Q 531).

EDUCATIONAL USES

General

4.60 Ofsted stated that reliability, affordability, ease of installation and ease use for all of the necessary technology were critical if the information superhighway was to make a positive impact on schools, teaching and learning (p 255). Taking a wider view, Telecential Communications suggested that education and training (in particular, life-long learning) would become a prime motivator for the growth of the information superhighway industry (p 294).

4.61 The role for Government, according to Ofsted, should be in evaluating the best educational uses and disseminating the results, establishing quality control, encouraging networks for professional support, addressing the issue of copyright and promoting the training of teachers both initially and in-service (p 257). Aspen Consultancy said that Government should also be active in promoting education at both the early years and the executive level (p 161).

4.62 Heriot-Watt University believed that the Internet would have a fundamental effect on education: "Much more responsibility will be placed on the student to organise his or her own study programme, to study at their own pace and submit themselves for examination when they feel appropriate" (p 228). Changes for the university sector were predicted as the quality of an institution would start to be judged on the level of support given to the learning process and on the reputation of speciality subjects.

4.63 In 1995 the Government conducted a consultation exercise on "Superhighways for Education".[2] The priorities established from the exercise are as follows: "raising the general level of IT capabilities in schools, further education colleges and initial teacher training; developing high quality on-line education applications and services; developing the infrastructure of equipment and connectivity. The Government committed itself to: support and encourage the piloting of new communications technologies in education; to make available resources to enable continuing provision of equipment and training; to liaise with industry to promote the development of additional on-line applications and services; and to work with the Higher Education Funding Councils to review progress on the SuperJANET[3] project and to disseminate the outcome as widely as possible. The Government will also look to the communications companies and providers of on-line services to ensure that institutions are not deterred from connecting to networks because of high service or product costs" (pp 288–289).

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[1] Since OFTEL's first session of evidence to this enquiry the Director General proposed licence amendments for BT's and others' licences (Q 1032).

[2] The consultation paper can be accessed on the Internet at:
http://www.hmsoinfo.gov.uk/hmso/document/supered/supered.html

The results of the consultation exercise were published in *Superhighways for Education: The Way Forward*, which can be accessed at:
http://www.hmsoinfo.gov.uk/hmso/document/supered2/supered.html

[3] For which see paragraphs 4.82–4.84 below.

Level of use

4.64 In March 1996 about 4,500 schools and colleges in the United Kingdom had connections to the Internet (Q 255), mostly via dial-up over normal telephone lines. NCET research conducted in the context of a project with the BBC Networking Club showed that the most popular services were e-mail and World Wide Web access, which offered many benefits for teaching and learning. The NCET said that e-mail offered the possibility of communicating directly with other people and organisations around the world, working on collaborative projects and accessing expertise not usually available. Graphical browsers such as Netscape put the resources of tens of thousands of databases around the world at the finger tips of teachers and learners, through a simple file-transfer operation (p 98).

4.65 NCET said that most of their evaluation of communications technologies had been based on narrow band dial-up over the conventional telephone network. Teachers involved in those projects had spoken of "changes that they have seen in pupils' work and in increased motivation, the greater availability of resources and the greater pride in terms of being able to present work taken from digital sources". NCET was currently involved in managing the evaluation of 21 pilot broadband projects to identify the added value of connections to these networks, within what contexts standards were raised and learning was improved, and to identify the implications for teacher training. NCET pointed out, however, that in other types of information technology use it was relatively simple to set up different sizes of pilot projects and extrapolate from the data thus collected to a wider audience. "When we are talking about networks we actually cannot evaluate how people will use networks until everyone is connected because the behaviour changes when all of the community is connected. When you have only a small number of the community connected people actually do not use the full facilities. So it has posed a particular challenge because we are having to use a leap of imagination to get to the extrapolation" (Q 248).

4.66 NCET believed that schools needed local area networks in order to maximise the benefits of Internet access (Q 258), a point with which the DfEE agreed (Q 282). Ofsted said that "the physical connection of school premises to the Superhighways and the development of a LAN [local area network] within a site to allow access from various rooms, have been implemented in only very few institutions" (p 255). Moreover, usage had often been limited except where interested teachers had taken the lead: "This is partly because of the dearth of material with curriculum relevance on file servers, and partly because physical connection has rarely been smooth and productive in the use of teachers' and pupils' time" ..... "Some are not much farther along the road to smooth working a year after first access to the Internet" (p 255). This and the "mismatch between current realities and the hype" (p 256) were identified as real problems that could easily lead to teachers being predisposed not to use the information superhighway in the future.

4.67 FEDA expressed similar views: "current developments are haphazard in terms of usage because of inadequate co-ordination and lack of a clear curriculum strategy which a national support programme could provide" (p 223).

4.68 "The NCET called for an out-sourced service for schools whereby they would pay a fixed, subsidised rate for a level of service including a specified band width and support, and possibly including training (Q 257). One commercial service which has already progressed beyond the trial stage is BT's CampusWorld, which is an Internet-based content service developed in line with National Curriculum requirements and currently providing about 18,000 pages of information which both pupils and teachers can access in a closed "walled garden" environment. CampusWorld is a nation-wide service, with over 2,000 schools already subscribing[1] and around 70,000 accesses each teaching day. BT also runs CampusVision using ISDN telephony to enhance remote learning, particularly in areas of the country where teacher provision in certain subjects is difficult and the use of ISDN tele-conferencing can thus enhance teaching capability (QQ 519–524).

[1] BT hope to have 8,000 schools subscribing to the service by the end of March 1997 (Q 522).

4.69 The Institute of Physics said that the advantage for schools of on-line connections via the Superhighway as opposed to CD-Roms was that the latter could become outdated quickly, whilst on-line connections could be used to provide up-to-date information. "It is very important that children do learn about developments which are happening currently within science ... for too many years we have taught physics in schools which is largely 19th Century and only peripherally 20th Century and that must change" (Q 721). The Royal Academy of Engineering said that "in many schools the high cost of books has led to "one textbook" courses. It would encourage sixth form and university students to take a wider view if textbooks were available (for a comparatively affordable charge) on the World Wide Web" (pp 276–277).

4.70 ASLIB called on the Government to encourage partnerships and, where appropriate, to provide pump-priming funding to raise the investment to improve the educational infrastructure. They also wanted the information infrastructure included in the National Curriculum (Q 183), as did the NCET (Q 264).

4.71 Perhaps the widest use of on-line services and networks for educational purposes in the United Kingdom is by The Open University. Currently 15,000 (10 per cent) of their students and 1,700 tutors (25 per cent) were said to be registered to access on-line services hosted at The Open University or available on the Internet. These figures were expected to increase to 100,000 (66 per cent) and 3,700 (52 per cent) respectively by the year 2000 (pp 613–614).

Affordability

4.72 The Open University also identified cost to the student and the cost of training as significant barriers to the use of computer technology and network communications in education. The Open University was anticipating that its own expenditure on just on-line support services could be in excess of £5 million by the year 2000 (p 614). To support home-based learners, The Open University suggested, amongst other ideas, that an "'educational services' 0345 number at reduced tariff" could be offered to reduce the cost of network access (p 615).

4.73 The costs to schools (in particular "fear of the potential cost of telephone connections" p 223) were identified as a major barrier to the up-take and use of the information superhighway in education. Ofsted stated: "In almost all the examples cited of large-scale use of telecomms by schools the telephone charges had been either waived or heavily subsidised" (p 257). "Whatever the tariff for access, it needs to contain safeguards which allow the cost to be effectively and responsibly controlled by the institution" (p 257). Ofsted favoured the use of a levy mechanism on existing superhighway users to provide access to remote areas, and also to ensure that educational institutions were offered attractive use tariffs (p 257). The Further Education Development Agency (FEDA) suggested that "A 'map' of the highways and a clear 'fare' structure would encourage purposeful travel" (p 223). FEDA also said that "a further education version of HE's [higher education's] JANET and Super-JANET would secure more equitable access" (p 224).

4.74 In the USA there is regular cross community support within the education sector and UCISA said that, as a result, schools were much better provided for in the USA than in the United Kingdom. UCISA identified the problem: "A more significant factor [to lack of money], which has inhibited HE from assisting other communities, has been the strict adherence to the constraint imposed by Government funding rules, which mean that facilities provided from the HE budget cannot be used to support other communities" (p 298). The Open University also expressed support for a change in the funding of the Higher Education network infrastructure and said that: "The Government could do more to foster a culture which acts against the current 'Cinderella syndrome' where delivering relatively low technology solutions at industrial strength to a mass audience is seen as less important than delivering advanced technology to a few" (p 614).

Teacher training

4.75 Microsoft identified a need for teachers "to be skilled up in the utilisation of the PC and the Information Highway as a tool for teaching" (Q 368). Such activities are already underway where the value and potential of the information superhighway have already been identified. At The Open University, for example: "Both students and tutors are being taught useful IT skills and are gaining competencies in information management. The tutorial staff are also receiving training in effective teaching using the new communication technologies" (p 614). The Chief Executive of the NCET said that she could not "imagine how we can still be undertaking initial teacher training without making IT a clear pillar of that training ... It should be relatively simple to catch teachers in their initial teacher training stage. That is one of the easier things to do if we had a mind to do it." She advocated giving portable computers to teachers so they could use them in the privacy of their own homes (Q 262).

4.76 The Department for Education and Employment (DfEE) said that it was now a requirement of all courses of initial teacher training that they included elements of IT usage and experience (Q 281). The DfEE was running a pilot programme to equip over 1,000 teachers with multi-media portable computers to enable them to improve their skills in private and to explore the use of computers in the curriculum (QQ 266, 284–285). The DfEE pointed to the responsibility of the Teacher Training Agency in this area, and hoped that "we may see some movement towards teachers themselves, in the context of lifetime learning, perhaps taking on more personal responsibility for updating themselves and more use of their own time" (Q 284).

4.77 The Teacher Training Agency (TTA) said that "there is a general need to raise the IT capability of teachers if we are to make a reality of the superhighway", and also that, "school leaders need to be trained in both the curriculum and administrative potential of IT and related technologies" (p 293). The TTA highlighted problems with the present training situation for teachers: "in all key stages IT teachers command of their subject lags behind when compared with the command other teachers have in their subjects" (p 293). The picture for Key Stage 2 was particularly poor with only 31 per cent of IT teachers being graded as very good, compared with a figure of 50 per cent for all subjects. At Key Stage 4, 67 per cent of IT teachers were graded as very good, compared with 86 per cent for all subjects (pp 293-4).

4.78 The Institute of Physics said that many teachers, particularly in primary schools, had little knowledge of science and were therefore in need of considerable training effort since science was now part of the National Curriculum at primary level. The Superhighway could also be used to help keep secondary school teachers up-to-date (Q 726).

Industrial training

4.79 Several witnesses emphasised training as a priority area. The Heads of Departments and Schools Committee of BAILER, for example, said that a great deal of industrial training could become computer-based. It predicted that the existing commercial companies in the industrial training sector would move into cyberspace and be either followed or led by the large management consultancies and the computer software houses, such as Microsoft, which already had considerable computer-based training resources themselves. Microsoft, for example, was already offering training in computer subjects through its Microsoft Academy on the Microsoft Network (p 571).

4.80 The DfEE said that development projects by the Department and others had shown how technology-based training could provide high quality learning, accessible at a time and place to suit the learner or the employer. New technology could also, through enhanced simulation technologies, offer a quality and range of training which was unachievable by conventional methods. In 1995 the Department had announced a new Innovation in Training Initiative, which would help Training and Enterprise Councils in particular to develop flexible learning methods based on the newest technologies in their own programmes and to establish local access to advice and information on such methods, especially for small firms (p 583).

SuperJANET and academic use

4.81 The Joint Academic Network (JANET), which is not a "superhighway" as it is of limited bandwidth, offers extensive coverage by connecting more than 50,000 computers including all higher education institutes (HEIs), the Research Councils and some industrial sites. It allows e-mail, access to remote computing facilities and information services and access to the Internet (p 288).

4.82 There is currently only one educational broadband information superhighway operating in the United Kingdom and that is SuperJANET, which was started in 1993 and is funded through the Higher Education Funding Council. SuperJANET is capable of handling real time multi-media traffic enabling the transmission of sound and video as well as text and numeric data (pp 97, 288). SuperJANET covers some 130 sites in higher education[1] and research and is due to expand further (Q 289). The Library Association said that the national libraries, which had access to JANET, were making increasing use of the network to deliver and promote their services. The National Library of Scotland, for example, was making available unique databases such as the Bibliography of Scotland (p 252).

4.83 ASLIB called on the Government to make JANET and SuperJANET more widely available to industry (QQ 184–191). The British Library, which is connected to SuperJANET itself, said that "there is a need for citizens of this country and for major institutions in this country to have access to SuperJANET or something like SuperJANET" because it provided access to a huge amount of information very quickly (QQ 219–224).

4.84 The DfEE said that a number of further education colleges were being connected to SuperJANET, as they had become more involved in the provision of higher education. Researchers in higher education used SuperJANET to form international links with other researchers and to access large information data sets. Extending SuperJANET "too widely", for example to schools, "might mean that it would cease to meet the needs of higher education and research and also perhaps at the same time it would not actually meet the needs of schools or other interested users" (Q 291). The higher education sector already considered that it had insufficient band width for all the international connections it wished to make, and additional users would create "even more demand for those services and the chances are that no-one is going to be satisfied." (Q 296) The DfEE also drew attention to concerns which had been expressed by companies supplying networking services commercially, who were "extremely reluctant to see SuperJANET broadened to wider usage outside the HE sphere" (Q 294).

4.85 The Institute of Physics (IoP) said that British academic traffic had insufficient protected bandwidth to support national research programmes. The United Kingdom was probably the only European country which connected to the laboratory at CERN (European Organisation for Nuclear Research) only via Europa-net, in contrast to other countries which had used leased lines to supplement Europa-net. For its publishing operations, the IoP used commercial Internet providers rather than JANET, so it could readily compare the two services. It believed that for international Internet connections the academic community was getting a poorer service than commercial users (QQ 691–692). Partly as a result of EC funding, an increasing number of scientific experiments were conducted on an international basis, making the ability to communicate with colleagues overseas an essential working tool (QQ 714–717).

4.86 The Universities and Colleges Information Systems Association also complained of the constraints placed on the United Kingdom Higher Education sector playing its part in the international community by the restricted capacity of international bandwidth (p 298). The Scottish Office said that "in the recent Government Consultation "Superhighways for Education" many HEI responses identified a lack of international connectivity (especially to the USA) as a growing

[1] Not all higher education institutions are connected to SuperJANET (p 288).

problem. The narrowness of international bandwidth, in addition to increasing Internet traffic is resulting in increasingly slow data transmission" (p 288).

4.87 The Royal Society of Edinburgh said that the whole of Scotland was now covered by four Metropolitan Area Networks (MANs) linking Scottish Higher Education Institutes whereas England and Wales were still only partially networked. The MANs offered new opportunities for co-operation and collaboration between institutions, including support for a national electronic library, distribution of televised lectures and the sharing of computer-based teaching and learning materials. Students could be provided with the facilities for "self-paced, supported learning" (p 285).

Life-long and distance learning

4.88 The Further Education Development Agency said that both "staff and students require information technology core skills for sustained employability" (p 225). The Policy Studies Institute said "information handling skills, in the broadest sense, need to be an explicit part of the national curriculum" (p 264). The University of Leeds was more specific and called for computer literacy skills to be replaced by "information literacy", as this would be the key educational and training issue of the new millennium (p 303): "Without it being seriously addressed and adequately resourced, the users of the Information Superhighway will be as disenfranchised as if they had been set free in a library without ever having been taught to read and write" (p 303). The CBI made a similar comment, highlighting the importance of skills training: "what is the point of universal access for someone who does not understand how to use a service or what to use it for?" (p 194).

4.89 ASLIB said that they had recently launched a distance-learning package which would go on to the Internet and enable them to reach "anyone in the world at very low cost with training and education" (Q 132).

HEALTHCARE

4.90 The British Medical Association (BMA) highlighted three main types of application for the information highway in medicine. First, there were the library aspects of service provision, where access to information was provided through the World Wide Web or through Medline. Secondly, there were administrative applications, for example transferring contract data between purchasers and providers. Thirdly, there were the clinical aspects, including managing communications between one doctor and another, for example communications between a General Practitioner (GP) and a consultant using telemedicine or, more simply, sending an electronic referral letter from a general practice to a hospital and receiving a discharge letter in the other direction. Dr Ross Anderson, a Consultant to the BMA and Lecturer at the University of Cambridge, told the Committee that it was the "very simple aspects of the information superhighway such as electronic mail between general practice and hospitals which probably have the greatest potential for bringing real short term gains. I have no doubt that in the medium to long term there will be a lot of gains to be had from telemedicine but right now working secure e-mail systems will probably bring the most benefit" (Q 409).

4.91 The Department of Health also emphasised the administrative benefits of electronic communications in the National Health Service (NHS). They stressed the benefits for patient care of, for example, a GP being able to receive the result from a hospital pathology or radiology department as soon as it had been produced. They also believed that using e-mail for messaging and transmission of forms in the NHS "could save at least £100 million a year ... and that buys an awful lot of hip replacements" (Q 433). The Department of Health estimated that about 25 per cent of dentists were already making item of service claims electronically, and 66 per cent of "computerised general practices" were doing patient registrations electronically "and most of those are now moving on to make their item of service claims electronically" (Q 435).

4.92 The Royal College of Nursing (RCN) listed a number of possible examples of administrative applications of electronic communications which could be of direct benefit to patient care. These included improvements in communication between multidisciplinary teams such as care programmes for mentally ill patients, and rapid dissemination of urgent information such as

drugs to be recalled. The RCN pointed out that current methods of disseminating urgent information in the NHS had recently been questioned. Following the confusion caused by the attempt to disseminate information about the potentially harmful effects of some contraceptive pills in October 1995[1] the Department of Health had agreed to review the information systems used to issue new health warnings (pp 282–283).

4.93 Several witnesses mentioned telemedicine as one of the potential benefits of the Internet (Q 435, p 283). Examples of telemedicine include the use of a specialist service to a remote dermatologist by a GP's surgery in Wales, and the academic department at Manchester Royal Infirmary training surgeons using virtual reality at a distance. The BMA said that telemedicine had particular benefits in relation to medical conditions which could be diagnosed by sight rather than touch, and looking in orifices which were not normally exposed, for example dermatology, endoscopy and laryngoscopy and similar procedures. The benefits were greater when the distances involved between the locality of the GP and the specialist were greater, for example in Scotland and Wales, or if the traffic was bad in some parts of the South West of England (QQ 409, 413–414). Whilst acknowledging the notoriety which some Internet support groups had attracted, the BMA drew attention to the potential benefits which these groups offered by giving patients and trauma victims from all over the world the opportunity of discussing mutual problems whilst retaining their anonymity (Q 418).

4.94 In the United Kingdom over 90 per cent of GPs have computers in their surgeries and over half of those use computers in their consulting rooms—"probably the largest single group of clinicians anywhere in the world who have ... found a ... practical benefit for patient care in the daily use of computers and information technology in the context of the consulting room" (Q 408). Only a small percentage of these computers are currently connected to an external network, at least partly because of concern about the confidentiality of personal health records.

4.95 Lack of critical mass does not appear to be the major barrier to the development of a British information highway in medicine. The BMA identified the need to legitimise the computerised medical record as one of the main impediments to progress. It has been part of the terms of service of GPs that they must make records on paper (QQ 408, 410). The Department of Health, whilst agreeing with the significance of this legal constraint (Q 436), said that "the major barrier in many places is the willingness of hospitals to allow it to happen" (Q 444).

4.96 In an ideal world, an official from the Department of Health thought that more financial resource for GP practices would be the single most important key to increasing the rate of uptake of IT in the health service. "We know exactly what we require in a practice to enable all these things to happen and because there are so many GP practices that is where the major costs lie. So if I could wave a wand I would invest about £5,000 in every GP practice in the land and connect them to the NHS wide networking system" (Q 446). He also recommended on-line booking of outpatient appointments: "that is something I think the NHS needs to have. If you can book a holiday anywhere in the world then it is about time that you can book an outpatient's appointment before you leave the GP's surgery" (Q 433).

4.97 One of the main concerns raised by the Royal College of Nursing (RCN) was security. The RCN said that the NHS needed to communicate with social services and the private sector and patient information would need to be transferred to these agencies. "However the standards within the NHS Wide Network do not apply to local authorities and the private sector. The RCN is concerned that the same stringent standards must be applied if the security of health related information is not to be compromised." One of the problems identified was the lack of a formal approval process for software used throughout the NHS: as well as causing problems for compatibility this also raised concerns over whether data could be protected from corruption and unauthorised access. In addition, "the guidance issued by the Department of Health only considered

[1] The BMA also referred to the "third generation Pill scare" and the subsequent sharp rise in the number of abortions (Q 423).

the threat from external (to the NHS) unauthorised access" and the RCN said that there was also a risk from 'internal' unauthorised access and use of patient information. The RCN called for encryption to be used to protect the privacy of patient information and suggested that it was a role of Government to provide a framework for security standards (pp 281–283).

4.98 The University of Warwick also suggested that it was a Government role to ensure that privacy in general could be maintained where necessary (p 306). The University of Leeds suggested that while the concerns of the NHS about security of information were understandable, they were at present "unnecessarily constraining on the potential for interconnectivity with other parts of the public domain" (p 302).

4.99 The RCN considered that US software had already had a negative impact because of the marked differences between the nursing cultures of the US and the UK. "In the UK the dominance of US based nursing information systems has already damaged nursing's attitude to IT". It called for "an agreed 'core specification' for nursing and health care information systems" which would focus on the relationship between the nurse and the client. At present most of the software in use was more suitable for contracting and meeting patient charter standards rather than supporting patient and client care (p 283).

BUSINESS USE

4.100 Application and use of the Internet in British industry lags behind its use in the United States.[1] In 1995 it was estimated that 37 million people aged over 16 in the USA and Canada had Internet access, of which 2.5 million produced goods or services over the Internet (Q 661). According to figures from the American Physical Society, of the 132,000 registered domain Internet addresses in the USA 120,000 are for industry and 2,000 for universities. The Institute of Physics is working to help industry, particularly small and medium sized enterprises, to use the Internet for technology transfer, networking and finding trading partners (Q 727).

4.101 The Chairman of the Technology Foresight Information Technology, Electronics and Communications (ITEC) Panel saw the Information Superhighway being "as essential as the phone for the economy over the next few years". He cautioned, however, "that the technology should be thought of as essentially disruptive to many, if not most, enterprises ... if you imagine buying a music CD in the UK at the moment. If you spend about £12 or so, something like £5 of that £12 is for physical distribution. If you could distribute it electronically across some kind of network, then whoever was consuming that £5 on trucks, warehouses and so on is going to find things quite disruptive ... When the means of production are increasingly brain powered, the way in which we organise business around brain power as the key asset is going to be a real dilemma in the information age ... understanding how to master this technology is going to be ... crucial to the way the economy in a high value adding, developed country is going to operate." (Q 658)

4.102 Microsoft highlighted the fact that the Internet represented "a real opportunity for British business, particularly in the software and media fields, to reach world markets without having to partner with a distribution organisation in North America or Asia". Corporate Local Area Networks could create "an incredible number of opportunities to improve productivity and empower departments" ((Q 368). ASLIB suggested that there might be a dedicated United Kingdom Internet for business, pointing out that trading on the Internet was rising rapidly and was "a fraction of the cost of trading in other ways" (QQ 165–6).

4.103 NatWest has been involved in the East Anglian trials using broadband networks. It said that with electronic delivery methods companies offering direct line financial services to customers might enjoy a competitive advantage as compared to those companies with a large branch network to support. NatWest could already "down-load electronic cash into your home over a Mondex

[1] A significant proportion of Internet use is for recreation. CompuServe pointed out that 60 per cent of the traffic on their network was in the evening. They said that "most of the growth in this whole industry is on the consumer/leisure side and not so much on the business side" (QQ 750, 753).

terminal, so in theory most of the basic transactions satisfy more than 80 per cent of our requirements and can be accomplished now, almost totally automatically without the need for a physical high street presence." NatWest's duty of care to its employees and sense of "responsibility to ensure that as far as possible we maintain employment" placed a break on the speed at which such a change would take place (QQ 580–583).

4.104 NatWest also drew attention to the fact that "the mere existence of the Internet allows consumers to find financial institutions elsewhere around the world, and ... to enter into a relationship with them ... there is a need to ensure that the regulations governing the operations of banks and accreditation of banks and financial institutions are monitored and are implemented to protect the consumer" (Q 581).

4.105 The Newspaper Society said that the on-line edition of the *Irish Times* had been "very, very successful simply because there are so many expatriates". The *Irish Times*' research had suggested that expatriate Irish people were prepared to pay for such a service "if the price is right" (QQ 340, 345). There were, however, few British examples of local publishers making money from on-line services. One successful initiative by Northcliffe Newspapers was *Autonet*, which was a classified advertising service for motors in the south west of England (Q 345).

4.106 Patents are now published in both digital and paper form, and in a few years' time will be published only in digital form. The British Library already has a collection of over one million patents held in electronic form (Q 206).

4.107 A recent report by the Robert Gordon University Aberdeen on *The Intelligent City: electronic information and its potential in the provision of health and safety information in the oil and gas industry* found that oil and gas companies appeared to be technologically constrained not only by considerations of security, but also by the limited awareness of key personnel. The report identified three categories of staff:

— "the IT managers, who have a detailed understanding of Information Technology and the ability to influence corporate investment in it, but who have limited awareness of the specialist information needs of the staff of their companies, and of the information resources, particularly external information, available to meet those needs

— the specialist managers, in this case the health and safety managers, who have an understanding of the specialist information needs of the companies, a limited awareness of the information resources available to meet those needs, and the ability to influence corporate investment in it, but who have little understanding of the potential of Information Technology

— the Librarians, who have an understanding of the specialist information needs of the companies, an awareness of the information resources available to meet those needs, and some understanding of Information Technology, but who have little influence over major issues of corporate policy and investment.

There was little evidence of a developed strategy involving all of these employees. As we move from the so called 'post-industrial Society' into the 'Information Society', this paradigm of expertise and responsibility becomes questionable."

4.108 The *Intelligent City* report concluded, first, that a fundamental re-assessment of the training of IT specialists was necessary, with a view to broadening their understanding of the role which information played in organisations and of the information resources available.[1] Secondly, more attention needed to be paid in the education and training of both general managers and

[1] "Group Ware" software such as Lotus Notes and MS Exchange can help to keep different parts of organisations, for example research, marketing and sales departments, informed about each other's activities, to their mutual benefit.

specialist professionals to developing an understanding of how people and organisations use information, the relevance of electronic databases to meeting information needs, and to means of organising or accessing information. Thirdly, general managers needed to be better equipped to appreciate the need for and the possible components of a corporate information strategy. Finally, the education of librarians and information scientists needed to place greater emphasis on the promotion and development of corporate information strategies, user needs analysis and evaluation and consolidation of information.[1]

Home shopping

4.109 The CBI said that use of the Internet for retail had not yet reached its full potential. Thousands of companies advertised their goods on the Internet, often reaching new customers inexpensively, but the actual volume of transactions remained modest as security of transactions remained a major concern. As this problem was overcome, however, there might be many new opportunities for niche suppliers as well as major retail groups. There were also considerable opportunities for manufacturers to communicate directly with their customers, allowing them to determine precise needs, tailor products to the individual and market directly to the consumer (p 193). The CCA pointed out that shopping was partly a social activity (Q 55).

4.110 QVC (a shopping channel on cable and satellite television) considered that the widely available tools of the telephone and television presented greater sales potential for mail order shopping in the immediate future than the Internet. Although in the United States some 80 per cent of QVC's audience had never made a purchase from QVC, mail order was expected to become more popular, partly because of the increase in the numbers of "working women". "Time poverty is much more of a consideration nowadays. In addition to that, we know that there are more people who are less mobile, older people, women with babies who are at home, so the demographic changes that are taking place will make mail order more attractive to more people and so it should have a large penetration. However, anybody who thinks that this or QVC is going to be the death of traditional high street retailing is kidding themselves. It will have a very, very small effect on high street retailing" (Q 844). The profit margins available in the supermarket trade were so small as to make non-specialist grocery shopping via the Internet uneconomic (Q 846).

4.111 However, CompuServe said that their electronic shopping area, which in 1995 had been expanded to include the UK, had been "very successful", with £1½ million worth of retail sales in the shopping area in one year with 700,000 visitors in the area and an average order value of £45. They considered that ingrained habits were inhibiting the growth of online shopping rather than the supposed insecurity of online transactions (QQ 772–781).

EMPLOYMENT CONSEQUENCES

4.112 The Chairman of the Technology Foresight ITEC Panel emphasised that there would be both positive and negative employment consequences arising from the Information Society. On the positive side, "it is a wonderful opportunity for business in the UK, small, medium and large, to reach many new market places internationally, to reach new kinds of consumers, to serve enterprises in other countries and so on, so it is an excellent opportunity for knowledge workers, for brain power, really just to get on with it. Access like that is going to be very important, so the UK could become one of the best places to have brain power businesses. That key question of why do you not set up this particular piece of value adding business activity in the UK rather than anywhere else is going to be a central question for our Foresight Panel. I think it is a central question for the UK economy and for UK politics. ... On the down side ... it is a wonderful way for businesses in other countries to come and access domestic markets here and supply them. It is a wonderful way for businesses here to out-source functions to overseas suppliers. It is a great way to export jobs." (Q 687)

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[1] JM Smith, JW Murdoch, IM Johnson and RC Marcella, *The Intelligent City: electronic information and its potential in the provision of health and safety information in the oil and gas industry*, Report to the British Library Research and Development Department (Robert Gordon University, Aberdeen, 1996), pp 68–70.

4.113 CCTA, the Central Computer and Telecommunications Agency, quoted the current US administration's view that "information is one of the nation's most critical economic resources. Estimates are that two thirds of US workers are in information-related jobs and the rest are in industries that rely heavily on information." CCTA said that "it is not unreasonable to assume that this estimate could apply to Britain. In which case the Information Superhighway, which provides the means of accessing and transmitting much of this information, becomes vital ... The Information Superhighway is key to delivering electronic government that will soon operate in ways that the most visionary planner could not have imagined five years ago" (pp 176–177).

4.114 The IDPM said that information technology had led to the "implosion" of corporate career structures (p 239) and that this had had a major impact on employment. Job losses had occurred in banking, administration and clerical sectors and there was more to come: "The potential for many IT-related jobs to move off-shore cannot be overstated. If the task can be adequately specified ... an Indian Software house may already be able to bid at 20-25 per cent of the UK/US price for comparable quality" (p 241).

4.115 Aspen Consultancy gave a graphic example of how the work of a high tech distribution company could be replaced by electronic means, thus negating the need for the company itself. The term "marketspace" was coined to describe how jobs would disappear down to a few crucial points (many of which could be overseas) while the rest of the business was conducted electronically (p 161).

4.116 In relation to employment prospects and problems, ICL said: "It would assist the UK greatly if targeted awareness programmes were addressed to the areas of greatest threat and opportunity." ICL emphasised the potential of broadband technologies for assisting teleworking, which it thought would "become an increasingly real option for many people" (p 231).

4.117 The CBI also focused on the need for planning so that the employment consequences of the Information Society in the United Kingdom were managed in an orderly fashion. "There is large potential for growth in employment in the Information Society, albeit in new forms and types of employment for which education and training will be required. At the same time in the UK there is a threat to traditional sources of employment in manufacturing and the production of material goods due to the newly developing Asian economies based on their lower wage and social cost structures. It is particularly important therefore to manage this change to avoid social upheaval and the consequential cost. Government policies, both economic and social, should take account of the need for time to implement the considerable changes implied by the development of the information society (p 195).

4.118 The Technology Foresight ITEC Panel emphasised the need for large numbers of skilled information technicians. Furthermore, "if this technology really is going to be pervasive in society then most of our citizens will need to be literate in those sorts of skills." (Q 687)

Teleworking

4.119 The BCS was among several witnesses[1] who stressed the potential benefits of teleworking: "this can have enormous impact in the need for expansion in the physical transport infrastructure which is very expensive—much more so than the cost of a high bandwidth communications infrastructure—and environmentally damaging." The BCS recommended speeding up "the realisation of this potential" by incentives for individuals to use a part of their home for remote working and, "for people who do not have the space, the provision of local telecommuting centres removing the need for a long commute. Such centres could be a regular feature of all suburbs and villages" (p 170).

[1] *Eg*, pp 189, 195, 264, 280, 295. For further background information see also the Report by the Parliamentary Office of Science and Technology, *Working at a Distance - UK Teleworking and its Implications* (June 1995).

4.120 The CBI said that there had already been considerable growth in teleworking, which could accommodate both full-time and part-time employment, allowed much more flexibility than traditional forms of working and had the potential to help revitalise depopulated communities. It warned, however, that the trend should not be over-emphasised. "Many business tastes are unsuited to relative remoteness from customers, suppliers or colleagues. Moreover, many employees prefer to work in physical proximity to their colleagues" (p 195). The ESRC said that the recent literature on changing working practices suggested that various forms of teleworking were unlikely to grow significantly in the absence of major and widespread adjustments in lifestyles, support services, etc. (p 213).

4.121 IDPM distinguished between what it saw as the advantages of "flexiworking", working from a home office linked to the corporate systems but having regular physical meetings with colleagues or customers and using company premises and facilities for what could not be done economically from home, and "the teleworking trap", where the individual did not regularly communicate other than electronically or by post (p 240). The Library and Information Commission said that there was "a feeling in some quarters that teleworking is being promoted by the telecommunications and IT industries, which stand to benefit from equipment sales, but the economic benefits have not yet been proved" (p 250).

ELECTRONIC PUBLISHING

4.122 The Newspaper Society said that it did not "see the end of newspapers in the medium or even long term ... we see electronic publishing in its various forms as a means of enhancing what we already have" (Q 352).

4.123 News International has been one of the pioneers of newspaper publishing on the Internet, where both *The Times* and *The Sunday Times* are available on-line. Despite the present lack of profitability of the on-line versions of these newspapers, News International justified their investment on the grounds that they were "busy investing in the future". In particular, they saw a distinct trend away from newspaper readership and towards other sources for news information and entertainment amongst young people. "We feel that this shift away from newspaper reading really can be likened to the shift from the oral tradition to the written tradition: we are now witnessing a similar shift to the computer literate tradition, and it is just as fundamental." They thought that Internet customers would be in addition to newspaper readers (QQ 957, 959, 962). The traditional newspaper industry, both in the United Kingdom and in the United States, also feared that the classified market would move swiftly towards on-line, and it had recently been predicted that American newspapers were likely to lose half their profitability in the next five years because of the impact of the Internet. "If that is true, that is a significant shift, and that is another reason we are interested in these markets. We are not just interested in reaching readers, we need to take the advertisers with us" (Q 967).

4.124 Butterworths British and Irish publishes a total of 1,000 titles with 200 new titles issued each year. Over recent years it has placed increased emphasis on the development of electronic products, including CD-ROM and Lexis on-line products and services. Butterworths regarded the development of the Information Superhighway as "a crucial stage in the evolution of publishing." They warned, however, that if it is to become "more than an electronic mail and marketing infrastructure, the Information Superhighway must offer a *profit* incentive to prospective information providers and a *spend* incentive to prospective customers. Without these commercial drivers, the impact of the Information Superhighway on commerce and industry, and its influence on society's values, will be limited".

4.125 Butterworths recommended that governments should encourage telecommunications and computer suppliers and information providers to work with Microsoft to establish a second tier infrastructure based on Microsoft Network. The second tier infrastructure would create a high quality, paid for, business information service in addition to the existing low cost, easy access information services available on the Internet. They suggested that providers of business information services would be subject to commercial practice rules and pay administrative and

information management charges, and that users of these services would pay subscription or transaction charges (p 581). News International foresaw the development of subscription-based, high quality on-line services, personalised to the requirements of individual customers (Q 969).[1]

4.126 In January 1996 the Institute of Physics (IoP) became the first publisher in the world to offer all its 31 learned journals on-line. The electronic version is included in the price of an institutional subscription to the printed version, and anyone in that institution can access the electronic version on their local terminal. Planned developments include links to errata, corrigenda and addenda and hypertext linking of references. Most sales are overseas. A pilot project had suggested that an electronic version could halt a decline in institutional sales. The IoP had run "a very large survey of research physicists worldwide and they were very clear that they wanted properly refereed and edited journals whatever medium is used for publication, and despite the growing use of less formal communications through electronic preprints and bulletin boards". The IoP were concerned that printed books and journals attracted zero-rate VAT, but "the exact same content offered on-line" attracted full-rate VAT, thereby discouraging the use of modern technology. Furthermore, electronic publishing could not provide a quick fix for the decreased funding of university libraries (QQ 696–697, 699).

4.127 The British Library said that traditionally the learned societies had put "a great deal of effort into indexing the literature of science, so that in the print-on-paper mode we are able to find articles of interest. The learned societies and other scientific organisations are going to have to rethink that mapping and indexing to enable that searching to be more effective in the electronic media" (Q 227). There was widespread recognition that this issue needed to be gripped both nationally and internationally (Q 193).

4.128 The Director General of the British Library, Mr Russon, reported that there was a range of views at an international conference on scientific electronic publishing of what "the scientific archive should house—should it be restricted to strictly peer-reviewed journals or should it extend to every jotting that a scientist made on the superhighway on a bulletin board? I think there was clear agreement that the priority requirement is for genuine peer-reviewed electronic publications, but there are those who would argue that it should go much deeper than that, and indeed technology would allow it to go much deeper than that. I remain to be convinced that the system would not just collapse under its own weight if one tried to collect every jotting that everyone ever made" (Q 204).

4.129 Mr Russon suggested that one way of encouraging the growth of electronic journals would be for the Funding Councils' research assessment exercises to take account of such journals as a legitimate publishing medium (Q 240). Another catalyst for the creation of an electronic journal would be if embedding some of the data in electronic form within the journal became a critical way of presenting the results of a particular piece of research (Q 243).

Community use

4.130 The CCA said that most of the cable companies were developing local channels which would provide an opportunity to focus on the local level, as distinct from the regional level on which terrestrial channels tended to focus (Q 53). They contended that as cable installation costs were generally extremely low compared with other operators, and as cable usage costs were generally between 15 and 30 per cent cheaper than other operators, cable became the network of choice for operating any kind of a "kiosk" system (Q 93).

4.131 Microsoft said that America On-line's business had attracted "6 million consumers dialling up on their home PCs". These people had been attracted by easy access to information, including educational information, "but the big thing that kept people coming back was the ability to form on-line communities, to meet people in a common interest, whether it be travel to Alaska or gardening or political debate, and through the technology people can share information on the

[1] Readers of the Internet version of *The Times*, which is currently available free of charge (http://www.the-times.co.uk) can already specify their personal interests.

bulletin board or have real-time, on-line chats." Microsoft emphasised the importance of the community aspects of the Internet as "a nice, clean, well-lighted, friendly place to go" in an era when there was often little sense of community elsewhere (Q 371).

TECHNICAL STANDARDS

4.132 Several witnesses thought that the adoption of agreed standards was important for the development of the information superhighways (*eg* p 309). The University of Warwick considered that solutions to technical problems would be "of little or no value if they do not correspond to world-wide standards" (p 306). The ECN said "the issue is about software standards on the network itself" (p 216) rather than network standards, as these would be determined by the market. The PSI, however, warned that although markets could establish standards quickly, "the establishment of incompatible systems based solely on market dominance can retard progress" (p 259). The PSI referred to the current incompatibility of cellular networks, and called for Government action to promote the establishment of standards.

4.133 The British Standards Institute (BSI) said that there could be problems when sending information across different networks as there was as yet no convergence between two message standards which were regularly in use in the United Kingdom and USA. It was "often necessary to use ... shareware [free software made available by individuals], with its attendant risks, in order to send information in electronic form over the Superhighway" (p 171). The Internet Society and the International Standards Organisation (ISO) had now started working on converging the sets of standards, but this was expected to take some time.

4.134 Other areas of activity included the World Wide Web and informal standards which were being developed by the World Wide Web Consortium. The BSI warned that "the United Kingdom will be disadvantaged unless United Kingdom organisations take an active part in this consortium" (p 172).

4.135 The European Informatics Market (EURIM) supported a system of open standards (originally proprietary standards which were later made available for all to use). EURIM said that it "would like to see Governments and standards bodies place greater interest on the need for vendors to agree standards prior to investment". Trying to set standards later was often much more difficult because of the investments which had already been made (p 221).

4.136 The Department of Trade and Industry (DTI) said that agreed standards could create "more disadvantages than advantages. If the standard creates a big market and creates market opportunities, that is good because companies working in Europe need the size of market to repay investment. On the other hand, however, if it constrains what they do, if it limits innovation or prevents them differentiating their service offering from each other, then the standard is probably unhelpful." The Government should not have a say in standards, except in the few cases where there were strong regulatory reasons. In general it should be left to the market players to decide what standards they needed to make the business work. In the DTI's view the traditional standards-making process was "effective but slow" (QQ 3–4). At an international level, however, the International Telecommunications Union was "just too slow" (Q 13).

4.137 OFTEL said that "with regard to network competition ... we have scoped the problems, we know what they are, we are tackling them and to the extent there are standards and interconnection issues outstanding, they are not because engineers cannot solve them, but because accountants and business managers cannot come to agreements." (Q 27) The CCA did not see a lack of internationally agreed standards as the real inhibitor of growth of the information superhighway. The main barrier to development was the need to understand user needs (Q 73).

COPYRIGHT AND INTELLECTUAL PROPERTY RIGHTS

4.138 The Standing Conference of National and University Libraries (SCONUL) said that content for the information superhighway and CD-ROMs publications was increasingly in multimedia format, but "it currently appears that the creation of multimedia products is unduly hampered by the need to gain a large number of copyright permissions from a great variety of sources" (p 291). SCONUL suggested that there might be a case for a carefully controlled relaxation of copyright in particular circumstances and called for an examination of the topic (p 291). Dow Jones Telerate Ltd suggested that the level of originality needed to gain copyright protection should not be set too high (pp 209–210). De Montfort University described copyright in relation to images in particular as being "highly complex" and said that the law needed better definition (p 97).

4.139 SCONUL also raised the issue of ethics and copyright, highlighting that the digital environment could allow publishers (in the course of collecting a use or copyright fee) to monitor who had accessed what material and maintain records of the access which might then be put to other uses. SCONUL said: "Copyright in published material must of course be adequately protected, but adequate protection must not be advanced as a reason to restrict unduly or to monitor the private or educational use of information". It added that "the balance of protection must not, in our view, be readjusted too far in favour of the publisher" (p 291).

4.140 Dow Jones Telerate Ltd said over-regulation of copyright could lead to market distortion (p 209) and that "products with identical content should be protected in the same way regardless of the mode of delivery" (p 209). There was, however, a clear need for copyright: "The expectation of reward for creative effort and investment is the incentive to create and innovate. The continuing expansion and improvement of the 'superhighway' infrastructure itself and the improvement of services and data provided on that network, can be ensured only by rewarding creation and innovation" (p 211).

4.141 News International emphasised that the central issue relating to copyright was that of enforcement. "The risk of copyright infringement increases enormously with digital technology. It is not only a matter of getting the protection right in the first place, but ensuring effective means of enforcement are available. While that might be the case in the UK at present it is far less clear in many foreign countries and that is something we need to address" (Q 998). Mr Taylor, the Minister for Science and Technology, agreed. "Although I think many of our laws are in place in the UK and at the European level and things are going in the right direction, it is observance of the laws and how you pull up a country that is being less than compliant in observing those laws that is the problem". Mr Taylor drew attention to the existence of "watermarking" technologies, enabling the identification of non-authorised recordings, as a possible way forward (QQ 1024–1025).

4.142 The Library Association said that copyright was a major issue in developing superhighway applications: "there is a danger that the potential [of a global information infrastructure] will not be fully realised until mechanisms are incorporated into the network for the protection of intellectual property" (p 253). For example, "There is no provision in United Kingdom copyright law which gives librarians or their users any rights to deliver information in electronic form ... If permission is not given, traditional methods of delivery still have to be used. Copyright is therefore seen by librarians as a barrier to full network use" (pp 253–4).

4.143 The Library Association policy with regard to material in electronic form was that, in general, libraries and librarians should be able to do with it what they already do with material on paper, *eg*, lend, copy for the purposes of electronic delivery, copy for members of the public for personal education or research use, permit limited general copying, allow public browsing of material and general access on site or remotely, all without incurring charge or seeking specific permission (pp 254–255).

4.144 The Library Association also called for legislation to allow the conversion of copyright protected texts and images into digital form for preservation and conservation purposes, and for legislation to provide for the legal deposit of certain electronic media.[1]

4.145 The Newspaper Society emphasised that publishers would only invest in new media products if there was an appropriate legal environment to allow them to recoup their investment.[2] They saw the Government's upholding in European Union negotiations of the Anglo-Saxon tradition of copyright ownership, moral rights and eligibility for copyright protection as vital (QQ 343–344), as did Microsoft (Q 368).

4.146 The DTI said that the question of intellectual property rights with regard to equipment was specifically within their area of responsibility (Q 21). M Verrue of the European Commission said that intellectual copyright issues could only be dealt with at a very broad international level. The Commission hoped that EU Member States would be able to agree a consensus view amongst themselves on the various copyright and copyright-related issues, which would help the debate within WIPO (QQ 644–645).

Security, encryption and verification

4.147 The Royal Academy of Engineering identified security and privacy of information as a key issue in the electronic information debate, and thought that legislation was needed to protect sensitive data. It also called for the regular up-dating of legislation to prevent the unlawful accessing of data, whilst accepting that this would be a difficult area to police (p 75). The British Library agreed that Government action was needed in these areas at both national and international level (Q 216). The British Medical Association stressed the importance of security in maintaining public confidence in health care networks, and said that it was "fundamental that privacy is at the centre of our concerns" (Q 426). The Department of Health said that they were "determined to protect the confidentiality of health data but ... [were] determined also to balance the risks against costs" (Q 448).

4.148 Dr John Taylor, Director of Hewlett Packard Research Laboratories Europe and Chairman of the Technology Foresight ITEC Panel, said that "one of the recommendations we would make very strongly is that we should really open up the availability of strong, end to end encryption to the mass of business, commercial users and so on as quickly as possible, subject to the right kind of safeguards. I do not think that the Internet could develop without the equivalent of sealed envelopes. If we tried to develop the postal service with just postcards, it might have been somewhat handicapped. The next main feature that we need to give is end to end security so that people can have a much higher degree of confidence in the fact that their information is protected. When that becomes available, we understand the design of fire walls and the networking will change. Fire walls at the moment are there on the basis that you have not got any other kind of security. When you have got other kinds of security, then the architecture changes and there will be quite a rapid evolution." (Q 657) He believed that high grade security was going to be essential in the digital world, moving towards military security for business operations (QQ 663–668).

4.149 Microsoft called on the British Government to take a leading role on encryption by implementing best practice (Q 368). Students were breaking the present level of encryption "within a couple of hours as a joke". Without adequate encryption electronic commerce, which could be of particularly great benefit to disabled people, the elderly and those in rural areas, would "not grow as vibrantly as it should" (Q 390). Microsoft emphasised the need for improved encryption to secure both business and consumer confidence: "you need to reach some sort of framed environment where people feel secure that by putting their Access number on this or instructing their bank about that or even sending some e-mail to mum, it is not going to be read and accessed

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[1] Library Association/Joint Consultative Committee Statement on *Copyright and the Digital Environment* (October 1995), p 4.

[2] A similar point was made by the Technology Foresight ITEC Panel (Q 679).

by the great unjust out there" (Q 392). At the Massachusetts Institute of Technology, however, Dr David Clark (a Senior Research Scientist) said that what was required were levels of encryption appropriate to the material being transmitted, rather than adopting military-grade security measures where they were not needed.[1]

4.150 The DTI said that they were involved in discussions about encryption at the European Union level because the European Commission had issued proposals about electronic trading using encryption. There had also recently been moves within OECD to try to agree matters at the international level (Q 25). In June 1996 the Government announced its proposal for the licensing of Trusted Third Parties providing encryption services for business. This policy was drawn up after detailed discussions between Government Departments and aims to provide secure communications for industry and commerce whilst safeguarding law enforcement requirements through warranted interception (pp 527–529, 554, 557).

4.151 The Newspaper Society thought that the present lack of confidence that transaction methods on the Internet were sufficiently secure was holding back the development of on-line newspapers (QQ 349–350).

4.152 BT and NatWest both considered that the "problem" of security and encryption was more apparent than real (QQ 553, 556–557). NatWest equated the risk of passing card details over the Internet with passing on the same details during a telephone or mail transaction. The level of fraud for such transactions represented about 5 per cent of the total card fraud in the United Kingdom (£4.3 million in 1995) (p 612). BT said that because encryption was now available through silicon chip technology it could be provided at a very much lower cost than in the past. This meant that encryption was "no longer the significant barrier that it might have been at one time". The rapid growth in popularity of Intranets, providing Internet services to closed user groups such as individual companies or communities, also helped to reduce the scale of the security problem (QQ 518, 530). Mr Taylor, the Minister for Science and Technology, believed that security considerations meant that the growth of Intranets would outrank Internet growth (Q 1019).

4.153 Verification was highlighted as an important issue by many witnesses (*eg* pp 169, 245 and 281, 612–613, 622–623). The problems with verification of information were two-fold: first being able to identify genuine products or sources of information, and second, judging whether the information itself was correct. The most basic level of verification was correctly associating an Internet address with that of a reputable company or individual, which would necessarily depend on how the Internet addresses were allocated. The system in the United Kingdom was described by Intervid Ltd. as "a sort of controlled anarchy" (p 245) exercised by a small committee of Internet professionals, although this was an apparent improvement on the system in the USA where anyone could apply for any name.

4.154 The Royal College of Nursing (RCN) highlighted the problem of verifying medical information available on the Internet: "There is no control over the quality of healthcare information available on public information pages or bulletin boards. Medical advice may be inaccurate or unsafe" (p 281). They suggested that one role for Government should be to provide guidelines for "kite marking" and verifying information for public use (p 283).

4.155 Verification is also important in the context of security of payment for goods and services over the Internet. The CBI described security of payment as "fundamental to the enabling of electronic commerce" and said that retailing over the information superhighway had not reached its full potential as a result (p 193).

4.156 NatWest said that the requirements for electronic commerce were two fold: the ability to authenticate the parties involved on each end of the wire, and the secure transfer of value between two parties (p 612). Visa said that it had been working on the development of open

[1] Appendix 8, paragraph 8.

standards for Secure Electronic Transactions (SET) with MasterCard, Microsoft, Netscape, IBM and others. SET was likely to be available by the end of the year and as a result, Visa expected that "electronic commerce will grow exponentially" (p 622). NatWest, however, was cautious because of the level of encryption it incorporated and the current restrictions on its use: "SET proposes to employ 1024 bit RSA, a very strong level of encryption, but one which will require US export approval if it is to become part of a global standard. It is clearly essential to the development of secure electronic commerce that this export approval is forthcoming" (p 613). NatWest itself had developed the Mondex card, which had "very secure chip card technology which will allow, or can allow, both the authentication of the parties involved and a secure transfer of value between two valid Mondex "purses"." (Q 548) The Technology Foresight ITEC Panel emphasised the importance of encryption technology in guaranteeing authenticity and tamper-proof status and preventing illegal copying (QQ 674, 682).

4.157 Visa called on the Government to take action on verification and security and suggested two key areas that should be addressed: "removing barriers to using encryption technology that hinder security on the Information Superhighway; [and] passing legislation recognising digital signatures as valid means for entering into contracts" (p 624).

4.158 Several witnesses complained about US restrictions on the export of encryption algorithms. News International, which thought that "encryption is going to be absolutely central to the commercial development of ... [on-line] services", said that there were many national restrictions on the export and use of encryption. The United States was the most important example because of its lead in the development of new technology (QQ 971, 973).

4.159 In the USA, encryption is perceived as one of the main problems with the information superhighway at present.[1] The Information Technology Association of America said that the ban on exporting software from the USA which included high levels of encryption could cost its members $65 billion by the year 2000. Similar restrictions in the United Kingdom might thus have similar consequences. Questions were also being asked in the USA about which authorities should have access to keys for decrypting material, under what situations such keys should be used and who would be liable should the keys be misused (accidentally or otherwise).

"Undesirable" and illegal material

4.160 The Science and Technology Minister Ian Taylor MP has said that the Internet industry must address public concern about undesirable and illegal material available on the Internet if it is to avoid demands for inappropriate legislation. "The Government's preference is for a voluntary approach. The most effective way of influencing the development of the Internet is to enlist the help of the industry; it is in their own commercial interest to meet public concerns. An imposed regulatory regime is not likely to solve all our problems. It could also hamper the emergence of new and innovative companies and services ... The Internet was designed to survive a nuclear attack—and is likely to prove a challenge to effective regulation."[2]

4.161 The Home Office said that Special [police] Branches across England and Wales were aware of the growing presence on the Internet of extremist groups such as the British National Party. The material placed there most frequently reproduced information and opinions which were published legally elsewhere and the police therefore did not become involved. Also of concern was racist material which was produced abroad, particularly in the United States. Some of this material might have attracted criminal prosecution had it been produced in the United Kingdom but it fell outside the police's jurisdiction. Although the Metropolitan Police Special Branch and other Special Branches across England and Wales used the Internet for intelligence gathering about race hate material there was no specific monitoring.

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[1] See Appendix 8.

[2] DTI Press Release, 21 March 1996 (http://www.coi.gov.uk/coi/depts/GTI/coi6798b.ok)

4.162 The Home Office said that material passing over the Internet was subject to the same laws as material being distributed by other means. The Government was concerned to see whether enforcement of the laws over the Internet raised particular problems which could be addressed by legislative change, and was determined to ensure that domestic legislation would not lag behind technological advances. The Internet's global character, however, meant that the impact of legislation was difficult to predict. The Home Office pointed out that material stored on Internet hosts overseas was available with little more expense or trouble than that sourced from within the United Kingdom, and the Government had to consider the possible effect of new domestic legislation on the United Kingdom Internet industry, compared to the impact on the availability of illegal material. The Government would urge the Internet Service Providers' Association to implement a Code of Practice, including the behaviour of Internet service providers when faced with unacceptable material on the Net, as soon as possible.

4.163 The Home Office concluded: "it is important to distinguish between illegal material and material which is legal but which some would find offensive. Self-regulation is an appropriate tool to address the latter. Dealing with illegal material is a matter for the courts and the law enforcement agencies. The Government notes the dialogue between the police and some Internet service providers and would like to see this developed constructively for the benefit of the Internet and society generally" (pp 603–604).

4.164 CompuServe said that as an access provider they did not accept liability for the content on their network unless they were informed of some illegal activity (QQ 799–800). The CCA said that a number of cable companies had used gateway software to filter out certain Internet material being accessed in schools. "However, we fundamentally do not believe that it is the role of the network operator to be the policeman of the system. We think that we really are very unsuited to it. We are not trained to be censors. We are not accountable to anybody ... We think this is something which needs serious debate amongst regulators and government". They recommended following Oftel's example in working for the development of the self-regulating body the Independent Committee for the Supervision of Standards of Telephone Information Services (ICSTIS) which set the telephone industry's own code of behaviour for material which is allowed to go out over sex or chat lines. They acknowledged, however, that the need for international regulation created additional complications (Q 114).

4.165 The Policy Studies Institute said that "the on-line environment confuses censors because it has both private and public elements and in the light of that two clear principles should be observed. Publicly available material should be subject to the same laws as other content while private and semi-privately available material (such as discussion groups) should be subject to the same rules as the telephone ... leaving censorship to service providers is not a tenable long-term strategy. If we accept that it is appropriate to have bodies like the British Board of Film Censors and the Broadcasting Standards Authority, then it is almost certainly appropriate to have some mechanism to control, or at least to monitor, the standards of the material made available over publicly-accessible electronic networks" (p 260).

4.166 Christian Action Research and Education (CARE) expressed concern over the nature of material available on the Internet, and called for voluntary international action based on a code of practice monitored by an international standards organisation with a similar approach to the UK-based ICSTIS. CARE said that clear, consistent and enforceable rules on pornography were required. Immediate action needed to be taken against threatening e-mail, the existence of child pornography (both pictures and text) and against sexually violent material being distributed on the Internet. There was currently a lack of resources being devoted to enforcement on these matters (p 178).

4.167 The NCET said that a number of educationally-oriented Internet service providers offered a protected area or "walled garden" in, for example, a Netscape environment of educationally suitable sites with useful subject materials. These services usually provided a reasonable amount of protection against undesirable material (p 98, Q 260).

4.168 An alternative to the probably impossible task of reaching universal agreement on censoring the World Wide Web has been developed by the Platform for Internet Content Selection (PICS), which uses labelling technology to allow users to identify categories of information which they do not wish to see (Q 377). The system is dependent on content providers rating their own material or on third parties rating material (p 608). The Home Office said that the Government wished the provision of protective software and filtering technologies to become more widespread, in part because they avoided "heavy handed regulation which could damage the Internet's role as a driver of competitiveness" (p 604). CompuServe called on the Government to express its support for PICS, which would be adopted as the industry standard for "adult material" (QQ 771, 789–790). They warned, however, that for "the stuff that really is illegal" PICS was not a solution. "You cannot rely on criminals to classify their content." (Q 799)

4.169 ICSTIS said that Internet screening solutions such as PICS were not foolproof and could be subject to abuse. The pressure to rate material in order to ensure it could be widely accessed might tempt some content providers to mis-rate material in order to maximise opportunities for it to be accessed. In the premium rate telephone services sector the fact that access to "adult material" was restricted to certain codes had led some service providers to try to mask material and present it as something other than an adult service so as to avoid the tighter restrictions which applied. ICSTIS said that it was not clear how users would be able to register complaints if content on the Internet was mis-rated or what action could be taken against content providers who might abuse the rating system in this way. It concluded "it is unlikely that one single solution will present itself as the 'killer application' for regulation and control. It is more likely that a package of measures will develop which perhaps combines the best of what technology has to offer with the strengths of an effective and flexible Code of Practice and system of industry regulation." (pp 608–609)

4.170 De Montfort University said that "clarification and simplification are required in the area of limitation of liability in matters of libel and unsuitable material. Institutions which take due diligence to implement internal regulation and good practice should be protected from legal action in respect of aberrant behaviour of individuals over whom they have no control" (p 197). UCISA also expressed concern on this matter, particularly in relation to bulletin board providers and whether they were to be liable for what individual students might use the service for. UCISA called for the adoption of a legal framework in the United Kingdom to remove any doubts over liability (p 300).

PARLIAMENT

4.171 A report by the Consultative Committee of Experts of the Inter-Parliamentary Union (IPU) on the *Use of Modern Computer Technologies, such as the Internet, for Inter-Parliamentary Communications* considered that "national parliaments, for whom access to information has always been a critical factor, are particularly well placed to benefit from the increased information accessibility and transparency offered by the Internet. Because it is truly global, the Internet makes possible low-cost communications with people and organizations around the world, thus enhancing the visibility and accessibility of parliamentary institutions. Regular use of the Internet would result in reduced costs of communications between national parliaments as well as with the IPU."[1]

4.172 The IPU Committee also pointed out that "as national parliaments and the IPU produce and distribute printed information in large quantities, it is likely that electronic publishing on the Internet would significantly reduce distribution costs in comparison with the traditional methods of printing and distribution on paper. Not only does the Internet make it possible to deliver information to a large and growing population interconnected by low-cost electronic superhighways at a fraction of the cost of distribution on paper, but it does so in a more environment-friendly way".[2]

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[1] In the House of Lords, the majority of such communications are conducted via the Overseas Office, which will gain access to the Internet in summer 1997 as part of the on-going programme of cabling Parliament.

[2] IPU Report of the Consultative Committee of Experts, p 3.

4.173 Reuters called on Parliament to set an example by making greater use of the Internet and electronic publishers to disseminate transcripts of the proceedings of the Houses of Parliament and Select Committees; calls for evidence, including the ability to take responses electronically, and the contents of documents deposited in the parliamentary libraries and which are suitable for publication (p 275).

4.174 John Tomlinson MEP emphasised the potential for Internet use in the democratic process. "The Internet is an opportunity for supposedly open government to become just that. In representative democracy ... it is the right of every citizen to know exactly what their elected representative is doing on their behalf, and to have access to information about the process through which decisions are taken, as well as the decisions themselves. This is important not just in ensuring that our citizens are informed about the society in which they live, but it also gives them the opportunity to partake in the process through lobbying of their elected representatives, and ultimately through casting an informed vote at election time. Such participation is an essential pillar of democracy, as is the accountability that it helps to progress." He stressed how cheap it could be to provide parliamentary information on the Internet. "For my own web site,[1] the initial set up cost was £50. My monthly rental of the disk space required for the web site is £20 ... I currently have over 350 pages of information within my web site ... The pages are accessed from citizens of all 15 Member States of the European Union and beyond. Since launching the service my pages have been accessed over 10,000 times,[2] working out at an average of 300 a day for the month of January when the service was launched." (p 296)

ROLE OF GOVERNMENT

4.175 Many witnesses called on the Government to exercise leadership in the field of IT (pp 168, 190, 203, 237, 250, 262–3, 278, 295, 306), especially in education (Q 397), to promote awareness and to build a vision with practical policies and responses (Q 313). The BCS stated that "Leadership is the most critical of all roles the Government could play" (p 168). The PSI said that creating a suitable policy framework should be a key role for Government, but that action so far had been limited, with little evidence that the Government had recognised either the magnitude of the changes or the need to take a positive lead. The PSI also said that the Government was, as yet, making "relatively little contribution" to the creation of the EU policy framework, although this framework would speed the transition into the information society (pp 262–4).

4.176 The PSI expressed its concern over the current status given to the information superhighway in the United Kingdom: "The Government does not appear to be giving high priority to the creation of the superhighway. Responsibility is dispersed among a number of different departments" (p 263). The CBI also identified the "fragmentation of responsibility for information policy amongst government departments" as a problem and considered that there was "scope for a co-ordination mechanism responsible for information initiatives and national resources, reporting to the Cabinet" (p 195).[3]

4.177 ICL identified a need to ensure that the government exhibited and promoted best practice with its own staff and that policies across government were made in the full light of the capabilities of new technology (p 230). The Library and Information Commission pointed out that here too there were differences in the approaches adopted by different departments. "Whereas some departments have impressive Web pages, with links to other information sources, others have no Web page and are not even connected to e-mail" (p 250). The Scottish Office saw the opportunity of receiving direct feedback electronically from members of the public who used its Internet pages as a potential benefit (p 287).

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[1] http://www.poptel.org.uk/john.tomlinson/

[2] By 28 March 1996.

[3] The need for a uniform approach to Government policy in relation to the information superhighways was also emphasised by the Library and Information Commission (p 250) and the Direct Marketing Association (p 203).

4.178 The IDPM favoured "a major national exercise to produce an agenda for action focused on the pre-conditions for the successful development and application of IT, including the skills needed at all levels by both the suppliers and the users" (p 237). The IDPM added that the Government and not just the DTI should also work to remove legal and political barriers to implementation (p 237).

4.179 ASLIB said that content was the essential element of the superhighway which had "not been given the priority that it should have, not only by the United Kingdom Government but by the European Union as well". It contrasted the role of the National Information Infrastructure Task Force of the United States Government, which had put as a priority the electronic delivery of "information needed in our everyday lives, in our work and in the way we conduct our lives, and in our relationship with government" (QQ 126–127). ASLIB linked the relative paucity of United Kingdom content to the Government's failure to promote seed corn investment for entrepreneurs in this field, and called on the Government to underwrite such investment to encourage venture capital organisations and banks to invest in this important new area.[1] They also considered that most of the initiatives taken by the United Kingdom Government had emphasised technology rather than content. The United Kingdom needed a body to represent all government departments and sectors of interest (QQ 139–140).

4.180 The Technology Foresight ITEC Panel wanted government action in this area "to be as lightweight, minimal and skeletal as possible. It needs to pick on just the things that it needs to prescribe and leave the rest to be negotiated" (Q 673). It described four main areas of focus for UK government action. First, the UK should be taking a leading role in the international adoption of high grade encryption standards and frameworks—"that is the critical next step if we are going to be at the leading edge of exploiting this technology that is going to happen." Second, the UK should take a leading role in developing the legal copyright and intellectual property frameworks necessary for doing "info business" across the Internet. Third, there should be a regulatory framework in place to ensure "low cost, higher band width pervasive access to this network". Fourth, government agencies, bodies and policies needed to reflect the convergence of the telecommunications industry with other industries. "The government needs to make sure that the right cross-couplings are in place inside itself so that it can be more enlightened in the way that it behaves externally. If we insist on talking about things in separate, watertight compartments, we will not really get to the heart of some of the new issues" (QQ 678–681). Finally, it called on the Government to pay more attention to the UK's representation in international fora, and to host one or two major international gatherings (Q 685).

4.181 The DTI said that its Communications and Information Industries Division was trying to meet three themes of the Government's policy. "First of all we are aiming to be involved in the development of markets in this area, in the whole communications area, both here and overseas. We are looking at what the Government can sensibly and properly do to encourage the actual contents side of the market in terms of the infrastructure and what goes onto the infrastructure. The third area is our relationships with the industries which supply the market. There again, we need to think very carefully about, and our activities are focused upon, what role we can usefully play in adding to the efforts of companies in these sections" (Q 2).

Research funding

4.182 M Verrue of the European Commission said that better targeting of research funds for the development of new applications of information technology "could be used for bringing the kind of initial support to the content industry which would be helpful without necessarily clashing with EU discipline on state aids" (Q 651). The Telematics programme is one of several EU R&D programmes in this sector. This programme provides finance for demonstration purposes of new applications of existing technologies with "an immediate societal value", including assistance to

[1] Janice Hughes of Spectrum Strategy Consultants also emphasised the importance of the availability of venture capital for the new information superhighway industry in the United States (QQ 313–4).

handicapped people or elderly people, management of health care centres, navigation assistance and education and multi-media products (Q 653).

Government Information

4.183 CCTA, the Central Computer and Telecommunications Agency, provides the CCTA Government Information Service (CGIS).[1] This is an on-line service giving access to selected government information via the Internet. The service provides information from 120 public sector bodies and 60 government departments and agencies. The information provided includes ministerial speeches, press notices and statistical data as well as more general information about the various organisations' services. Since its inception in November 1994 the CGIS service has been accessed over six million times, about 200,000 times per week with 60 per cent of these accesses from Europe and the United Kingdom. A key objective of the service is to provide users with a single on-line point of entry to public sector information using simple search techniques. The service has won several accolades, including *Computing Magazine*'s Internet Users of the Year Award 1995, and was judged one of the top 5 per cent Internet sites by Point Communications Corporation of the USA (p 175).

4.184 NACAB believed that government should have a duty to present its information in a form which could be interrogated by themselves and their clients. Key information which should be provided by government would be "basic statutes", case law from courts and tribunals, benefit levels and eligibility criteria. Although they agreed with the Committee that there was a case for users of Social Security information with common interests getting together with the Department of Social Security to see if its information could be provided in a form which was accessible and useful to all user groups, they were doubtful whether such an exercise would be successful (QQ 630–634). They warned, however, that if other departments followed the example of the Contributions Agency and made their information available on a touch screen terminal[2] there was a danger that unless a consistent and coherent approach was adopted throughout government "we could end up with half a dozen different computers each containing information from different government departments within the waiting room" (Q 628). The Citizens' Advice Bureaux themselves are part of a federal structure, which means, for example, that a change in IT policy such as setting up a national Citizens' Advice Bureaux computer network would involve working with bureaux "much more through persuading and influencing rather than giving instructions about the way things are done" (Q 618).

4.185 ASLIB said that the biggest web site in the United States was the Inland Revenue Service, which was serving both the citizen and the government in terms of information, cost reduction and efficiencies. They were concerned that 85 per cent of information on the Internet was American information, which meant that "as the world goes to the Internet to find out sources for trade, licences, partnerships and information making them more competitive, they will see an array of United States information, an array of United States companies, United States-controlled databases, etc. That is why it is important to Britain" (Q 131). Another difference between the United States and the United Kingdom was that in the United States there was no copyright in government-created information, and a vast amount of government information was available on the Internet free of charge and the information industry was encouraged to copy the information and add value to it (QQ 172–3).

4.186 The Royal Academy of Engineering pointed out that it was in the interest of government to promote the use of electronic information channels to the public as it could thereby avoid "the selective message that is presented by the media" (p 276). The Scottish Office referred to the fact that the Internet provided "the opportunity to receive direct feedback electronically from members of the public who use the service" (p 287).

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[1] http://www.open.gov.uk/

[2] This was a pilot project for testing in a single bureau (Q 627).

Crown copyright

4.187 Mr Stephen Saxby, senior lecturer in Information Technology Law at the University of Southampton considered that the Government had "some way to go before it completes ... necessary liberalisation of the market in official information. I recognise progress in establishing sympathetic licensing regimes, which are now extending towards electronic publishing. However, it is in the very licensing process itself that the log jam exists ... the abolition of Crown copyright would lead to a tremendous increase in the availability of official information and in the quality of the added value that organisations might contribute to official data when making it available to users ... government has a duty to ensure that a core of official information in its primary form, is made available to the public either free of charge or at cost. This will of course include the law of the land, including statutory instruments as well as a range of quasi-legislative material" (p 286).

4.188 The General Council of the Bar also considered that there was "a strong case for removing at least statutes and other legislation from the scope of Crown copyright protection. Similar observations apply to other Government information, in particular the Inland Revenue Manuals and the Patent Office Work Manuals, which explain how Government departments interpret and apply the law." The General Council of the Bar emphasised that the legal position in the United Kingdom in continuing Crown copyright protection in the law of the land was out of line with "most if not all of the other EU/EEA/EFTA states", and suggested that the restrictions exercisable by virtue of Crown copyright might fall foul of the competition provisions of the Treaty of Rome (pp 596–597).

4.189 Reuters pointed out that the Government was the largest "content provider" in the United Kingdom. New technology had the potential to transform the way in which official information reached the public. It was vital that government policy encouraged this process. Reuters said that "whereas in other countries, and in particular the US, governments have grasped the formidable political and economic implications for public sector data offered by the information superhighway, the UK information sector is handicapped by a Crown Copyright licensing regime which is based on the relatively trivial financial benefit to the Exchequer. For example, the most recent profit target set by the Treasury for HMSO was £11.9 million. Reuters is therefore seeking a change of policy in this important area, and to follow the US example. We believe that the economic, social and political consequences for the UK could be very large." (pp 271–274)

Electronic archives

4.190 The British Library said that "the information superhighway offers us enormous possibilities to extend our ability to provide information speedily and effectively ... The extent of our present ability to do that lies very significantly in the fact that the Library has enjoyed over a long period the privilege of legal deposit of printed publications. We believe that if we are to continue to fulfil our responsibilities in the future, it is now essential that legislation be enacted to extend the principle of legal deposit to non-print materials" (Q 193). They added "whilst we are collecting ... printed material for future generations, because legal deposit does not extend to electronic publications, we are not collecting that material, which will therefore probably be unavailable to future generations" (Q 196).

4.191 The University of Oxford was particularly concerned about the future role of copyright deposit libraries, of which the Bodleian is one. Issues of special interest included arrangements for the deposit of material in new media, and for the archiving and preservation of material published solely electronically. The University thought it probable that the higher education sector would have an important role to play in relation to the preservation of [electronic] material (p 303).

4.192 The Institute of Physics (IoP) said that there were no clear lines of responsibility as to who should hold the electronic archive. The IoP was committed to retaining an electronic archive for its own publications, but there was no guarantee that all publishers would act in that way. It was interested in the possible extension of the legal deposit legislation to embrace electronic publications, but warned that physics was an international activity and deposit libraries and

institutions in other territories might not take a similar stance to that of the British Library (QQ 710–713).

Electronic evidence

4.193 The IDPM said that the Government should move quickly on the issue of the admissibility of electronic evidence in court and also that there was "a major need to clarify the legal powers and responsibility for monitoring and tracking illegal transmissions ... which may travel across a wide range of networks and jurisdictions from originator to receiver" (p 238).

Regulatory framework

4.194 Several witnesses[1] called for a light touch to regulation and little direct Government intervention to encourage the growth of new utilities (*eg* pp 203, 230, 243). The Institute of Management Services (IMS) said that as the United Kingdom superhighway was likely to be a conceptual linking of a number of disparate networks, all that would be needed in some cases was a regulatory framework to foster inter-connection (p 243). The ECN stated: "the Government role should only be to regulate for a fair, open, and competitive market place" (p 218). Telecential Communications said that the Government should not regulate specific technologies (p 295).

4.195 Microsoft emphasised that they did not wish government to control the Information Highway, but they saw "a role for regulation and framework to help foster the market forces at work" (Q 368). Given the fast pace of development of the Information Superhighway, they stressed the need for the government to think about the future, rather than thinking "about the business as if it were yesterday" (Q 397).

4.196 BT's main requirement of Government was an open playing field which allowed them to attack the emerging markets without "unnecessary constraints". They defined these as "regulatory constraints that prevent us from using certain technologies in certain areas, and which constrain us from developing new services by guidelines which were maybe sensible when they were introduced but no longer have much meaning in a very fluid and changing new environment. The IT environment is one that is changing almost on a daily basis. It is very difficult to take rules of ten years ago and apply them today sensibly. We are looking for some removal of these unnecessary hurdles" (Q 502).

4.197 BT drew attention to three regulatory constraints on their activities; the ban on BT broadcasting entertainment services, the price cap and the constraint on BT's use of radio technology (Q 505). BT was to be given radio licences for telephony provision "in a very great proportion of the country covering a very small proportion of the population". These would be useful in reducing the cost of providing a universal telephony service in the areas concerned but would "not be of great use in providing the sort of broadband digital services that we are talking about in connection with the information society." (QQ 513–514)

4.198 The Communication Workers Union (CWU) and the Direct Marketing Association (DMA) were among those who supported BT's call for an end to the current asymmetry in broadcasting regulations. The CWU described BT as "the only organisation able and willing to create a genuinely national and genuinely broadband network for Britain", and said that "specifically, the ban on BT carrying entertainment services on its telecommunications network should be lifted" (p 189). The DMA called for at least a level playing field to be established for BT and others so that "United Kingdom plc." could benefit from the 1998 liberalisation in the European telecommunications markets (p 201). Mr John Harper considered the problems and business prospects of the cable companies and the regulations placed on BT to protect its competitors, and concluded that: "The situation amounts to a serious drag on progress with highways in this country" (p 227). Further deregulation was called for by the Library and Information Commission (p 251).

[1] To avoid unnecessary repetition some evidence on this subject is discussed, together with the Committee's opinion on it, in the following Chapter.

4.199 The Royal Academy of Engineering said that a number of its Fellows were "of the opinion that the Government's constraints on British Telecom have impeded the interests of UK firms regarding worldwide manufacturing of "Information Superhighway" infrastructure. There is little incentive for cable companies to provide an "Information Superhighway" since there is not competitive pressure for them to do so. It is unlikely that they will risk serious investment on digitalising their cable infrastructure in advance of market pressure without regulatory requirements" (p 279).

4.200 Dr Rudge of BT emphasised that domestic regulatory hurdles had particular significance given the globally competitive nature of the markets in which BT operates. "Some of those no entry signs definitely slow you down if they do not stop you entirely ... and the trouble is we are in an international competition and slowing us down is tantamount to death really, you cannot be slow in this game. When I ... talk to some of our suppliers ... and I say: "The rules in the United Kingdom are that BT is going to be kept out of this area to see if a couple of little companies can get off the ground in the next five years", they look at me with astonishment. That is in effect what you get [as a result of the present regulatory regime in the UK]—the big player slowed down to allow one or two small companies to see if they can make it" (Q 511).

4.201 BT emphasised the importance of the Government's role in enabling national competitiveness in European and global markets. "We are going through a liberalisation transition ... not only in Europe but generally around the world. During this period we must have regulation and there is a need to strike a balance between local competition, to make sure that there is local competition ... and national competitiveness in that we are competing against big players from other countries who are just as determined to establish themselves in these markets. Keeping an eye on that balance is not something for the regulator because he has a national remit, it is something for ... the DTI or Government to ensure that the balance is a sensible one" (Q 508).[1]

4.202 The British Computer Society (BCS) on behalf of the Engineering Council called for government action to ensure the deregulation of the IT and telecommunications service industries world wide and to promote the concept of international standards (pp 168–9). The Federal Trust also supported a programme of accelerated liberalisation in the EU (p 222). At the EU level, the Federal Trust proposed a committee of national regulators "to promote best practice between member state governments and to tender advice to EU and national competition and regulatory authorities" (p 222).

Regulatory convergence

4.203 Full exploitation of the broadband superhighway would probably require the involvement of over a dozen regulatory bodies in the United Kingdom. According to the National Consumer Council, "at least 10 different agencies have regulatory responsibilities for different aspects of telecommunications and broadcasting. With technological and industrial convergence, existing regulatory structures can result in confusing and contradictory decisions, as well as gaps in regulatory responsibility to deal with emerging problems."[2] This issue was touched on in the House of Commons Trade and Industry Committee Report on Optical Fibre Networks. The Report recommended that the Government review both the structure of broadcasting and telecommunications regulation and the powers of the regulators. Possible solutions would include establishing one body with overall responsibility, or two separate bodies to cover network regulation and content, or to bring each of the existing regulators into a framework of common purpose.

4.204 In 1994 the Government said that it was "mindful that the growing convergence of telecommunications, broadcasting and information services may ultimately require a similar

[1] Mercury Communications thought that there was an increasing divergence between the EU's and OFTEL's proposals (QQ 864–5).

[2] National Consumer Council, *The Information Society: Getting it right for consumers* (London, April 1996), 10.

convergence in the regulatory structure. It would however be premature at present to promote change in the regulatory structures, in the absence of much more concrete information about how convergence will occur."[1] In the mean time, the Government has continued to legislate separately for the rapidly converging industries concerned, including the Broadcasting Bill introduced in the present parliamentary session.

4.205 In the light of the convergence of various technologies through digitisation, a number of witnesses, including CWU and ESRC, called for a parallel convergence of regulation under one authority (pp 189, 213). The Department of National Heritage (DNH) said that there was no clear-cut boundary between telecommunications and broadcasting, and it was possible that the licensing responsibilities discharged by the Independent Television Commission (ITC) under the Broadcasting Act 1990 might, in some circumstances, cover content carried on the superhighways, particularly where it included moving images. It was questionable whether ITC licensing would be regarded as an appropriate solution to any problem perceived to attach to the content of superhighway services, and the legislative position would need to be reviewed as services developed and the regulatory needs and responses became clearer (p 591).

4.206 Responses to OFTEL's own consultation exercise indicated that "there was widespread support for a fundamental review of the regulatory regimes covering communications" (p 547). Mr Cruickshank, the Director General of OFTEL, commented on the calls for a single regulator. "The first thing to say is that the DTI, DNH, the ITC and ourselves find that we can work with little difficulty effectively right now. A number of the concerns which I read in the media about that as an issue are, for the moment, not real ones. We can work in a complementary fashion and deal with the issues. Secondly, however, that is clearly under some stress as the technology changes and we move towards a digital world in which the distinction between digital video, telecoms and enhanced services, Internet or whatever, is not there". Mr Cruickshank thought that "at some point in the next Parliament there will be a need for a Communications Act as distinct from a Telecoms Act or a Broadcasting Bill and the important thing would be for the then Government to properly identify what the relevant market for regulation is, what the right framework of rules should be and only then to go to the issue of what is the right regulatory structure" (Q 1033).

4.207 M Verrue of the European Commission said that by the end of 1996 the Commission would produce a Communication on the long-term implications of convergence and the case for consequential regulatory reform. Discussion on this document should take place with Member States and national regulators in 1997, with a view to the Commission's proposing legislative changes in 1998. The Commission's first priority in this field was, however, the deregulation of the telecommunications sector. Whilst Canada, France and Germany had, in common with the DTI and OFTEL, reflected on the legal consequences of technological convergence no country had taken the legislative initiative in this area (QQ 646–647).

THE CHALLENGE FOR THE FUTURE

4.208 The Lord Privy Seal said that "Government is giving considerable thought to the implications of all these new technologies and the information superhighway, how it will affect the future of our country ... I think perhaps ... we can all agree on our objectives. We want a thriving information technology and multimedia industry in this country. We want all our industries to be in a position to seize the opportunities which the new technology offers and to make it work for them. We want every individual to have the opportunity to explore and, of course, to take advantage of them. We think that this emphatically is not a task for the Government alone. On the other hand, the Government does have a very important role" (Q 1054).

4.209 The British Library emphasised the importance of "raising awareness within government, within industry and within education of the potential of the superhighway and the need

[1] Cm 2734, *Creating the Superhighways of the Future: Developing Broadband Communications in the UK* (November 1994), 31.

for all of us to work together to ensure that we can exploit it for Britain ... we should have every optimism that Britain can come out of this very well, simply because we have a superb publishing industry, we have very strong media companies, we have probably one of the best library and information networks in the world and we have the English language ... we have everything to play for, but we have to find ways of getting all parts of the community thinking about how it is going to affect their particular interests and lives" (Q 244).

4.210 The DNH said that "this is a time of great opportunity, helped by the fact that English is increasingly the language of international communication, but there are also dangers of being left behind. For example, the UK starts with many advantages in the field of educational materials, but may be losing the initiative to the United States" (p 588).

4.211 Andrew Graham said that "the Information Highway is at a particularly critical point in its development. As a result there is much that could be done now that will not be possible later. Moreover ... what is required can be done relatively easily and without great cost". He emphasised that there was "enormous potential in this area for the UK both to enhance democracy and to expand the role of UK institutions ... British universities, libraries, publishers and broadcasters continue to be respected throughout the world. Moreover, English is now the world language. Added to this, the UK has a vibrant media and software industry. The Information Superhighway is a global phenomenon. It would be insane if British institutions were to miss a major opportunity by failing to provide the public information that the information society so obviously requires" (pp 598, 602).

4.212 Oracle also stressed the need for the UK to be a front runner in building the Information Society. "Central government must take an active role in making sure that the UK business community is aware of (and prepared for) the Information Superhighway. The commercial development of the Internet and WWW as a global channel for conducting business has reached a point where it is vital that UK businesses are in at an early stage in order to take competitive advantage of the opportunities offered. If they don't, then they face competition from other countries who do adopt the WWW as a new business channel, and risk losing market share in a global market place" (p 618).

4.213 The Technology Foresight ITEC Panel urged the UK to take early action in joining the Information Society: "the UK should be just getting on and doing ... rather than waiting for others to do it ... we could be a leader rather than a follower" (Q 678). It called on the UK to develop a specialisation and leadership role in a few key areas of the new technologies (Q 687), and concluded: "this technology is profoundly important ... Sixty years ago people might have said the phone was not terribly important because people would spend most of their time chattering on it, chattering is very important in society. Many other kinds of uses of this technology are very important in society. We think it is going to be quite disruptive, quite profound and we ought to be master of it and a leader in its exploitation not a rather unwilling laggard who just has it done to us" (Q 690). In other words, we need an agenda for action.

CHAPTER 5 OPINION OF THE COMMITTEE

INTRODUCTION

5.1 As an Information Society, the UK has a lot going for it. It has a liberalised telecommunications regime, substantial network investment, very strong telecommunications and broadcasting companies, a healthy publishing industry and established library and information networks. Like the US, it also has a head start in that English is recognised as the common language of the Internet and is increasingly becoming the common language of global communications. Given all these advantages—and more besides—the UK should be a world leader of the Information Society.

5.2 What is needed now is a concerted effort to pull together all the current UK initiatives, many of which are excellent, into a coherent whole. Although the United Kingdom currently enjoys several competitive advantages in the communications sectors, as is always true of competitive advantages, we must use them or lose them. There is at present a window of opportunity which offers a chance for the United Kingdom, led by its Government, to exploit the potential of the Information Society to the full. The Committee's enquiry focused on the barriers to the development of a National Information Infrastructure (NII) in the United Kingdom, with a view to making a series of recommendations on the steps needed to establish the UK NII. Although it was not initially the Committee's intention to review the current regulatory regime in the UK, a substantial number of witnesses identified problems with this regime as a major barrier to the development of Information Superhighways. One major concern is that the relentless trend towards convergence of the telecommunications and broadcasting industries has not yet led to a convergence in the multiplicity of regulatory bodies operating in this field. Our recommendations for change in the current regulatory regime are given in paragraphs 5.18–5.48 below.

The UK Information Society Task Force

5.3 Most other countries which are aspiring to build their own National Information Infrastructures have the following features in common:

(i) Clearly articulated government-wide objectives for the Information Superhighways, involving both the private and the public sector;

(ii) Clear policies to implement these objectives, working within a central framework and timescale;

(iii) High profile campaign, with widely recognised national champions;

(iv) Public information campaigns.

5.4 Several countries, including the US, have set up high-level NII task forces and advisory councils to identify and articulate the critical issues to be addressed in the development and application of information and telecommunications technologies for the benefit of industry and of society as a whole. The national task forces typically bring together ministers and senior government officials with representatives of the private sector. They act as a focal point for action across government and nation-wide, and their activities are publicised, not least on the Internet itself. We were particularly impressed by the work of the US Advisory Council on the National Information Infrastructure in advising the Secretary of Commerce on a national strategy for promoting the development of a NII. The 36 members of the Council were drawn "from among America's most accomplished individuals in telecommunications, electronics and computer software and hardware, entertainment, broadcasting, labor, as well as educators, public leaders at the State and local levels, and leaders of the disabled and other interested communities."[1] The Advisory Council's publications convey a sense of co-operation between the private and public

[1] US Advisory Council on the National Information Infrastructure, *A Nation of Opportunity: realizing the promise of the Information Superhighway* (January 1996), 53.

sector, as well as the impression that the Council had identified not only aspirations for the US NII, but how they might be achieved. The benefits of the Information Superhighways policy of the US administration raise the possibility that if the UK Government adopted a similar approach by appointing its own high profile advisory body, it could assist in the creation of the Information Society in the UK, as well as helping UK plc to recognise the full potential of its world class telecommunications and broadcasting industries.

5.5 In the UK, as in the US, the private sector is heavily engaged in building the Information Superhighway infrastructure. But unlike the US Government, the British Government has not had the benefit of a high profile national task force involving the private sector to help create the Information Society in the UK. There has been a plethora of announcements of Government initiatives: those highlighted by the Lord Privy Seal include the creation of the Central Information Technology Unit (CITU), the DTI's Information Society Initiative, the DTI's Multimedia Industry Advisory Group, the DfEE's Education Superhighways Initiative, the Technology Foresight Programme and the creation of the "rather catchily entitled" Cabinet Committee, GEN 37 (QQ 1054, 1064).[1] The Committee warmly supports all these initiatives. We were also impressed by the considerable achievements of the Minister for Science and Technology in driving forward the use of IT both within his own Department and more widely, and by the sense of drive, leadership and enthusiasm which the Lord Privy Seal conveyed in discussing his own new role as Chairman of the Cabinet Committee. We view the Prime Minister's creation of the GEN 37 Committee as a positive step, and were encouraged that it was discussing such issues as the Prime Minister's vision of a computer project for the Millennium, and the concept of "IT For All". But despite the Lord Privy Seal's exceptionally frank and helpful evidence, the tradition of secrecy which still to a certain extent surrounds Cabinet Committees is likely to ensure that little is known about GEN 37's work. Indeed, few people seem to know of its existence. It is a far cry from an American-style Task Force.

5.6 We consider that the results of GEN 37's work should be given a higher profile, as should the role of its Chairman. A national champion of the Information Society—a UK Al Gore—could speed its development, although Cabinet-wide commitment is needed to give the development of the Information Society the priority it deserves in the UK. We recommend that GEN 37 should produce and publish regular policy reports, following the example set by the Cabinet Committee on Competitiveness.

5.7 Moreover, despite the creation of CITU and GEN 37, the inter-departmental and inter-agency co-ordination needed to drive forward a nationwide initiative is still lacking. The Committee's enquiry brought acutely into focus the absence of a channel for sharing information about the Government's current policy between departments and agencies, let alone adequate co-ordination. As a result there is a sense of a great deal of world-leading development taking place in the United Kingdom, accompanied by a serious risk of opportunities being missed and the wheel of technological innovation being re-invented in hundreds of disparate pilot projects which are currently being tested up and down the country. As a nation we have failed to identify our aims and objectives for becoming an Information Society. Unlike other countries who are leading the way in developing the Information Superhighways, we have no national targets for the installation of broad-band infrastructure and no timescale for Government-led action. Government has conducted no detailed analysis of the number of jobs we stand to gain or lose.[2]

5.8 We recommend that a top priority for CITU should be to involve all Government departments and agencies and local government authorities in a nation-wide survey of the possible benefits and disbenefits of developing a National Information Infrastructure and its applications in the UK.

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[1] The Central Computer and Telecommunications Agency (CCTA) is missing from this list.

[2] The Department for Education and Employment did, however, tell the Committee that "current evidence does not suggest that the progressive introduction of new technology will result in fewer jobs overall in the UK." (p 584)

5.9 The number of different bodies involved in promoting the use of IT in schools brings sharply into focus the need for co-ordination not only in the formulation and implementation of policies, but for a channel of regular communication between ministers and senior officials working for all the various agencies working in this area, as well as the DfEE. In the public sector alone, the National Council for Education Technology, OFSTED and the Teacher Training Agency gave evidence to this enquiry in addition to the Department.[1] We received a *cri du coeur* from the NCET about their own lack of leverage in policy making, about the need for the DfEE, OFSTED and NCET to be rowing in the same policy direction, and about the fact that if the teacher training framework does not ensure that new teachers are trained in IT "we have the system moving against itself" (Q 264).

5.10 Sticking to the example of the education sector, we acknowledge the work of the DfEE and associated Departments in the *Superhighways for Education* initiative (see paragraph 4.63 above). The number of responses—431—to the consultation exercise indicates the extent of interest in IT applications in the education sector, and the follow-up report, *Superhighways for Education: The Way Forward* provides a useful scoping exercise which highlights some of the main areas for further action, such as teacher training, where the Government looks to the TTA to take the lead in England. But the 24 glossy, well-presented pages of *Superhighways for Education: The Way Forward* bear no comparison to the report prepared for the US National Information Infrastructure Advisory Council on *Connecting K–12 Schools to the Information Superhighway*.[2] This report takes as its starting point the premise that "connecting all of America's public K–12 schools to the national information infrastructure (NII) would be valuable and is achievable." It identifies three main challenges—funding, teacher training and educational content—and provides an economic analysis of various options for connecting schools to the NII. The report is longer, less glossy and more helpful in suggesting possible courses of action than the *Superhighways for Education* documents. Several of our witnesses, not least the Lord Privy Seal (Q 1069) and the Director General of OFTEL (QQ 1045–1048), highlighted the "can do" philosophy of many American citizens as a significant factor in building the US NII. We consider that in the context of creating the US NII the publication of clearly written "how to" information has played a significant part in fostering the "can do" philosophy.

5.11 The Lord Privy Seal provided a helpful written memorandum (pp 553–558) in response to this Committee's question of how the UK Government, without a Task Force, matched up to that of the US in achieving each of the nine principles identified in the US National Information Infrastructure and Task Force Agenda for Action. This memorandum served to convince us further that a great deal of progress has already been made in the UK, and that the lack of a central dynamic focus not only obscures this progress, but acts as a barrier to its further development. Although we hope that the work of GEN 37 can be given more publicity, by definition a Cabinet Committee comprises ministers—in the case of GEN 37 at a very senior level—meeting behind the closed doors of Whitehall. It is not well placed to tap the energy, expertise and enthusiasm of the private sector, or to conduct the nationwide publicity campaign which we are convinced is needed. We have therefore concluded that a further organisation is needed, to fulfil a high profile, nation-wide, as opposed to a Government-wide leadership role.

5.12 To assist the Chairman of GEN 37, and to encourage a nation-wide debate on the creation of an Information Society, we accordingly recommend the creation of a UK Information Society Task Force (ISTF) by the end of this year. The ISTF should be chaired by an enthusiast. Its two main functions should be to act as a think tank to Government, and to ventilate views on the creation and development of the UK Information Society. There should therefore be a presumption that its reports will usually be made public, and should be presented to Parliament as well as to the

[1] The DTI has also been involved in the Schools On-Line Project (p 7).

[2] The report was prepared by McKinsey & Company, Inc. K–12 is the American kindergarten to Grade 12 school structure, covering pupils aged about 5–18. The American K–12 initiative is discussed in NCET, *Highways for Learning: An Introduction to the Internet for Schools and Colleges* (1995), pp 47–51.

Cabinet Committee. It should, however, retain the discretionary power to advise the Government in a confidential capacity where it sees fit.

5.13 The ISTF should have the task of identifying barriers to the development of the UK Information Society, and recommending the appropriate remedies. One of the first jobs of the ISTF should be to draw up a policy document setting out its advice to the Government for a UK agenda for action, involving both the private and the public sector. This should be disseminated as widely as possible, with the aim of encouraging a national debate along the lines of the debate which the *KickStart* report has engendered in the US. Following the example set by such Task Forces in other countries, information about the activities and publications of the ISTF should be made available on a widely-publicised site on the World Wide Web. This should include an e-mail address encouraging citizens to participate in a nation-wide debate on the shaping of a UK Information Infrastructure. It should include links to other key web pages, so that, for example, a teacher could use the ISTF site as an easy access point for specialist advice on in-service training, IT applications, assistance available from charitable bodies, etc.

5.14 The members of the ISTF should be drawn from government (including regulatory bodies), industry, commerce, consumer and academic interests. Since the development of the Information Society should be a national objective, we would wish it to represent the full diversity of interests, expertise and opinions across society as a whole. We believe that with the leadership of such a Task Force, the UK could make the best of its advantages, and gain a sense of purpose in building an Information Society open to all.

5.15 We would envisage the membership of the Task Force being similar to that outlined for the US American Advisory Panel in paragraph 5.4 above, with the addition of representatives of publishing companies and the printed media. A good starting point when looking for members for the Task Force would be the Technology Foresight Information Technology and Electronics (ITEC) Panel, whose Chairman and members gave clear and convincing evidence to our enquiry. In April 1995 this Panel, and that on Communications, published reports which are relevant to the building of the Information Society in the UK. The Communications Panel recommended *inter alia* that the UK's regulatory regime should evolve to allow the UK to gain the maximum economic and social benefits from the convergence of telecommunications, broadcasting, electronic publishing and information technology. It also recommended that the Government should set an example to industry and to the public by becoming a leading-edge user of telecommunications and information technology, and that every school should be connected to public broadband digital networks giving access to high quality, interactive, educational software, including video-on-demand. The ITEC Panel's recommendations included a call for a national Information Superhighways Initiative and emphasised the need to remedy the issues leading to the UK's low competitive ranking for computer literacy.[1] The experience of the Technology Foresight Panels leads us to consider it essential that the Government should publish written responses to any reports made by the ISTF. Otherwise there will always be a tendency for what may be useful recommendations to sink without trace.

5.16 Other countries which are developing NIIs have set targets for the development of broadband networks, roughly centred on the beginning of the next millennium. We accept the view put forward by the Lord Privy Seal (Q 1062) that the danger of any Government imposing such targets is that it can misjudge the situation. Nonetheless, we consider that the agreement between Government and the private sector of specific public sector infrastructure objectives in the UK, for example for connecting all schools to the Internet, and all GP practices to their local hospitals, would serve a two-fold purpose. First, it would serve to indicate that the technology of the Information Superhighways of the future exists today and can act to the benefit of us all, rather than

[1] The reports' recommendations are summarised in the Parliamentary Office of Science and Technology report on *Information "Superhighways"*, p 89.

being a distant future dream. Second, it would give all those concerned in building the Information Society goals at which to aim and against which to judge our progress.

5.17 The ISTF would play a crucial role in proposing and monitoring the delivery of policy objectives, thus both helping and stimulating GEN 37 to deliver the necessary decisions in government. We were surprised by the Northern Ireland Office's lack of response to our enquiry, which, in contrast to the responses by the Scottish and Welsh Offices, indicates a possible failure to grasp the potential which the Information Society could offer all parts of the United Kingdom. Moreover at present, in the absence of cross-Departmental commitment to the Information Society it is difficult to see how even a simple target might be delivered in practice. For example, one barrier to the development of Internet use in schools which emerged in evidence was the inclusion of many teachers among the "information can-nots". An obvious long-term solution would be to require IT training to be a prominent feature of training courses for new teachers, but eliciting information on that alone entailed circular correspondence between the Department for Education and Employment and the Teacher Training Agency. For Parliament, there is an issue of the Next Steps Agencies, however unwittingly, being less susceptible to parliamentary scrutiny, and certainly less accessible, than policy Departments.[1] The wider issue is that of the policy initiative needed to resolve a problem, which could be addressed relatively simply and cheaply, falling between the stools of Department and Agency. This is not just a question of "Turf Wars"—inter-Departmental struggles—which may occur. It is an even more serious one of no single Agency or Department thinking that it is their particular responsibility to take the initiative. GEN 37 should act to identify such problem areas, and, where necessary, identify the Department or Agency responsible for action.

Regulatory policy

5.18 The United Kingdom has led the world in liberalising its telecommunications infrastructure. The Government's policy in this area has been highly successful. Witness after witness stressed the vital contribution this had made to the development of the Information Society in the UK. Particularly impressive was the fact that major players, including CompuServe, Mercury Communications, Microsoft and Nortel, emphasised the importance of the deregulated telecommunications environment to their operations in the UK. It is in the nature of reports of this kind that the emphasis of their recommendations—in this case our Agenda for Action—is on areas where change is needed. This must not obscure the fact that competition is, and will be, the key to the development of the Information Superhighways, and the UK telecommunications market is arguably the most competitive in the world. This is a UK success story on which we, as a nation, must build.

5.19 The UK's lead in opening its domestic telecommunications market to external competition has not been paralleled by equivalent action in other countries. We welcome the firm lead which the European Commission is taking in attempting to open up the telecommunications markets in all EU Member States, and agree with the Director General of DG XIII that this must be the top priority in this area.

5.20 Several US companies, including AT&T, NYNEX, US West and TCI have benefited from access at preferential prices when interconnecting with telecommunications networks in the

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[1] The latter have well-established channels of communication with Parliament, based on the office of the Parliamentary Clerk. Channels of communication between Parliament and the regulatory bodies, including OFTEL, are also needed. The problems associated with a lack of cross-departmental co-ordination are often brought into focus by the enquiries of this Committee since, unlike the Departmental Select Committees in the House of Commons, its work encompasses the activities of a wide range of Government Departments and Agencies.

In evidence to the Select Committee on Public Services on 2 July 1996 the Deputy Prime Minister suggested that "the whole ethos of public sector life [and] the overheads that all of us impose ... in terms of the name and the notion of public accountability ... [do] not actually deliver a great deal of public accountability in the vast majority of cases ... I personally think that that is an unnecessary constraint upon potentially wealth creating operations" (Q 410 of that Committee's evidence).

UK. Despite the recent passage of the US Communications Act, UK companies wishing to invest in the US telecommunications market still face restrictions. In common with several of our witnesses, including OFTEL, "we are still not satisfied that the US market is as open as it might be" (QQ 1038–1040). We urge the US Government to demonstrate the strength of its commitment to building the Information Superhighways by lifting the restrictions which are currently frustrating the aspirations of companies such as BT and Cable & Wireless to expand their activities in the US.

5.21 In addition to liberalising telecommunications infrastructure in the UK, the Government's regulatory policy has attempted to foster network competition through tough controls on BT, as the previous monopoly network operator which still enjoys the majority share of the domestic telecommunications market. OFTEL summarised this policy in evidence in the following terms:

> "The policy pursued by both Government and OFTEL since the privatisation of BT and, more particularly since the review of the BT-Mercury duopoly in 1991, has been to foster the development of a mosaic of competing interconnecting telecommunication networks run by different operators in different geographical areas. Only when the market is underpinned by competing, interconnecting infrastructure can it become truly competitive and allow regulation to be progressively drawn back." (p 32)

5.22 The word mosaic[1] conjures up positive images, which the current map of cable network operators in the United Kingdom does not necessarily inspire. As the ITC told us (p 491) "although much of the publicity surrounding the launch of what was called the cable revolution in the early 1980s related to interactive services, cable operators currently have two distinct businesses of a not very innovative nature: the distribution of cable television channels and the provision of a plain old telephone service. Other services are being explored or trialled but the picture is of a series of different initiatives, often localised, without a strong national theme." In other words, the cable companies are not developing the entertainment services which they were expected to in 1981. This is a fact of life, rather than anyone's fault.

5.23 What need not be accepted as a fact of life is the present restriction in the licences of BT, Mercury and certain other Public Telephone Operators (PTOs) on the conveyance of entertainment services in their own right. In 1990 the Government's consultative document *Competition and Choice: Telecommunications Policy for the 1990s*[2] proposed not to remove this restriction. In the Government's own words, "a majority of respondents disagreed with the proposal and supported an earlier lifting of the restriction. They argued that a continuing restriction would delay the introduction of new technology and innovative services and that, provided BT and the other PTOs were required to grant reasonable and non-discriminatory access to their networks, more effective competition could be expected to emerge."[3] The Government decided in 1991 not to act on this majority view, but were persuaded instead by the arguments of the cable companies against allowing telecommunications operators to convey entertainment services. The 1991 White Paper announced "while there may be room for debate as to the degree of risk to those companies' investment plans if the restrictions on the PTOs conveying entertainment signals were to be lifted, the Government's conclusion is that the potential benefits are not sufficient to outweigh that risk."[4]

5.24 Since 1991 the "room for debate", not all of it constructive, has continued. There has been a dynamic increase in the number of companies providing telephony services in the UK, and the cable companies are investing heavily in providing optical fibre networks. Over five billion pounds has already been invested in cable infrastructure in the UK, and by the end of the decade it is estimated that about 12 billion pounds will have been invested in this infrastructure (Q 52). But the cable companies have, for the most part, either not chosen or have not had the resources to

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[1] A recurring theme of OFTEL's evidence, which also referred to the likelihood of the market for advanced applications taking the form of "a mosaic of independent service providers and network operators" (p 30).

[2] Cm 1303.

[3] *Competition and Choice: Telecommunications Policy for the 1990s* (March 1991), Cm 1461, p 25.

[4] Cm 1461, p 26.

develop the wide range of interactive services which other countries are seeking to develop. Critical mass is essential for network operators to develop the new advanced applications, both in the United Kingdom and on a global basis. The present regulatory structure was designed before the Information Age became a reality. When privatisation and market liberalisation of the British telecommunications industry began in 1984 the new cable communications operators were expected to provide a range of entertainment services, which BT is not allowed to offer. The fact that in 1996 cable operators would derive much of their business from telephony was not anticipated. In allowing the persistence of "asymmetry"[1] in the hope of encouraging network competition, the Government and OFTEL may not be acting in the long-term interests of the British consumer.

5.25 The 1994 report by the House of Commons Trade and Industry Committee on *Optical Fibre Networks* was motivated by "concern that Government policies could be hindering, or not sufficiently encouraging, the development of the most advanced infrastructure and services, and that this could result in the UK falling behind other countries, with damaging consequences". That report considered that early lifting of the restrictions on the PTOs would be likely to promote investment in broadband infrastructure, and recommended changes in regulatory policy, including the removal of the restriction on PTOs conveying or providing entertainment.

5.26 The Government's response, published in November 1994, rejected the Committee's recommendations for regulatory changes. At that time, the Government considered that "in the future ... the relative importance of regulatory issues is likely to recede, as competition becomes even more established in communications services. The issues for the industry will then focus on applications and services, and consequently other roles of Government will become more important, such as being a consumer and purchaser of services and in facilitating research and experimentation."[2] This prediction has not yet materialised and all too often the protracted, and on occasion somewhat bitter, debate over the regulatory framework in the UK acts as an unnecessary distraction from the development of the broadband infrastructure, and by extension its applications and services, in the UK. This must stop.[3]

5.27 In evidence to this Committee the Director General of OFTEL explained that he intended to start to review the policy on whether BT should be allowed to convey broadcast entertainment to homes "for Government to take a view at the beginning of 1998, which means the work will start in 12 months" (Q 1034). We believe that this review has already become overdue. The attempt to go against the powerful trend towards convergence of the telecommunications and broadcasting industries is unlikely to succeed in the long term, and in the short term is preventing BT from developing its role in service provision. The US already enjoys a dominant position in this industry; one effect of the UK's current regulatory policy is to assist its global competitors.

5.28 OFTEL's review of the restriction on BT having a national broadcast conveyance licence is not intended to cover the restriction on providing broadcast entertainment services, which OFTEL itself said was "arguably of greater commercial significance than the restriction on conveyance" (p 545). Mr Cruickshank said that "the issue as to whether BT can be a provider, ie like Sky and have its own programme content, is something for the Government and the Government has continued to see ... 2001 as being an appropriate time for that to be considered" (Q 1041). We consider that the restrictions on telecommunications companies either conveying or providing broadcast entertainment services in their own right should be reviewed as a matter of urgency, with the aim that both reviews should be completed by 1998. We acknowledge the Government's position, which is that the billions of pounds of further investment needed by the UK cable

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1 Regulations restricting the services which can be offered by BT, Mercury and certain other PTOs.

2 *Creating the Superhighways of the Future: Developing Broadband Communications in the UK*, Cm 2734 (November 1994), 10.

3 As the Director General of OFTEL said in his evidence (Q 1048): "The most important thing all of us can do, including myself, is to stop arguing about the finer detail of BT's licence or when precisely a ban on national broadcasting might not be lifted and try and invoke some sense of confidence about how this technology can be deployed, how teachers can be equipped to use it, how the Health Service can be equipped to use it better and so on."

franchisees if the Government's objectives are to be achieved would be put at risk if the 1991 White Paper framework were reviewed prematurely, and that any adjustment of policy could markedly alter the current market value of existing cable franchises.[1] Nevertheless, taking all the relevant factors into account, we consider that full competition should be allowed from 2001, to capitalise on the enthusiasm for the use of new technologies which the millennium celebrations are expected to foster.

5.29 A further restriction on BT has been the price cap. OFTEL has proposed a reduction in the coverage of the price controls to those parts of the market where competitive choice is proving slowest to develop. We welcome this proposal, and the commitment that the period of price control from 1997–2001 will be the last. We are particularly glad that OFTEL has not seen fit to extend the proposed new retail price controls to broadband services (pp 549–550).

5.30 The "local loop"—the part of the telephone network from the home to the exchange—is vital to the development of a UK NII. The use of radio is likely to be of key importance in providing the local loop in rural areas. We welcome the Government's announcement that it will be awarding three licences for radio fixed access in the 10 Ghz band to provide ISDN services, together with a further two licences in the 2 Ghz band to provide services in remote rural areas, including much of the Pennines (p 527). In view of the dramatically growing demand for radio spectrum we also welcome the publication in June 1996 of the Government's White Paper on *Spectrum Management: Into the 21st Century*, which aims to improve the way in which the finite resource of the radio spectrum is managed so that future growth in demand can be accommodated.

Regulatory convergence

5.31 Convergence—in particular, the breakdown of old distinctions between the broadcasting and telecommunications industries—raises a number of difficult issues with respect to regulation. We are moving out of an era of relatively tight regulation of broadcasting, which could be exercised by the Independent Television Commission because it enjoyed the leverage over broadcasters provided by its power to grant access to the scarce and valuable "commodity" of a broadcasting channel. We are moving into an era in which there will not only be a multiplicity of television channels, but where the types of information and entertainment that used only to be "broadcast" by television and radio companies can be delivered to (or downloaded by) people along a variety of networks, including telephone lines.

5.32 At the same time, the divide between the two main types of devices through which such entertainment and information products are received—the relatively cheap television, which can be found in almost every household, and the much more expensive personal computer, which can be found in perhaps one in five—is being blurred by technological change. To receive the variety of services made possible by the digital revolution, televisions will become "cleverer" (and more expensive), while network computers are being developed which are cheaper than existing PCs (and "stupider"—that is, only as clever as they need to be to carry their owners into the world of information superhighways to which their telecoms supplier will provide access).

5.33 Meanwhile, questions are also being raised about the regulatory regime for telecommunications. This was developed to manage the transition from market dominance by the original state-owned national telecommunications monopoly to a fully competitive telecoms market, in which the customer enjoys real choice between a number of network suppliers. So evolution was to be expected; indeed, the Director-General of OFTEL has frequently indicated that he would consider it a success to have brought the industry to a point at which his office was no longer needed. But this adds to the need to review the regulatory structure, and to begin looking forward to a rather different regime.

[1] *Creating the Superhighways of the Future*, 13, 15.

5.34 The key questions concern the role of, and relationships between, the Independent Television Commission (ITC), OFTEL and the Office of Fair Trading (OFT). There is a secondary issue as to whether the maintenance of a further body or bodies concerned with broadcasting standards and complaints, beyond the ITC itself, any longer makes sense. A larger question concerns the validity of any national regulatory regime in an era of satellite broadcasting, global information superhighways, the European Single Market for business and the extension of the role of the World Trade Organisation into such key issues as intellectual property rights. But if the UK does not put its own regulatory house in order, the chance of it living comfortably in the global village is all the more remote.

5.35 In the present regime, there is clearly considerable overlap—or difficulty in drawing boundary lines—between the ITC, OFTEL and the OFT. This is not, of itself, an overwhelming argument for change: a little competition between regulators may even be healthy. But changes in broadcasting and telecommunications are going to make these overlaps greater, these boundaries harder to draw, and therefore tend to increase uncertainty amongst the regulated.

5.36 Uncertainty can be expensive. A confusing and overlapping regulatory regime is a cost burden on business. Awkward boundaries can create economic distortions, leading to a misallocation of resources. Meanwhile, the boundaries as presently drawn require excessive attention to be devoted to semantics rather than substantial issues. It will become increasingly difficult, for example, to say what does and what does not constitute "broadcasting", so that the remit of a broadcasting regulator will be constantly up for debate.

5.37 If we want our regulators to carry out useful functions on behalf of society, rather than count angels on the heads of pins, we must refocus attention on the specific purposes of regulation. If the United Kingdom is to maximise the potential for economic growth and human satisfaction offered by the digital revolution, it needs a regime which is logical, light and clear.

5.38 What is regulation for? Broadly, the purposes of regulating these two industries can be categorised under two headings. Regulators are concerned with competition and content. Of course, these two concerns themselves may interact: the purpose of protecting competition is not to satisfy some arcane principle of interest only to economists, but to prevent the customer suffering from unjustifiably high prices and restricted content. Nevertheless, there are issues to do with decency, quality, public service and national culture which are distinct from issues of competition. At present, some of these are dealt with by regulators who are also concerned with competition, some are not. It is the Committee's view that they are best dealt with separately; that maintaining the distinction reduces the risk they will simply muddy the waters of competition policy, leading to outcomes which satisfy no clear set of criteria.

5.39 The first question, therefore, concerns the role of OFTEL. OFTEL is, pre-eminently, an economic regulator—and that is how it sees itself. A mark of this successful focus is the extent to which it has managed to devolve certain non-economic aspects of its work to self-regulatory industry groups. But will it, in future, continue to make sense for competition issues in telecommunications to be dealt with by a body dealing only with this one industry? Is there, in other words, a role for OFTEL in the future? One possible option would be for its scope to be broadened to cover all forms of broadcasting—becoming, in effect, OFCOM (Office of Communications).

5.40 In our view, however, this is not a long-term solution. While it would resolve certain boundary issues in the short term, they would merely re-emerge around the newly-defined territory. The overlap with the OFT would meanwhile be increased. For the analysis of competition issues the key question is the definition of the "relevant market" within which a company is operating—according to circumstances, this may be wider or narrower than the communications industry as defined for regulation. While certain issues in broadcasting (for example, whether one company may be able to establish and abuse a "gatekeeper" position for subscription television) may seem to be industry-specific, they are best analysed according to the general economic

principles underlying competition policy. A competition authority unconstrained by artificial sectoral limitations is, ultimately, the proper resting-place for such responsibility.

5.41 Competition policy is, of course, itself up for review. Nowhere is the question of whether a distinct national regulatory regime can be maintained, when Brussels has competence with respect to trans-European competition policy, brought into sharper relief than in the audio-visual industries. These are, after all, increasingly dominated by European and indeed global companies. To abdicate all national regulatory responsibility would, however, be quite wrong. It would leave a vacuum; there are still many competition issues which fall to national authorities to resolve. What is however clear—and generally agreed—is that national competition policy should be reformed to go more easily with the grain of the European regime; at the same time, we hope, encouraging the reform or at least refinement of the Brussels regime.

Content regulation

5.42 If competition issues in the communications industry were to be dealt with by the same authority involved in resolving these across other industries—the OFT or whatever successor emerged from the reform of competition policy—is there a role for any industry-specific regulator at all? There are those who argue that content regulation is bound to fade. They argue that days when a government body could restrict what is seen in people's homes before a certain hour of the day, for example, are clearly fading: if the VCR[1] has not undermined the "threshold", satellite broadcasting and the availability of multi-media products via the Internet clearly will.

5.43 While it is a mistake to leap ahead of reality in regulation—terrestrial, time-specific, non-interactive broadcasting is still the dominant source of audio-visual entertainment in people's homes—we must look ahead to a time when controls on this form of broadcasting would cover only a small proportion of what is available. This raises concerns about the protection of privacy, the control of pornography, libel, fraud and general enforcement of the criminal code in the Information Society.

5.44 American experiences in attempting to restrict the carriage of pornography along the information superhighway have given force to those who believe no content regulation will be possible. Clearly, we are entering a world in which parents in particular will need to accept more responsibility for what they and their children see and hear. Quite old-fashioned technology, like the off switch on the television or computer, will still be available to them; while new filtering devices are coming on to the market and service providers are beginning to construct closed worlds, or "walled gardens" within their online services. By differentiating the parts of the Internet world to which subscribers buy their travel ticket, they can enable parents or schools to close off access to the red light districts. The market, in other words, is itself generating a range of solutions to these concerns about the new, unregulated world.

5.45 Where these are deemed to be inadequate, and government intervention is needed, it is also clear that as much as possible should be agreed internationally. There are no customs posts in cyberspace. The ability to circumvent national restrictions on the Internet, entering information superhighways via another country's telecommunications network, is already evident. It is also plain that no one country can protect the intellectual property of its citizens satisfactorily: global agreement and enforcement will be ever more necessary in the digital age, with its revolutionary potential for unlimited, perfect reproduction. Finally, any attempt to "hoard" encryption systems for the benefit of one country would seem misguided. Export is simply too easy. But again, there are issues here which must be resolved internationally, to ensure that the defence and law enforcement agencies of national governments are not emasculated by the growth of the Information Society.

[1] Video Cassette Recorder.

5.46 Nevertheless, it would be wrong to conclude, here and now, that there will be no role for some kind of national successor to the ITC and the non-economic functions of OFTEL. There may still be need for an agency concerned with some non-competition issues relating to the content of what is provided via the networks of the future. Competition and self-regulation will ensure many social objectives are met. But the functions of the ITC will not simply disappear overnight. The transition will require sensitive application of an evolving regulatory regime.

5.47 Moreover, governments of the future may wish to ensure that the communications industry continues to carry out certain public service functions. These will be best monitored by an agency which is distinct from the competition authorities of the future. Such issues as how the principle of universal access should evolve in the information age will need to be kept under review. There may continue, for some time at least, to be some residual licensing role to be carried out, and some public service objectives to be met in the execution of such a role. The role of Britain's public service broadcaster, the BBC, in such a world—and the access of the BBC to the citizens it was created to serve—is one of the issues that will have to be considered in such a context. It is not too soon for consideration to begin of these difficult issues of public policy.

5.48 To sum up our recommendation for the near future, we consider that by 1998 a new regulatory regime for both telecommunications and broadcasting will be needed, distinguishing between issues relating to competition in the provision of networks and services, and issues relating to content. We were encouraged that the European Commission has suggested a timescale for consideration of this problem leading to legislative proposals in 1998 following a wide-ranging debate next year. We call on the Government, OFTEL and the ITC to play the fullest part in the EU discussions on this subject.

"Undesirable" content

5.49 One of the Internet's greatest attractions is the infinite variety of its content. The ease of small-scale publication on the Internet with the aid of desk-top publishing software means that almost any material can be attractively and professionally presented by a single individual. But the very openness of the Internet to all the weird and wonderful facets of human life has its downside, which is reflected in growing concern about the minority of material published on the Net which is much more weird than wonderful, and some of which is downright unpleasant. There is particularly widespread concern over easy access to sexually explicit material, including paedophilia, and material relating to drugs, religious cults and racist groups.

5.50 Even if it were desirable, it is unlikely that censorship of Internet content will ever be possible, partly on technological grounds, partly because of its global nature. The best hope of controlling the circulation of undesirable material on the Internet is self-regulation. Just as there is no single "killer application" for the Information Superhighways of the future, so too there is no single "killer solution" to the new problems which will inevitably be associated with the information revolution. We agree with ICSTIS, which has a considerable amount of relevant experience in supervising standards of telephone information services, that a package of measures is likely to be needed combining technological solutions with an effective and flexible Code of Practice and system of industry regulation. We join the Government in urging the Internet Service Providers' Association to implement a Code of Practice covering the problem of unacceptable material on the Internet. ICSTIS should be used as a model for consumer protection in Internet-based and other similar services.

5.51 Much of the concern about undesirable material on the Internet centres on the possibility of children accessing adult-rated material. For school use a number of "walled garden" environments already exist, which do not allow access to the sites which cause such concern. In the work environment employers may prohibit their employees from joining newsgroups, which may contain some of the more explicit material available on the Net. We have no doubt that where there's a will there will always be a way to by-pass the filtering software which is now becoming widely available. Nonetheless, we consider that such software, which allows, for example, parents to identify categories of information which they do not wish their children to see, represents a

significant step forward. We call on the Government to express its support for the Platform for Internet Content Selection (PICS) as an industry standard.

5.52 There is also concern—which we share—about the spread of racist and anti-semitic material on the Internet, including anti-semitic literature masquerading under the guise of "revisionist" history. As the use of the Internet and other means of "superhighway" communications develops, so too will its potential for increasing international tensions. We have in mind, for example, material published electronically by extremist religious groups. We also noted that although special police branches in England and Wales use the Internet for intelligence gathering about race hate material there is no specific monitoring. The Home Office, in collaboration with its international partners, should keep this situation under close review.

Government

5.53 Using IT to "re-engineer Government", as is planned in Singapore, could make life easier for individuals, particularly those who are heavily dependent on state benefits and public services for their support, and for industry, whilst at the same time stream-lining Government Departments and helping to prevent fraudulent benefit claims. We welcome the fact that CITU has been looking at the technology, costs and benefits of the further exploitation of IT to deliver greater efficiency in government. As the Lord Privy Seal told us, "IT is making it possible to restructure our dealings ... with the consumer ... in a way which will not necessarily align or even recognise the divisions between Government itself internally ... we once had no choice but to deal with clients agency by agency ... IT now makes it possible for the details of Government organisations to become really irrelevant to businesses and the citizen ... it holds out the possibility of a one-stop-shop" (Q 1055). Clearly there are difficult calculations to be made of whether the cost of providing the systems and public access terminals would be balanced by the administrative savings. We were encouraged that CITU is already addressing these issues (QQ 1058–9, 1080)[1] and note that the Government of Singapore hopes to save public money by introducing its own one-stop-shop terminals, whilst at the same time improving Government's service to the citizen.

5.54 The Inland Revenue's pilot system for the electronic submission of tax returns by approved tax agents is expected to save both the agents and the Department money, as well as speeding up the tax filing process. By April 1997, when the Self Assessment regime is introduced, all approved tax agents should be able to submit electronically self assessment tax returns on behalf of their clients.[2] Subject to satisfactory evaluation, we recommend that this project should be extended to enable any tax payer who wishes to submit his or her return electronically to do so.[3] Pilot projects, such as the Cambridge Childcare Project, should be developed by public/private partnerships with a view to placing a "front end" across the vertical divisions of government departments, thereby creating a virtual "one-stop-shop" for those seeking information.

5.55 We also noted the Lord Privy Seal's frank analysis of the need to manage change within Government if a policy of using IT to re-engineer Government were to be adopted. "Pretty dramatic organisational changes ... will have effects on public sector employment. That in itself is a form of change which is going to need internal management and care and sensitivity for public employees. There is going to be a need for training. There is also ... clearly going to be a need ... to avoid turf wars within Government. So far, as far as I can make out, the co-operation between Government departments has been enthusiastic and good but of course when it comes to talks about ... paying for these matters then we begin to see blood all over the various carpets" (Q 1060).

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1 We note the Government's announcement of their intention to publish a Green Paper, based on the work of CITU, in autumn 1996, "charting the way forward on the use of information technology across the civil service". (*House of Commons Hansard*, 11 July 1996, cols. 594-595).

2 Information Society Initiative factsheet, *Information Society Issues in Brief*.

3 The Lord Privy Seal thought that the ability to fill out one's income tax form electronically whilst discussing it with an official would be "of extraordinary interest" (Q 1054).

5.56 Despite protestations of ministerial co-operation,[1] concern about Turf Wars has continued to be voiced. News International thought that there had been a certain amount of "jockeying for position" between the DTI and the DNH, which for the most part was being resolved. They also believed that "the ITC and OFTEL ... see avenues down which both of them could justifiably go, and perhaps are to some extent not jockeying for position but certainly staking out their ground. By all means let them fight this out as long as it does not inhibit progress while they are doing it, which is the important thing" (Q 991). We agree, and were glad to see that the Lord Privy Seal was clearly aware of this problem as an unnecessary and unwelcome impediment to the development of the Information Society in the UK.

5.57 Many witnesses referred to the need to unlock British content for the development of services. One way of achieving this would be the development of demonstrator projects, particularly as public funding for such projects need not necessarily clash with EU discipline on state aids (Q 651). We recommend that the DTI develop a Content Foresight Initiative as part of its Technology Foresight programme.

5.58 We welcome the European Commission's INFO2000 programme, which focuses on information content providers in its aim to stimulate the development of a European multimedia industry. We also applaud the DTI for drawing the attention of UK companies to this programme with a special factsheet as part of its Information Society Initiative. Funding available for selected projects under the programme will be up to 50 per cent, and about half the total budget is to be spent on selected European multimedia collaborative projects. Although the DTI has noted that competition for INFO2000 grants will be strong, it has also stressed that companies which are successful in their applications "can reap rewards going beyond finance for a particular project. They can forge new alliances with innovative European companies and win footholds in expanding overseas markets."[2] We hope that British companies will participate wholeheartedly in the INFO2000 programme.

Government information

5.59 There are three major obstacles to adopting an "Open Government" policy for use of the Internet in the UK. First, in the absence of an overall policy regarding the electronic publication of Government information Departments are free to pick and choose what information they publish. Second, there are conflicts between the need for Departments and Agencies to maximise revenues and the desire to make government information widely and freely available. Third, although some UK public sector web pages are commendably well designed—OFTEL's, which has links to BT and Mercury, is a particularly good example—many are not.

5.60 Promoting the use of electronic publishing to facilitate widespread access to Government publications is one of the most important steps which Government could take to encourage the development of the Information Society in the UK. The Government has written to Departments to try to encourage them to place consultative papers on the Internet. We agree with the Lord Privy Seal that "encouragement will help", but not with his assertion that "in the end it is a matter for individual departments" (Q 1075). Writing "encouraging" letters to Departments is not enough. The goal should be that all Government publications providing information of widespread interest to citizens should be made available free of charge in electronic form. This goal would need to be co-ordinated across all Government Departments and Agencies to promote uniform standards and to ensure that this policy objective is achieved in a timely and orderly manner. CITU, which is already working on the important concept of an electronic "front end" for Government information, has a key role to play in this area.

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[1] In recent evidence to the House of Commons National Heritage Committee (3rd Report, 1995–96) the Minister for Science and Technology spoke of the close co-operation between the DTI and the DNH (p 32) and the Secretary of State for National Heritage did not consider that all the information superhighway responsibilities should be gathered together in one department (p 39): *The Structure and Remit of the Department of National Heritage* (HC 399).

[2] Information Society Initiative factsheet, *INFO2000: financial support for model projects.*

5.61 We recommend that the Government should set all Departments and Agencies minimum standards for the electronic publication of information. These standards should cover (i) the categories of information to be published electronically, for example, all press releases, (ii) minimum time standards for the electronic release of publications,[1] (iii) common presentation standards, so that all Government electronic publications have the same "look and feel", irrespective of the Department or Agency in which they originated, and (iv) the timetable to be adopted for making each category of publication available free of charge in electronic form. In particular, we call on the Government to announce in their response to this report that from henceforth all Green Papers will be available for consultation electronically.

5.62 We attach particular importance to the timely availability of Government information on-line. As a general rule, for example, press releases covering important announcements are highly sought after for at most a few days, so leisurely electronic publication timetables which result in them going on-line when interest in them is either extinguished or subsiding cannot be defended. Most WWW users must have had the depressing experience of locating a website which promises to provide the information they need, only to discover that it was last updated longer ago than they can bear thinking about. On-line Government information will need regular updating to guarantee, insofar as this is possible, its accuracy. All Departments would need to be aware of the on-going nature of this commitment, and of the price tag—and the effort—which will be attached to achieving it. We firmly believe that the benefits of such a major, Government-wide commitment would far outstrip the costs, and consider the recommendation outlined above to be one of the most important in our Report.

5.63 Several witnesses considered that the Crown copyright regime hindered the availability of official information in the United Kingdom and that its abolition, or relaxation in certain areas could significantly benefit the information and electronic publishing industries. It was suggested that the absence of a similar regime for official information was one reason for the USA's leadership in the development of the Information Superhighway. We recommend that the DTI should establish a Copyright Working Party to examine these concerns.

Towards universal access

5.64 The Information Society is not an exclusive club. Every British citizen should be able to become a member. In the long term, the aim must be that a majority of homes will have access to the Information Superhighways, perhaps via a low cost, low memory terminal or a television set-top box. But until this ideal is achieved, and, indeed, as a necessary stage towards achieving widespread knowledge, skills and use of IT, special arrangements will need to be made for public access. Demand for such access has already been demonstrated in the UK by the spread of cybercafés providing access to the Internet, often with personal assistance, known as a "hand-holding" facility, available as an optional extra, as well as the refreshments more generally associated with cafés.[2] These cafés can provide a good opportunity for accessing the Internet for the first time, but they are expensive.

5.65 A range of resources, applications and models for service delivery will therefore be needed to enable all citizens, their communities and the nation as a whole, to reap the full benefits of the Information Society. Public libraries in particular have experience of providing information through different media to many people. Their facilities can be used for lifelong learning; recreational use; answering day to day queries and problems; accessing business, community and local and national government information; and for accessing the national heritage of literature and

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[1] From the experience of the House of Lords in making arrangements for its own publications available in electronic form the Committee are aware that very tight electronic delivery standards for large publishing projects, for example, in the case of House of Lords *Hansard*, 9.30 am on the morning after the sitting day concerned, may only be guaranteed by paying a premium rate over a more relaxed delivery timetable. The latter seems to apply at present to the electronic publication of some Government documents.

[2] AJ Kennedy, *The Rough Guide to the Internet and World Wide Web* (Penguin, November 1995), 287–292. On-line lists of cyber-cafés in the United Kingdom and world-wide are at http://www.cyberiacafe.net/cyberia/guide/

art. We support the finding of the DTI's Multimedia Industry Advisory Group that "it will become important that the public has access to multimedia and on-line services regardless of their location and personal circumstances ... public access points to networks and equipment capable of handling multimedia applications could be established in libraries, community centres and other public buildings."[1] A range of locations is likely to be needed, including, as the Lord Privy Seal and the Head of CITU suggested, some Post Offices (QQ 1055, 1059).

5.66 Public libraries and CABs can also provide a supportive environment in which people can try out new technologies to which they might not otherwise have access, either at home or at work. Their staff should have the skills necessary to ensure that these facilities are exploited for the benefit of users. The combination of access, comprehensive coverage, skilled and supportive staff and powerful new technologies should mean that public libraries are well placed to help minimise the gap between the "information rich" and "information poor". We recommend that a nationally co-ordinated initiative to enable the benefits of the Information Superhighway to be delivered using public libraries be developed and supported by Government as part of the Information Society Initiative. The possibility of developing FreeNets[2] run by public/private partnerships, along the lines of the American and Canadian models, should be examined.

5.67 The Citizens Advice Bureaux could become more effective and efficient if all their bureaux were linked to an on-line database system to make unnecessary the regular manual updating of their current databases, designed in such a way that it would be simple for volunteer staff without IT training to operate. The system should be so designed as to allow the collection of statistical information on the categories of problems on which advice is sought, and this statistical information should be made public at regular intervals.

5.68 On 27 June 1996 the Director General of OFTEL issued a statement on *Improving access to the Information Society for Education and Public Access Points*. This statement announced OFTEL's intention of encouraging "the telecommunications industry to adopt a responsible attitude to enable affordable access to advanced telecommunications services for all educational institutions and public access points. It will challenge the industry to demonstrate that regulation in this market segment is unnecessary by developing a collaborative approach which:

— Offers affordable connection to wideband or broadband networks to all defined educational establishments and public access points within their licensed area, building on and expanding pilot projects already underway.

— Develops predictable and affordable usage tariffs which reflect the constraints on educational institutions' and local authorities' budgets.

— Establishes industry wide partnerships to deliver the telecommunications needs in a coordinated way."

5.69 Mr Cruickshank explained to the Committee that the hope was "to act on a voluntary basis with the industry and with the education community to complement what they are doing already—because remember the cable industry are committed to link-ups and BT are doing it unconditionally". He saw his own role as being "to complement that, to put in place *de facto*, I hope, a universal service. There are a lot of schools and libraries which are not on this network because they happen to be in the 15 per cent area which nobody is interested in and so some better working together ... is necessary. I am engaged on a crusade, not a regulation." (Q 1052) We welcome this announcement and the Director General's initiative in setting up a Task Force to

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[1] DTI Multimedia Industry Advisory Group Report (December 1995) p 73. Similar views were expressed in the Department of National Heritage's Public Library Review (1995), recommendation 3.1.

[2] FreeNets, or Community Nets, are public or community information services. The Heads of Departments and Schools Committee of BAILER said that because of the pricing policies of telecommunication services these had been relatively quick to emerge in the USA. "Some State authorities, eg Maryland, have been particularly vigorous in promoting community access and these may provide a model for the UK." (p 572)

consider these areas, and encourage him on his crusade. This will provide an opportunity to discover whether a voluntary approach to universal service will be sufficient and, if not, what further action is required.

5.70 Perhaps partly as a result of the widespread use of English, which is the common language of the Internet, in the Commonwealth, several Commonwealth countries are amongst the world leaders in developing Information Superhighways. Developments in Singapore, Canada and Australia, all of which have a higher gross national product per capita than does the UK, are particularly advanced. At the same time, some members of the Commonwealth are amongst the poorest countries of the world. As a means of helping to bridge the gap between "information haves" and "have-nots" within the Commonwealth, we recommend that a programme of information-sharing and mutual assistance between Commonwealth countries in developing the use of Information Superhighways should be set up. The Government already supports a number of Commonwealth activities, including Commonwealth scholarships, the Commonwealth Secretariat, the Commonwealth Foundation and the Commonwealth Fund for Technical Co-operation.[1] The Foreign and Commonwealth Office should pursue our recommendation within these existing mechanisms for co-operation.

Education

5.71 IT will play a major part in the working lives of all today's school children. Their future prosperity—and that of the nation as a whole—is likely to depend in no small part on the extent to which they leave school well skilled to become citizens of the Information Society. This is a matter which concerns many people, and should concern us all. Despite centres of excellence—which we support as test-beds for future more widespread developments—many schools remain poorly equipped with computer hardware and software, and with the personnel needed to support it. Although the costs of connection and teacher training are not inconsiderable, the purchase and installation of hardware is the largest upfront cost in equipping schools to exploit IT to the full. In some cases, use of older equipment, or least-cost technology where this is feasible, may reduce the cost. At St Matthew's Primary School in Cambridge, for example, we saw 12 perfectly serviceable 386 PCs, which had been donated through the initiative of a parent who worked for a bank which no longer needed them, being used with great enthusiasm by a group of pupils.

5.72 In America a number of schemes are in operation to encourage the recycling of used computer equipment from businesses and individuals. One such organisation is Gifts in Kind America, which connects companies willing to donate computers to needy school districts and nonprofit organisations. In 1994, Gifts in Kind America reported $118 million in donations, and total donations from this organisation had reached $100 million by the end of the first six months of 1995.[2] The UK needs to foster a similar sense of community-wide involvement in building the Information Society on this side of the Atlantic. We were therefore greatly encouraged by the creation of Free Computers for Education, which is encouraging companies nation-wide to donate computers for school use,[3] rather than allowing them to join the thousands of computers which are thrown into skips and landfill sites each year when companies upgrade their hardware. We call on companies nation-wide to support this scheme wherever possible, and for CITU and the CCTA to take the necessary steps to ensure that all Government Departments and Agencies allow suitable equipment which is no longer needed to be recycled in this way.

5.73 Adequate teacher training and support is essential if British schools are to take full advantage of the opportunities offered to them by the new information technologies. The aim must be that all teachers have adequate IT skills to enable them to feel comfortable about exploiting the benefits of IT to the full where this is appropriate for their teaching. As a simple first step towards

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1 *House of Commons Debates*, 18 April 1996, cols. 938–940.

2 United States Advisory Council on the National Information Infrastructure, *KickStart Initiative: Connecting America's Communities to the Information Superhighway* (January 1996), 90–94, 102–103.

3 The scheme will only accept PCs, with a minimum specification of 386s.

this aim, we recommend that all initial teacher training courses should contain an IT module as an essential requirement. Despite the vital need to remedy IT skills shortages amongst teachers, our enquiry identified the need for improved co-ordination between the DfEE and the various agencies working in this area before this need can be addressed fully. The ultimate responsibility for sorting out the present confusion over who should be taking the lead in improving teacher training in IT rests with the Secretary of State for Education and Employment. We call on the Secretary of State to investigate this area as a matter of the highest priority for her Department.

5.74 The Government should also support the development of aids to in-service IT training for teachers, including video and CD-ROM. The possibility of providing an out-sourced service for schools, enabling them to pay a fixed, subsidised rate for a level of service including a specified band width and help-desk support, should be developed, based on the experience of the Withywood project at Bristol.

5.75 Lack of a sufficient range of appropriate educational materials means that on-line teaching methods are not at present a suitable means for delivering the essential elements of the core curriculum to the vast majority of pupils in British schools. We see a case for promoting the use of IT in schools through the development of interactive materials, and would like to see a far greater range of CD-ROMs specifically addressing the National Curriculum, in maths and science as well as in the arts. The need for educational content addressing British curriculum requirements should be addressed by a targeted R&D programme, for which public funding should be made available to encourage private sector initiatives in this area. We were also impressed by the use made of the local Information Highway during our visit to the North Carolina School of Science and Mathematics. This school is a test bed for information technology applications in education, and through electronic links was connected to seven regional "cyber campuses", thus spreading access to the first rate facilities enjoyed by the school's own pupils.[1] We see potential for similar links being established in the UK. These could enable outstanding schools to become centres of excellence in one or a number of subjects, and could also improve communications between pupils and specialist teachers, particularly in remote areas.

5.76 It should be a requirement that all new school building projects involving classrooms, laboratories and libraries should incorporate the installation of a local area network. Consideration should be given to including a requirement to cable schools in all new licences to cable companies.

5.77 There is already a danger of children from poorer households being disadvantaged in homework provision as compared to those from households who can afford appropriate hardware and software. This problem should be addressed by a combination of schools keeping suitably-equipped classrooms open "after hours" to allow homework to be done on site, together with special financial provision to support computer access in after-school clubs, since these are mostly used by poorer households.

Training

5.78 The possibilities opened up by on-line training facilities are vast. In America, the Advisory Council on the National Information Infrastructure reported that "the desktop PC enables workers to draw on such diverse resources as online multimedia networks and live, interactive video conferences. From earning a master's degree or doctorate to receiving new product training, employees will increasingly come to rely on the Information Superhighway to further their career goals."[2] We would like to see a similar understanding of this potential in the UK. In North Carolina the Information Highway is being used to deliver education in prisons. We recommend that the Home Office should investigate the possibility of HM Prisons following suit.[3]

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1 See Appendix 8, paragraphs 69–71.

2 US Advisory Council on the National Information Infrastructure, *A Nation of Opportunity: realizing the promise of the Information Superhighway* (January 1996), 14.

3 See Appendix 8, paragraph 64. The North Carolina Information Highway is also used to deliver health care in prisons.

Higher education

5.79 In common with some major companies, but not all, the UK Higher Education sector is privileged in its access to an advanced broadband infrastructure. SuperJANET is the closest equivalent the UK has to a Superhighway backbone at present. Witnesses were divided over whether SuperJANET should be made more widely available to business use. It could not be widely used by business without significant upgrading of its capacity, although this could potentially be paid for by business itself. We recommend that a study be undertaken to assess the likely need for business access to SuperJANET, and, if a clear need is identified, that the DTI and DfEE consider funding mechanisms that might be appropriate to permit such access by industry for research purposes.

5.80 The Higher Education community has gained great advantage from the use of the Internet, particularly for e-mail and in facilitating international collaboration in scientific research. The system, however, is under strain. We noted concerns from the research community regarding inadequate access by research scientists to international sites. International collaboration is essential to the research and academic communities. We were impressed by US evidence of work in progress in some institutions to launch a priority service, for which a charge may be made to academic staff and faculty. The US National Science Foundation (NSF) has announced a Connections to the Internet programme to fund high-performance links from campuses and laboratories to the NSF's dedicated high-speed Internet backbone. The aim is for the entire network to gain capacity. Ultimately the NSF approach "could give everyone the chance to use "over-night express," "first class," or "third class" depending on content."[1] We recommend that UKERNA investigate the possibility of providing a similar service in the UK as a solution to the reported problems with international connections.

Health Care

5.81 Despite the impressiveness of the technical wizardry and clinical expertise engaged in telemedicine, the Committee considers that the most widespread benefits from the use of the Information Superhighways in healthcare are in the areas of administration and communication. An unacceptable amount of many, if not most, medical practitioners' time is spent bogged down in routine administrative tasks, chasing the "right" form, or an elusive hospital bed. The facility of GPs to book hospital appointments on-line would make life easier for all concerned, both patients and practitioners, and the Department of Health should set in place policy guidelines to encourage this. These guidelines would need to incorporate proposals for networking of GP practices, consultants and hospitals within a secure intranet system designed to ensure confidentiality.

5.82 The contract between health commissioning authorities and GPs states that "a doctor shall keep adequate records of the illness and treatment of his patients on forms supplied to him for the purpose." In 1993 a large national survey found that 8 per cent of general practices were already paperless.[2] In light of the support of the BMA for this change, we recommend that the Government should legitimise the keeping of medical records uniquely in machine-readable form, subject to strict safeguards concerning security, durability and back-up procedures, by removing the legal requirement for GPs to make records on paper. In their evidence the Department of Health expected that the necessary legal change would be made "very, very soon ... within weeks or months" (Q 436, pp 324, 335) but this change has not yet occurred.

5.83 There are far too many forms in use in the NHS. The "Fewer, Better Forms" initiative announced by the Secretary of State for Health on 15 April 1996 aims to remove an average of 1,900 forms a year from each General Practice. This process could be taken further if GPs and other health service practitioners were able to identify and down-load the forms they needed electronically, thereby reducing the current waste of paper, time and money. Witnesses were agreed

[1] *Science*, vol. 271, 22 March 1996, 1675.

[2] IN Purves, "The paperless general practice", *British Medical Journal*, vol. 312, 4 May 1996.

on the considerable benefits which the NHSnet could bring, but, as with the question of IT training for teachers, we received a strong impression that all the major players were waiting for someone else to take action (Q 455), not least in deciding on the appropriate level of security for patient records. Again, the ultimate responsibility rests with the Secretary of State, who should cut through this log-jam. The Department of Health should draw up a clear plan of action to fulfil its own estimate that using e-mail for messaging and transmission of forms in the NHS could save at least £100 million a year. As they told us, "that buys an awful lot of hip replacements" (Q 433).

5.84 The standards applying to the security of health related information within the NHS Wide Network should apply equally to local authorities and the private sector.

5.85 The mishandling of new health warnings in the NHS has caused considerable confusion, and is under review. The use of an NHS intranet to disseminate new health warnings should be investigated as part of this process.

Environmental benefits

5.86 The DTI's teleworking study, which reported in September 1993 on the business and economic implications of teleworking, resulted in a recommendation that Government should aim to become a leading exemplar of the use of teleworking and of networking technology to achieve productivity, cost and service quality benefits. A further recommendation was that there should be coordinated action between DTI and other relevant Departments to understand and optimise the employment, environmental, energy, transport and other benefits and impacts of telework take-up by Government and Industry.[1] We support these recommendations, and would like to see further action in this field.

5.87 The DTI is co-operating with the DfEE, the Department of Transport and the DoE in commissioning research into teleworking and related styles of working. This research is intended to investigate the prevalence and location of the different styles of teleworking and the effects on productivity, employment, travel and the environment.[2] We recommend that the Government should also undertake research into the possibility of increasing flexi-working (working from home on certain days only), particularly on days when air pollution levels are expected to be high. The Government itself, as a major employer, should take a lead in encouraging this practice.

5.88 Although the paper-less office is unlikely to prove a realistic goal, the use of IT to reduce unnecessary use of paper whilst at the same time increasing efficiency, for example through the use of electronic filing systems, should be encouraged. Again, this is an area in which Government could lead by example.

Electronic publishing and archiving

5.89 The VAT regime for electronic publications appears to be inconsistent with that for printed books and journals, with electronic publications attracting full-rate VAT and paper publications attracting zero-rate VAT. It is difficult to justify a different regime applying to a particular body of information simply because it is delivered in one medium rather than another. This anomaly is unlikely to encourage the growth of the electronic publishing industry in the UK, despite the fact that there could be environmental as well as economic benefits if this industry were to expand. We recommend that electronic publications should be made subject to zero-rate VAT, to put them on a par with printed books and journals.

5.90 In the UK the legal deposit of printed publications in specified "copyright libraries", including the British Library, has been of vital importance in preserving the nation's written heritage. With the explosion in growth of electronic publications there are dangers that a large body of scientific, technical, cultural and social knowledge will be lost if arrangements are not put in

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[1] POST, *Working at a Distance - UK Teleworking and its Implications* (June 1995), 33–34.

[2] Information Society Initiative factsheet, *Teleworking and flexible working*.

place to archive machine readable materials satisfactorily. At present, some of the archive is maintained by publishers, but there is no guarantee that everything of value will be retained. The British Library has argued for a change to the laws of legal deposit so that it is extended to include material in machine readable form. We support this proposal, so long as certain safeguards, for example regarding copying of such materials and where they can be inspected, are included. Many issues will need to be explored, such as the technical issues of maintaining and refreshing such an archive, the problems of materials which will only be readable by the use of obsolete or obsolescent hardware and software, and the issue of what is an accurate snapshot of a fast changing database. We recommend the introduction of enabling legislation to permit the extension of legal deposit to machine readable materials. If the barrier to the introduction of such legislation is, as we suspect, the lack of time for Government Bills in Parliament there would be the possibility of a private member's Bill being introduced into the House of Lords.

Encryption and verification

5.91 Despite the belief of several witnesses that the "problems" of lack of security on the Internet and insufficient levels of encryption had been exaggerated, we consider that high grade security will be essential for many users in the digital world. Strong, end-to-end encryption must be opened up to business and commercial users as quickly as possible, subject to certain safeguards. We therefore welcome the Government's announcement on 10 June 1996 proposing the licensing of Trusted Third Parties.

5.92 The US Government's restrictions on exporting software from the USA which includes high levels of encryption is threatening to become a major barrier to the development of the Information Superhighways, which is in no-one's interests. The Government must join with other EU Member States in putting pressure on the USA to relax its restrictions on the export of encryption technology.

Grants and assistance

5.93 One of the activities which impressed us most in the USA was the KickStart Initiative for "connecting America's communities to the Information Superhighway". In January 1996 the United States Advisory Council on the National Information Infrastructure published a report intended to help community leaders launch their own KickStart initiatives. This report contains "A leadership guide to getting there", including identifying costs and sources of funding and meeting responsibilities as users and creators of the Information Superhighway. The report also includes material on intellectual property, privacy and security and resources, both in print and on-line, for communities. The UK needs an equivalent document, which should be drawn up under the guidance of the ISTF with a view to becoming essential reading for the many people in leadership roles throughout the country, including industry and commerce, teachers and school governors and local community groups.

5.94 But any print-on-paper document is bound to become out of date, and the need for information and assistance will be ongoing. We therefore recommend the compilation of an electronic register of bodies giving grants to facilitate the use of Information Technology in the United Kingdom. The need for such a register is perhaps particularly acute in the education sector.

Conclusion

5.95 There is a great deal of activity already taking place in the UK to create the Information Society and work towards the Information Superhighways of the future. Our recommendations are intended to build on that work, to bring together the large number of excellent but often disparate projects taking place nationwide and, above all, to enable the UK to benefit from the great advantages which it enjoys with its world class telecommunications, broadcasting and publishing industries. Other countries are pulling together their efforts in these areas to create their own Information Societies. The UK needs its own Government-wide, industry-wide, nationwide campaign to build our Information Society and ensure that everyone who wants to join it can do so. There is room for more than one Intelligent Island in this world, and room for more than one Agenda for Action.

CHAPTER 6 THE AGENDA FOR ACTION

The Information Society Task Force

6.1 The results of the Cabinet Committee GEN 37's work should be given a higher profile, as should the role of its Chairman. GEN 37 should produce and publish regular policy reports (paragraph 5.6).

6.2 The Central Information Technology Unit should involve all Government departments and agencies and local government authorities in a nation-wide survey of the possible benefits and disbenefits of developing a National Information Infrastructure and its applications in the UK (paragraph 5.8).

6.3 To assist the Chairman of GEN 37, and to encourage a nation-wide debate on the creation of an Information Society, the Government should appoint a UK Information Society Task Force (ISTF) by the end of 1996. Its two main functions should be to act as a think tank to Government, and to ventilate views on the creation and development of the UK Information Society. The ISTF should have the task of identifying barriers to the development of the UK Information Society, and recommending the appropriate remedies. One of its first jobs should be to draw up a policy document setting out its advice to the Government for a UK agenda for action, involving both the private and the public sector (paragraphs 5.12–5.13).

6.4 The ISTF should be chaired by an enthusiast. Its members should be drawn from government (including regulatory bodies), industry, commerce, consumer and academic interests. Since the development of the Information Society should be a national objective, the Task Force should represent the full diversity of interests, expertise and opinions across society as a whole (paragraphs 5.12 and 5.14–5.15).

6.5 ISTF reports should usually be made public, and should be presented to Parliament as well as to the Cabinet Committee. Information about the activities and publications of the ISTF should be made available on a widely-publicised site on the World Wide Web. This should include an e-mail address encouraging citizens to participate in a nation-wide debate on the shaping of a UK Information Infrastructure. It should include links to other key web pages, so that, for example, a teacher could use the ISTF site as an easy access point for specialist advice on in-service training, IT applications, assistance available from charitable bodies, etc (paragraphs 5.12–5.13).

6.6 Specific public sector infrastructure targets for the UK, for example for connecting all schools to the Internet, and all GP practices to their local hospitals, should be agreed between Government and the private sector. The ISTF should play a crucial role in proposing and monitoring the delivery of policy objectives, thus both helping and stimulating GEN 37 to deliver the necessary decisions in government (paragraphs 5.16–5.17).

Regulatory framework

6.7 The restrictions on telecommunications companies either conveying or providing broadcast entertainment services in their own right should be reviewed as a matter of urgency, with the aim that both reviews should be completed by 1998. Full competition should be allowed from 2001 (paragraph 5.28).

6.8 A new regulatory regime for both telecommunications and broadcasting will be needed by 1998, distinguishing between issues relating to competition in the provision of networks and services, and issues relating to content (paragraph 5.48).

6.9 The Internet Service Providers' Association should implement a Code of Practice covering the problem of unacceptable content, including racist and anti-semitic material, on the Internet (paragraphs 5.50 and 5.52).

6.10 The Independent Committee for the Supervision of Standards of Telephone Information Services should be used as a model for consumer protection in Internet-based and other similar services (paragraph 5.50).

6.11 The Government should express its support for the Platform for Internet Content Selection as an industry standard (paragraph 5.51).

Government

6.12 Pilot projects, such as the Cambridge Childcare Project, should be developed by public/private partnerships with a view to placing a "front end" across the vertical divisions of government departments, thereby creating a virtual "one-stop-shop" for those seeking information (paragraphs 5.53–5.54).

6.13 The Department of Trade and Industry should develop a Content Foresight Initiative as part of its Technology Foresight programme (paragraph 5.57).

6.14 All Government publications providing information of widespread interest to citizens should be made available free of charge in electronic form. The Government should set all Departments and Agencies minimum standards for the electronic publication of information (paragraphs 5.60–5.62).

6.15 All Government Green Papers should be available for consultation electronically (paragraph 5.61).

6.16 The Department of Trade and Industry should establish a Copyright Working Party to examine concerns about the Crown Copyright regime (paragraph 5.63).

Towards universal access

6.17 Steps must be taken to limit the development of information "haves", "have nots" and "cannots" in the UK. The ISTF should consider whether the community service requirements in BT's universal service obligation should be extended (paragraphs 5.64–5.69).

6.18 Terminals allowing Internet access should be established in all public libraries and in a variety of other public areas, such as post offices and town halls. The possibility of developing FreeNets run by public/private partnerships, along the lines of the American and Canadian models, should be examined (paragraphs 5.65–5.66).

6.19 The Citizens Advice Bureaux should be linked to an on-line database system (paragraph 5.67).

6.20 A programme of information-sharing and mutual assistance between Commonwealth countries in developing the use of Information Superhighways should be set up (paragraph 5.70).

Education

6.21 Companies nation-wide should support the Free Computers for Education scheme wherever possible, and all Government Departments and Agencies should allow suitable equipment which is no longer needed to be recycled in this way (paragraph 5.72).

6.22 All initial teacher training courses should contain an IT module as an essential requirement. The Government should support the development of aids to in-service IT training for teachers, including video and CD-ROM (paragraphs 5.73–5.74).

6.23 Out-sourced services for schools, enabling them to pay a fixed, subsidised rate for a level of service including a specified band width and help-desk support, should be developed (paragraph 5.74).

6.24 The need to develop educational content addressing British curriculum requirements should be addressed by a targeted R&D programme, for which public funding should be made available to encourage private sector initiatives in this area (paragraph 5.75).

6.25 All new school building projects involving classrooms, laboratories or libraries should incorporate the installation of a local area network. Consideration should be given to including a requirement to cable schools in all new licences to cable companies (paragraph 5.76).

6.26 Selected schools should keep suitably-equipped classrooms open "after hours" to allow homework to be done on site. Special financial provision should be made available to support computer access in after-school clubs, since these are mostly used by poorer households (paragraph 5.77).

6.27 We recommend that a study be undertaken to assess the likely need for business access to SuperJANET, and, if a clear need is identified, that the Department of Trade and Industry and Department for Education and Employment consider funding mechanisms that might be appropriate to permit such access (paragraph 5.79).

6.28 UKERNA should take steps to ensure that British academic traffic has sufficient protected international bandwidth to support national research programmes, possibly by adopting a similar approach to the US National Science Foundation (paragraph 5.80).

Health Care

6.29 The Department of Health should set in place policy guidelines to encourage the development of facilities for GPs to book hospital appointments on-line. These guidelines should incorporate proposals for networking of GP practices, consultants and hospitals within a secure intranet system designed to ensure confidentiality (paragraph 5.81).

6.30 The Government should legitimise the keeping of medical records uniquely in machine-readable form, subject to strict safeguards concerning security, durability and back-up procedures, by removing the legal requirement for GPs to make records on paper (paragraph 5.82).

6.31 The Department of Health should draw up a clear plan of action to fulfil its own estimate that using e-mail for messaging and transmission of forms in the NHS could save at least £100 million a year (paragraph 5.83).

6.32 The standards applying to the security of health related information within the NHS Wide Network should apply equally to local authorities and the private sector (paragraph 5.84).

6.33 The use of an NHS intranet to disseminate new health warnings should be investigated (paragraph 5.85).

Environmental benefits

6.34 The Government should undertake research into the possibility of increasing flexi-working (working from home on certain days only), particularly on days when air pollution levels are expected to be high. The Government itself, as a major employer, could take a lead in encouraging this practice (paragraph 5.87).

6.35 The use of IT to reduce unnecessary use of paper whilst at the same time increasing efficiency, for example through the use of electronic filing systems, should be encouraged. Again, this is an area in which Government could lead by example (paragraph 5.88).

Electronic publishing and archiving

6.36 Electronic publications, which currently attract full-rate VAT in the UK, should be made subject to zero-rate VAT, to put them on a par with printed books and journals (paragraph 5.89).

6.37 Legislation should be introduced to extend the principle of legal deposit of publications in certain UK libraries to non-print materials (paragraph 5.90).

Encryption and verification

6.38 Strong, end-to-end encryption must be opened up to business and commercial users as quickly as possible, subject to certain safeguards. We therefore welcome the Government's announcement on 10 June 1996 proposing the licensing of Trusted Third Parties (paragraph 5.91).

6.39 The Government must join with other EU Member States in putting pressure on the USA to relax its restrictions on the export of encryption technology (paragraph 5.92).

Grants

6.40 We recommend the compilation of an electronic register of bodies giving grants to facilitate the use of Information Technology in the United Kingdom (paragraph 5.94).

APPENDIX 1

Members of the Sub-Committee who conducted the enquiry

Lord Butterworth
Lord Craig of Radley GCB OBE
Lord Flowers FRS
Lord Gregson
Lord Haskel
Baroness Hogg
Lord Hollick
Lord Phillips of Ellesmere KBE FRS (Chairman)

The Sub-Committee appointed as its Specialist Adviser:

Professor Charles Oppenheim
De Montfort University

APPENDIX 2

List of witnesses

The following witnesses gave evidence. Those marked * gave oral evidence.

Advisory Unit, Computers in Education
* Aslib
Aspen Consultancy
Bank of England
* BBC
British Association for Information and Library Education and Research (BAILER), Heads of Departments and Schools Committee
British Embassy, Paris
British Embassy, Tokyo
British Computer Society (on behalf of the Engineering Council)
British High Commission, Singapore
* British Library
* British Medical Association
British Standards Institution
* British Telecommunications plc
Butterworths (British and Irish)
Cable and Wireless plc
* Cable Communications Association
CCTA
Christian Action Research and Education (CARE)
Communication Workers Union
* CompuServe
Confederation of British Industry
* Rt Hon Viscount Cranborne DL, Lord Privy Seal and Leader of the House of Lords
De Montfort University
* Department for Education and Employment
* Department of Health
Department of National Heritage
* Department of Trade and Industry
Direct Marketing Association
Dow Jones Telerate Ltd
* Dr Mary Dykstra-Lynch
Economic and Social Research Council
European Communications Network (ECN)
* European Commission (M Robert Verrue, Director-General, DGXIII)
European Informatics Market (EURIM)
Federal Trust
Free Computers for Education
Further Education Development Agency (FEDA)
General Council of the Bar
Mr Andrew Graham, Balliol College, Oxford
GTi Electronics Group
Mr J M Harper
Heriot-Watt University, Professor Roy Leitch
Home Office
* Janice Hughes, Spectrum Strategy Consultants
ICL plc
Independent Committee for the Supervision of Standards of Telephone Information Services (ICSTIS)
IDPM
* Independent Television Commission (ITC)
Institute of Management Service
* Institute of Physics
Institute for the Management of Information Systems (IDPM)
Intervid Ltd

Joint Information Systems Committee
Law Society
Law Society of Scotland
Library and Information Commission
* Mercury Communications Ltd
* Microsoft Corporation
Multimedia Exhibitions Ltd (Free Computers for Education)
Museum Documentation Association (MDA)
* National Association of Citizens' Advice Bureaux
National Consumer Council
* National Council for Educational Technology (NCET)
* NatWest Group
* News International
* Newspaper Society
* Office of Telecommunications (Oftel)
Ofsted
Open University
Oracle Corporation UK Ltd
Performing Right Society (PRS)
Policy Studies Institute, London
* QVC
Reuters
Robert Gordon University
Royal Academy of Engineering
Royal College of Nursing
Royal Society of Edinburgh
Stephen Saxby, University of Southampton
Scottish Office
Society of Public Information Networks (SPIN)
Standing Conference of National and University Libraries (SCONUL)
* Mr Ian Taylor MBE MP, Minister for Science and Technology
Teacher Training Agency
* Technology Foresight ITEC Panel
Telecential Communications
John Tomlinson, Member of the European Parliament for Birmingham West
Universities and Colleges Information Systems Association (UCISA)
UK Education and Research Networking Association (UKERNA)
University of Leeds
University of Oxford
University of Warwick
Welsh Office
Virtual Precincts Ltd
Visa International

APPENDIX 3

Invitation to submit evidence

The Sub-Committee invite written submissions on matters of relevance to this topic, but in particular on the questions listed below.

Note: For the purposes of this enquiry the term "Information Superhighway" has been taken to mean a publicly accessible network capable of transferring large amounts of information at high speed between users.

1. What is the current form of the "Information Superhighway", and how is it developing (i) in the United Kingdom and (ii) worldwide? What specific problems arise from incompatible network standards and why are these incompatibilities arising?

2. What services are being provided, and should be developed/will be required, within for example the following areas:

(i) public information,
(ii) commerce,
(iii) finance,
(iv) education,
(v) industrial training,
(vi) health,
(vii) social services, and
(viii) entertainment?

3. Who will supply these services to consumers in the United Kingdom? How can the participating companies be categorised and what is the nature of the commercial relationships between them? How are suppliers likely to develop? What *service* standards exist and how are they likely to evolve?

4. How can universal access to services provided for the common good be secured within a commercially competitive market framework?

5. What is the role of central Government in connection with the "Information Superhighway" service provision, including the following areas:

(i) leadership;
(ii) promoting inward investment;
(iii) promoting and safeguarding the interests of UK firms worldwide;
(iv) promoting network compatibility;
(v) access to Government information;
(vi) security of payment;
(vii) data protection, confidentiality and censorship;
(viii) verification of information; and
(ix) promoting the development of UK-orientated software?

6. What is the role of local and regional Government in connection with the "Information Superhighway"? How can new services be used to boost (a) the ongoing regeneration of urban areas, (b) other local economies?

7. What will be the impact of the "Information Superhighway" on working practices and employment prospects?

8. Is the dominance of mass-market US software a threat or an opportunity? What hard *commercial* initiatives can be made (as opposed to "collaborative" ventures such as RACE or ESPRIT) to respond to this dominance?

APPENDIX 4

Acronyms

AJB	America's Job Bank
AOM	Acorn Online Media
ARPANET	US Defence Department's Advanced Research Projects Agency Network
ASLIB	The Association for Information Management
ATM	Asynchronous Transfer Mode
BAILER	British Association for Information and Library Education and Research
BBC	British Broadcasting Corporation
BCS	British Computer Society
BMA	British Medical Association
BSI	British Standards Institution
BT	British Telecommunications
CAB	Citizens' Advice Bureau
CANARIE	Canadian Network for Research, Industry and Education
CARE	Christian Action Research and Education
CAT	Committee on Applications and Technology (an IITF working group)
CBI	Confederation of British Industry
CCA	Cable Communications Association
CCTA	Central Computer and Telecommunications Agency
CD	Compact Disc
CDi	Compact Disc Interactive
CD-ROM	Compact Disc Read-Only Memory (disc-based data storage)
CERN	European Organisation for Nuclear Research (originally Conseil Européen pour la Recherche Nucléaire)
CGIS	CCTA Government Information Service
CITU	Central Information Technology Unit
CSCP	Civil Service Computerisation Programme
CWU	Communication Workers Union
DfEE	Department for Education and Employment
DMA	Direct Marketing Association
DNH	Department of National Heritage
DTI	Department of Trade and Industry
ECMS	Electronic Copyright Management Systems
ECN	European Communications Network
ESPRIT	European Strategic Programme for Research in Information Technology
ESRC	Economic and Social Research Council
EU	European Union
EUNET	A Europe-wide packet-switching network
EURIM	European Informatics Market
EURO-ISDN	A European version of ISDN
FEDA	Further Education Development Agency
GII	Global Information Infrastructure
GLOBE	Global Learning and Observations to Benefit the Environment
HEI	Higher Education Institutes
ICSTIS	Independent Committee for the Supervision of Standards of Telephone Information Services
IDPM	Institute for the Management of Information Systems (originally the Institute for Data and Production Managers)
IHAC	Information Highway Advisory Council (in Canada)
IITF	Information Infrastructure Task Force (in the USA)
IMS	Institute of Management Services
INRIA	Institut National de Recherche en Informatique et en Automatique (France)
IoP	Institute of Physics
IPR	Intellectual Property Right
IPU	Inter-Parliamentary Union
ISDN	Integrated Systems Digital Network
ISH	Information Superhighway
ISI	Information Society Initiative
ISO	International Standards Organisation
ISTF	Information Society Task Force
IT	Information Technology

ITAA	Information Technology Association of America
ITC	Independent Television Commission
ITEC	Information Technology, Electronics and Communications (a Panel in the UK Technology Foresight exercise)
iTV	Interactive Television Trial in Cambridge, England
JANET	Joint Academic Network
JISC	Joint Information Systems Committee
LAN	Local Area Network
LDO	Local Delivery Operator
MAN	Metropolitan Area Network
MCNC	Microelectronic Computing Centre of North Carolina
MDA	Museum Documentation Association
MIT	Massachusetts Intitute of Technology, Boston, USA
MPEG	Motion Picture Experts Group
MPT	Ministry of Posts and Telecommunications (in Japan)
NACAB	National Association of Citizens Advice Bureaux
NAS	National Academy of Sciences (in the USA)
NC	Network Computer
NCC	National Consumer Council
NCET	National Centre for Educational Technology
NCIH	North Carolina Information Highway
NHS	National Health Service
NII	National Information Infrastructure
NIIAC	National Information Infrastructure Advisory Council
NIST	National Institute of Standards and Technology (in the USA)
NSF	US National Science Foundation
NSFNET	US National Science Foundation Network
NYNEX	New York and New England Exchange
OFSTED	Office for Standards in Education
OFT	Office of Fair Trading
OFTEL	Office of Telecommunications Regulation
OSCE	Organisation for Security and Cooperation in Europe
OSI	Open Systems Interconnection
OST	Office of Science and Technology
OSTP	Office of Science and Technology Policy (in the USA)
OTIA	Office of Telecommunications and Information Applications (USA)
PA-NET	Parliamentary Assembly Network (set up by OSCE)
PC	Personal Computer
PFI	Private Finance Initiative
PICS	Platform for Internet Content Selection
POST	Parliamentary Office of Science and Technology
PSI	Policy Studies Institute
PTO	Public Telephone Operator
PTT	Posts, Telegraphs and Telephones
QVC	Quality, Value and Convenience (a shopping channel on cable and satellite television)
RACE	R&D in Advanced Communications Technologies in Europe
RAM	Random Access Memory
RCN	Royal College of Nursing
ROM	Read-Only Memory
SCONUL	Standing Conference of National and University Libraries
SCRAN2000	Scottish Cultural Resources Access Network
SET	Secure Electronic Transactions
SMEs	Small and Medium-sized Enterprises
Super-JANET	High speed upgrade of the Joint Academic Network
TERC	Technology Education Resource Centre (USA)
TTA	Teacher Training Agency
UCISA	Universities and Colleges Information Systems Association
UKERNA	UK Education and Research Networking Association
USO	Universal Service Obligation
VBNS	Very high speed Backbone Network Service (US equivalent to SuperJANET)
VCR	Video Cassette Recorder
WAN	Wide Area Network
WWW	WorldWide Web

APPENDIX 5

Visit to British Telecommunications plc laboratories, Martlesham Heath

Tuesday 2 April 1996

Present:

Lord Craig of Radley
Lord Flowers
Lord Gregson
Lord Haskel
Baroness Hogg
Lord Phillips of Ellesmere (Chairman)

1. *En route* to the British Telecommunications plc (BT) laboratory site Members were given a demonstration of how global positioning system satellite location could be combined with a digital map display to produce a real-time navigation tool.

MARTLESHAM

Introduction

2. The Sub-Committee's principal host for the day was Dr Alan Rudge, Deputy Group Managing Director of BT and Board member responsible for research. Some of Dr Rudge's remarks are quoted directly in the final three paragraphs of these Minutes, and give an overall impression of key issues discussed during the visit. Other members of the BT staff involved in the presentations and demonstrations were: Mr R Gavin, Mr R Foster, Mr G Young, Dr G Walker, Dr G Carey, Mr J Roberts and Dr T Rowbotham.

3. BT currently had an R&D and information technology expenditure of around £500 million, of which 20 per cent was spent on research. At Martlesham and at BT's other software centres BT was running 2000 research projects simultaneously. Emphasising the importance of research, Dr Rudge said that this was the only activity in the company where the number of employees had risen since privatisation.

4. An information superhighway was defined as being ubiquitous (having millions of people connected), digital, switched (i.e. interactive) and broadband. On that basis the superhighway did not yet exist, but BT was involved in trying to build both the network and a market based on "chasing the challenge" of customer expectations. BT was trying to develop the network by a process of evolution through medium band to the broadband of the future. At the same time the company was faced with increasing traffic being carried on its network which was not BT-originated (20 per cent now and likely to be 50 per cent by the year 2000).

5. Technology was being used as appropriate to allow the network to evolve gradually from narrow band to medium and broad band capacity. The actual network would ultimately resemble a massive version of the modern computer with the processing power and switches located away from the home, running software and applications over a wide area. It was these applications (and services provided) that would be profitable, but they required the infrastructure to be in place first.

6. The regulatory process and the weakness of the market were slowing down the infrastructure developments by BT, and several times in the past they had stopped BT from making investments in broad band in the United Kingdom.

The Information market place

7. The need for advanced electronic communications was evident in the measures that people would take to communicate - for instance flying abroad for a meeting. The cost of physical travel was falling, but the cost of moving information to the people, rather than vice versa, was falling much faster. The National Lottery was one example of the general trend towards "moving bits not atoms". Developments in computing, storage, modems and video coding had all caused costs to fall at the same time as the power and speed of technology had increased.

8. Traffic volume on the World Wide Web had increased exponentially and it was still accelerating. However, this was just the start. The Internet represented a relatively basic level of communication; it lacked true functionality and something much better was required.

9. Developments for the home market would now come from a number of different angles as technologies converged and became digital. The four main industries involved were computing (e.g. Microsoft and Oracle), telecommunications, content (e.g. Disney), and those based on "home platforms" for specific uses (e.g. for games). Collaboration between these industries was the key to an integrated approach.

Technical issues

10. Many similar technical issues were being faced by the four main industries. These included:

(i) Content

Formats, management tools, "legacy databases" (past technology);

(ii) Servers

Capacity, indexing, searching, security, billing, customer handling;

(iii) Networks

Speeds, resilience, evolution, tariff options;

(iv) User interfaces

User skills, applications;

(v) Terminals

Costs and capabilities.

11. In terms of physical infrastructure, fibre optic cables would still be BT's choice if a network were being installed from scratch, but the cost of completely replacing the existing United Kingdom telecommunications infrastructure would be prohibitive. Digital compression technology could already supply limited broadband capabilities (i.e. 2 Mbit/s video) over 5.5 km on standard twisted-pair copper wires. This technology was being used for BT's Interactive Television trials in Ipswich and Colchester, and the technology would allow BT to reach over 90 per cent of its customers with this bandwidth from local hubs.

12. A new form of advanced transmission technology would increase the bandwidth to 25 Mbit/s over 1 km, thus allowing simultaneous transmission of a number of video channels or a mixture of video, Internet and interactive services. To achieve this BT would need to install optical cables from its local hubs to street-side boxes and then use the advanced Tx techniques from there to the home. In one of the technology demonstrations it was indicated that such a system might also be partially intelligent in deciding what bandwidth to allocate to which service. Thus higher quality delivery could be obtained if only one service were being accessed from the home at a time.

13. Although fixed networks were considered to be the best option, medium bandwidth radio and satellite networks were also seen to have some potential. They would be particularly useful for point to point connections in rural areas and could also be the "trail blazer" for new services. For instance: radio coverage of a large area could be set up very quickly and cheaply and produce income as scattered users signed up; as customer numbers increased, more services could be developed and a fixed infrastructure gradually put in place to meet long-term demands.

Networked multimedia

14. The advantages of networked multimedia were that (i) it provided an efficient method of communicating information with ease to the largest number of people, (ii) it could be interactive and (iii) it could be up-dated in real time. For networked multimedia to become a reality developments were needed in a number of sectors of a chain between content producers and the home audience, and it was crucial that no sector in the chain was left out.

The networked multimedia chain:

1. Content producers and owners	2. Packagers retailers Service providers	3. Network operators	4. Customer Premise Equipment (CPE) (PC/television/set top box)

15. Examples of companies in this chain were Viacom and Warner Brothers (sector 1), television companies and electronic banking (sector 2), Sony (sectors 1 and 4), cable companies (sector 3) and BT (in sectors 2, 3, and 4). For companies to be involved in more than one sector was costly and Dr. Rudge wished to see many thousands of service providers, not just BT and a few others in sector 2.

Interactive Television

16. BT's Interactive Television experiment in Ipswich and Colchester was one of the largest in the world, serving 2,000 homes. The only home equipment required was a signal splitter to split the telephone and video signals from the standard phone line connection and a desk-top "black box" which was manufactured for BT by Apple. Eleven different services were offered including video films on demand, banking, home shopping, education, local information and networked games. The most successful services had been television programmes made available ahead of national broadcast times, films on demand and educational services (including access to over 600 titles of educational video-based material).

17. The films on demand service was offered at typical video-rental costs, but the up-take was three times higher than for standard video rental, probably because of the ease of access and convenience. The picture quality of the demonstration was high, all the standard capabilities of a video machine were available over the network (e.g. fast forward, pause, search and rewind), and the system could be programmed to bar unauthorised access to films in inappropriate age categories.

18. The home shopping service was one of the slowest to gain users (rather than browsers), but its use was increasing as the retailers moved away from just providing a two dimensional on-line catalogue to running a dynamic three dimensional on-line store where prices and promotions changed. A demonstration of on-line shopping at the Ipswich branch of House of Fraser included both static index pages and video clips of the products. Interactivity in the video allowed users to browse as if at a fashion show, and then request details and close-ups of items of specific interest. The improved colour reproduction of a video in comparison with a still photograph in a catalogue, and the ability to see garments being worn "in action", helped to reduce the number of returned items, something in which Freeman's had been particularly interested. The action of buying the product then proceeded in the logical order of choosing the colour and size of garment, placing it in a basket and then paying for it as one left the store. Secure payment was arranged as credit card details were taken when initially signing up for the service and these had to be confirmed with a pin number at the time of purchasing an item.

19. The speed of interactivity for some services demonstrated was still rather slow, but a number of short-cut steps were available (for practised users) to reduce the need to undo one's steps back to the home page if switching to a new service or area of interest. In each of the services demonstrated care had also been taken to ensure that a suitable, consistent and simple user interface had been created. For example, a red button (on screen and on the remote control unit) always took the user back to the previous "page", a blue button moved the user forward, and green and orange buttons provided other interactivity.

Campus World

20. BT was running a commercial educational network called Campus World, linking 2,000 schools (estimated at 6,000 users) across the country. This was believed to be the largest on-line educational service in the world. The system was password protected and the content, and access to the Internet, were limited to approved, "suitable", material in a "walled garden" environment. Applications specifically designed for three age groups were provided (infant, primary, and secondary) as well as standard features including a help desk, electronic mail and an on-line question and answer service similar to the information one might expect from an encyclopaedia in book form. BT had employed educationalists and curriculum consultants to help develop the system, and, again, the development of a suitable user interface had been critical. There was potential for an American version, and Campus Home would be launched in the near future.

21. BT had also produced advice for schools on when it was more effective not to use the Internet, and when traditional resources were better. They had no interest in "turning people off" new technology by encouraging unsuitable or ineffective applications.

Problems to be resolved

22. At present the Interactive Television trial was run under special dispensation from Oftel and it had not been made clear to BT what rules and regulations would apply if it were to try to offer a similar service on a national basis. One of the main problems was in supplying a comprehensive service to customers without overloading the system. For example, if 90 per cent of users wished to view a certain programme at the same time it would make more sense to broadcast this over the network, rather than offer it on a one to one basis; this would reduce the number of switches required at the local computer hub and thus reduce the scale of investment needed to provide an efficient and reliable service. BT was not currently permitted to broadcast on its network, while cable companies were so allowed. Dr Rudge said that seven years of this "asymmetry" was enough and that the regulation was now seriously slowing down further development by BT.

23. Dr Rudge also questioned the validity of reducing BT's capacity to earn money from its telephony services any further. These were the mature products of the industry that would provide the funds necessary to develop future services and products. A further problem was that of encouraging new, and thus comparatively small, markets for new products and services whilst the price remained high. For example, BT's tariff for installing an ISDN line was currently c. £400, whilst the actual cost to BT is much greater.

24. Finally, Dr Rudge suggested that there was a real need for a national player (i.e. BT) in the area of advanced interactive communications. This would be the only way to ensure high quality, a good standard of service across the country, and to keep the infrastructure, content and products up to date. BT played a major role in establishing standards. There would still be a need for local and regional companies as they would serve to keep the national player on its toes, but a system based only on scattered regional activities was backward looking and would be at the mercy of international competition.

Quotations from Dr Rudge

25. *Defining a Superhighway*

"Nobody has got a superhighway today other than in a lab."

"The Internet is the ham radio of the information age."

"The information age is a reality ... especially for us in the business, we know it is a reality."

"When someone says superhighway there are three things you should think of: digital, broadband and switchability."

26. *The window of opportunity*

"There is a window for new technologies ... There is a time when it is the best time to do something, and it doesn't last forever."

"If we are late into that [information technology] game nationally, then I can assure you that in 10 years' time we will be buying things from people further up the learning curve than we are."

27. *Respective roles:*

Of BT: "There is a role for a national player".

Of Government: "Take the blinkers off and stop thinking of the UK as a little island."

Of the Regulator: "Seven years' asymmetry was enough start for the cable companies."

APPENDIX 6

Visit to Nortel Technology Laboratories, Harlow

Wednesday 8 May 1996

Present:

Lord Craig of Radley
Lord Gregson
Lord Haskel
Lord Phillips of Ellesmere (Chairman)

1. The Sub-Committee heard presentations from Dr Allan Fox, Managing Director, Mr John Winterbotham, IT Strategy and Dr Piers Dawe, Principal Research Engineer, Optical Communications. It also saw a brief demonstration of the Cambridge OnLine trial in the Broadband Centre.

Background

2. Nortel (Northern Telecom) is one of the world's largest telecommunications manufacturers, and the second largest telecommunications and R&D company in the United Kingdom. Nortel provides the transmission and switching technology which enables the private and public telecommunications companies to run their networks and deliver advanced services to their customers, who include British Telecom, Mercury, Energis and Ionica. It is not a telephone operator.

Nortel's markets are currently as follows:

50%	USA
24%	Europe
11%	Canada
15%	other international

3. Nortel is exclusively an equipment supplier, with product lines broken down as follows:

40%	Switching (this sector is shrinking in proportional terms)
30%	Enterprise networks
15%	Wireless networks (growing rapidly)
10%	Broadband networks
5%	Cable and other

Nortel Research

4. Over 13 per cent of Nortel's annual revenue is ploughed back into research and development, with a substantial proportion going into the United Kingdom. In a recent Department of Trade and Industry report Nortel was credited as being the fifth largest investor amongst unlisted companies investing in United Kingdom R&D.

5. The Harlow laboratories employ about 1,000 people, and a $30 million building investment programme is underway. Fibre optics were invented in the Harlow laboratories (which pre-date their take-over by Nortel) and Nortel's scientists have maintained a leading edge in this field. Nortel's world centre of broadband services is based in Harlow and Belfast and its centre for radio technology development is at Paignton. These laboratories are linked electronically with others in the United Kingdom and a further 19 world-wide in one of the world's largest private networks. The Nortel network moves 1.5 million megabytes of information per month in and out of the United Kingdom.

The Information Superhighway

6. To Nortel, "the information superhighway is not a revolutionary, single, new entity but an evolutionary network of networks - some copper wire, some co-axial (TV), some optical fibre, some radio, some fixed, some mobile. Nor is it restricted to the developed world. In fact many developing countries are now able to leapfrog ahead, by-passing the old technology and moving straight to advanced networks. What is required is seamless interconnection between all the network technologies with as much bandwidth being carried as possible".

Terabit[1] Optical Switch Lead Project

7. The objective of this project is to determine the architectural options, practical feasibility and product opportunity for very high capacity 80–1000 GBit/s optical switches. The programme takes advantage of high speed optical technology developed for transmission applications and the use of existing products such as Magellan Concorde as front-ends. The massive capacity provided by this switch means that Nortel has "a solution waiting for a problem".

Regulation

8. The liberalisation process has been the key to Nortel's progress in recent years, and it is for this reason that it is now moving into France and Germany. In 1991 it acquired STC in the United Kingdom, and in 1994 it launched joint ventures with Matra in France and in 1995 with Daimler Benz in Germany.

9. Nortel would support minimalist definitions of universal service. It opposes the current "RPI minus" formula for charging for telecommunications services in the United Kingdom, arguing that "it is not in UK Plc's best interests that innovation should be suppressed". The company believed that the RPI minus price cap was resulting in money haemorrhaging out of Nortel's marketplace. There was a need to ensure that the associated regulatory and legal frameworks developed with and not after the superhighways themselves.

Comments on IT Strategy

10. The work on the centre of the Global Transmission Network was complete, and the cost of high speed transmission was dropping dramatically. The problem areas lay out on the periphery. This raised the need to:

(i) encourage increased bandwidth in the Local Loop, by a combination of fixed radio access, cable modems and increased ISDN;

(ii) increase the national skill base in IT;

(iii) develop a critical mass for Internet and broadband applications in the general population. Here a middle-class fear of unemployment was becoming a motivating factor in home PC purchase as parents wanted to equip their children with IT skills, much as people used to buy encyclopedias by the yard. The United Kingdom was lagging behind the United States, where the rate of take-up of display telephones was now supply limited.

11. There had been a change in the perspective of the use to which broadband services would be put, at least in the immediate future. The growth of Internet (rather than video-on-demand, which had previously been expected to be the "killer application" for cable companies) brought with it new possibilities for presenting a business case. BT, and other PTTs worldwide, were now building an advanced network for business use in parallel to the existing voice network.

12. Much of the money which was going to be made out of the Internet would be displacement revenue, for example electronic versions of local free newspapers. Little was know about its possible impact on the traditional postal service.

13. In New Brunswick the Government had taken the initiative in establishing broadband services. It was now estimated that by the year 2000 two out of three jobs in New Brunswick would be knowledge-based.

[1] 1 terabit = 1000 gigabits.

APPENDIX 7

Visit to Acorn Online Media, Cambridge

Wednesday 22 May 1996

Present:

Lord Craig of Radley
Lord Flowers
Lord Phillips of Ellesmere (Chairman)

The Sub-Committee visited Acorn Online Media, St Matthew's Primary School and Netherhall School in Cambridge.

ACORN ONLINE MEDIA

Introduction

1. Acorn Online Media (AOM) is a subsidiary of the Acorn Computer Group, which is 45 per cent owned by Olivetti. AOM was established in 1994 to develop products and services for the networked multimedia market. Presentations were given by Simon Wyatt (Director and General Manager of AOM) and Nigel Harper (a senior consultant at AOM).

2. Mr Wyatt said that the "killer application" for the information society, in so far as there was one, was interactivity. AOM's core business was in the production of intelligent set top boxes for interactive TV applications, along with associated systems software, network services and consultancy. A key aim of AOM's activities was to keep costs to the consumer as low as possible by developing computing and interactive TV systems which used the televisions people already had in the home. To achieve this, an important development was graphics software that produced good quality images using the particular qualities of a TV screen.

3. The AOM set top box could be regarded as an inexpensive computer with a minimum of Random Access Memory (RAM), an operating system that used Read Only Memory, and a high performance low power processing chip which did not require a cooling fan. RAM chips were still an expensive component of the set top box and AOM were attempting to achieve the maximum range of functions while restricting the RAM requirements to 4MB. Mr Wyatt said that "programmers have become lazy" and AOM had had to convince them to write less RAM-intensive versions of word processing and spread sheet software for use with the set top box and the Network Computer.

4. Most of the functions of the set top box could be operated using a simple hand held device similar to a TV remote control, although a keyboard, mouse, printer and other typical computer accessories could also be added to increase functionality and extend the potential service usage.

5. AOM had been working with companies such as Digital and various standards organisations to ensure that the set top boxes would meet current industry software standards. Content providers had agreed on about three or four standards for digital movie play back etc. and the AOM set top box was designed to recognise all of them. The set top boxes also had the ability to down load "applets" (small software applications that preceded the main content and allowed the computer to decode and display what followed) and hold them in the RAM memory while the content was being accessed.

6. Mr Wyatt predicted that at some point in the future when digital television broadcasting, digital televisions, and digital programmes had become established, then the AOM set top box might become an integral part of the TV set.

Interactive TV and demonstration

7. The Cambridge Interactive TV Trial (iTV) began in September 1994 with 10 "tame" users and a couple of content providers, using the already well established Cambridge Cable network. The trial was later expanded to 100 real customers and a number of schools. The Cambridge Cable network was upgraded in the trial areas to extend fibre optic cable as far as the street-side boxes. Coaxial cable was then used in the local loop to individual homes. The upgraded network infrastructure with Asynchronous Transfer Mode (ATM) protocols used throughout now provided full two-way broad band capabilities.

8. The trial was set up as a partnership with each contributing company providing hardware, skills, software, or content as appropriate within their fields of expertise. After establishing the network infrastructure, the main activity was the development of services. A "service nursery" was set up as a safe learning environment for the companies involved to learn from each others mistakes and to develop common themes for their content. Some of the companies taking part were the Post Office, Anglia Television, IPC Magazines, Tesco, National Westminster Bank, and the BBC. The Independent Television Commission and National Opinion Polls had also been active contributors. Mr Harper indicated that AOM's interest in providing training and help for the content producers was not just altruistic. It did not take long for the hype over the new technology to disappear and for people to start demanding content. Interactive TV and consumer interaction with services was effectively at the mercy of the content providers. Consumer interaction and the success of AOM was dependent upon content being up to date, interesting and worth watching.

9. The iTV demonstration featured: on-line booking of cinema tickets (including choosing one's seat and watching a film preview); personally focused news, where the user identified areas of interest and these items were regularly trawled from the various press agencies; indexing of broadcast material so that the user could jump to specific sections of a programme; and fast access to Ceefax. Apparently the fast Ceefax service was one of the most popular: AOM regularly downloaded and stored all of the broadcast pages of Ceefax on to an on-line cache which users could then access rather than having to wait for each Ceefax page to be broadcast. Banking, shopping, regular television channels, educational material and other cable services were also available.

Network Computers

10. The network computer concept was an alternative to the traditional PC and, like the AOM set top box, was designed with simplicity, ease of use and low cost in mind. The main computing power and data storage requirements were held on a local server and this was accessed over a network using a simplified Network Computer as the interface device. The Oracle Corporation was one of the main proponents of network computing and Acorn Network Computing had recently signed an agreement with Oracle to develop and provide a reference design for a network computer which Oracle would then licence to manufacturers.

11. Because software and stored information were not tied to a home computer, they were available anywhere that a network connection could be made. This was done using a smart card placed in the Network Computer (or street kiosk etc.) to identify the user and provide access to their files. The local servers for this required about the same computing power as modern Internet servers and the computing power may be optimised by software that learned the habits of its users (e.g. by down loading and caching the football results on a Saturday afternoon).

ST MATTHEW'S PRIMARY SCHOOL

12. Carole Macintosh (the Deputy Head of St Matthew's School) and a group of her children demonstrated how they were using computers and the iTV educational material in the school. Some of the educational software provided for the trial was now out of date although they were able to download current material and software from the Internet for use on traditional PCs. Ms Macintosh said that the iTV and other computing materials were being used mainly as an additional resource to books etc. rather than as a complete teaching medium.

13. The iTV system had advantages over the other computers in that a whole class or group of children could sit around the screen and interact with the programmes. The children themselves seemed completely at ease with the iTV technology and were happy to explore and interact with the features on offer through the system using a remote control hand set.

14. In addition to the iTV machine the school had a range of second-hand PCs (donated by a parent) and software (e.g. drawing packages) which the children were encouraged to use during their free time. It was apparent that a considerable amount of time and effort, by both teachers and enthusiastic parents, had been put into obtaining and setting up the computers, screening software and making the computers child-survivable. One example of parental activity was screening games down loaded from the Internet to weed-out those with violent scenes. However, the range of suitable material available (real content and not just "froth"), via the iTV system in particular, could still be much better.

15. The school had conducted a survey of the proportion of pupils with access to computers at home. This was 70 per cent, although the "computers" ranged from games consoles to fully functional home PCs. Children without home access were given extra coaching in keyboard skills at school.

NETHERHALL SCHOOL

Introduction

16. The Headmaster, Dr Hunter, provided an introduction to the school and its long history of being at the forefront of using computers and testing educational software. This was followed by demonstrations of the technology by Alastair Wells (the Head of Information Technology), Mr Driscoll (from Design and Technology Online) and a number of the A-Level students.

17. The School had 1495 pupils and 85 staff, split over two sites, which were linked by their computer use and physically by a fibre optic connection. The school is a superhighway evaluation centre, and had piloted the Design and Technology National Curriculum material for the Department of Education. A major new school building, which would include ATM technology, was under construction.

Use in the school

18. The school had an internal computer network and five labs linked together with a broad band connection. However, the amount of actual computer use was said to be quite small because of the physical and personnel limits involved: the cost of the computer equipment was still a major drawback, but the main need for additional funding was to provide an extra member of staff to develop the use of IT still further. The school was, however, trying to encourage the use of computing technology across all aspects of school life, and to all ages, by promoting the purchase of individual Acorn pocket book computers (based on the Psion pocket book). These were being made available to students through a nought per cent financing scheme. Loan computers would be made available to students who could not afford to buy them.

19. The school network used ATM protocols and they had a number of large storage devices for networked computer use, including a 480 Gigabyte hard drive for video storage. In terms of practical use the iTV system allowed users to gather data for school projects and collate video material which, for example, could be used either in the classroom by the teacher as a learning resource or by the student at home for preparing homework assignments. It was said that teachers were naturally experts at multimedia authoring (they do it already when preparing teaching material and so using the iTV system was an obvious extension to their skills).

20. The school was producing its own multimedia material for distribution on the iTV network and much of the authoring was being done by the students. One of the successful experiments so far had been to video a geology field trip and then place it on the network so that students could review the trip, compare views with their field sketches and catch-up on any aspects that they might have missed.

Demonstration

21. One of the benefits of a network system that linked to other schools was that items of expensive equipment could effectively be shared electronically between sites. A student demonstrated how it was possible to send the designs for an injection mould over the network to a computer-controlled milling machine, and then watch the process in operation via a video-feed back over the network link. In the demonstration the machines were in adjacent rooms, but any distance could be irrelevant if suitable network connections existed.

22. The students themselves were very confident about using the network technology and, in particular, seemed to enjoy the development work associated with multimedia authoring. Most of the students already had access to computers at home although few had home access to the Internet.

23. It was said that one teacher had overheard the following in a local pub: "I'm going to buy my son the Internet for Christmas". Clearly this demonstrated that the public awareness of the Internet was high, but that this was not yet matched by a clear understanding of what it was.

24. The school was clearly a centre of IT excellence, with equipment to rival that in some university departments and an exceptionally enthusiastic and dedicated Head of IT. The school acknowledged that it was fortunate in being in Cambridge and had benefitted by having significant links to the local high technology industries. The case for centres of excellence to act as test beds for other, less fortunate, schools was strongly argued.

APPENDIX 8

Visit to the USA

10–14 June 1996

Present:

Lord Craig of Radley
Lord Flowers
Baroness Hogg[1]
Lord Phillips of Ellesmere (Chairman)

The Sub-Committee visited Boston (Massachusetts), Washington DC and Raleigh (North Carolina).

BOSTON, MASSACHUSETTS

1. The Sub-Committee was accompanied by Mr Jim Poston (HM Consul-General, Boston), Ms Terri Evans (HM Vice-Consul, Press and Public Affairs) and Ms Rosan Kuhn (HM Vice-Consul, Commercial) throughout the Boston part of the programme.

Massachusetts Institute of Technology

2. The Sub-Committee was given an introduction to the Massachusetts Institute of Technology (MIT) by Carl Accardo from the Industrial Liaison Office. The university was founded in 1861 and is one of the leading research universities in the United States. It had an annual revenue of approximately $1.1 billion, including about $60 million from industry. The main areas of industry research at MIT were the life sciences, computer science, multimedia and materials. A staff "rejuvenation programme" of voluntary early retirements had recently reduced the number of faculty to just over 700. Mr Accardo said that the university operated a very proactive patents office staffed by specialists who worked with the professors and encouraged them to patent their work. As a result, MIT was granted 75–100 patents annually which it used to establish new off-shoot companies.

3. In the Laboratory for Computer Science, the Sub-Committee met Dr David Clark (Senior Research Scientist in charge of the Advanced Network Architecture group) who has been involved in the development of the Internet since 1975. Dr Clark said that the remaining major problems with the Internet were no longer of a technical nature: the main barrier stopping further developments was a general lack of knowledge and understanding of the Internet by those involved in telecommunications economics and policy.

4. The Internet was described as being more like a computer than a network in that it could be perceived as a platform for many applications depending on the user's needs and preferences. The Internet was thus not something that could be shaped other than by user demands, and its content was a reflection of society even if that meant that 90 per cent of the content was rubbish. What was needed now, and what people would pay for, was a layer of "editorship" to help users make sense of the "information soup".

5. In education it seemed that the best way to help the students was to help the teachers. Experience had shown that teachers wanted network access as a means to break their sense of isolation and many would be prepared to pay $3–5,000 of their own money for access. However, Dr Clark was concerned about the possible consequences of entertainment companies becoming heavily involved in the teaching of primary education through IT, and how these activities were being promoted as a service to society. MIT was not yet packaging its own materials for sale, although it was conducting experiments and evaluations to determine their real value to the teacher and students.

[1] Baroness Hogg was present until the meeting with the National Science Foundation on Wednesday afternoon (12 June).

6. The role of Vice-President Al Gore in creating and driving the vision of a National Information Infrastructure (NII) was thought to be important in terms of having a very visible spokesman for the programme. If the USA did not have such a central focus, then Dr. Clark said that they would have to invent one. The Federal government, however, had made it clear that it did not have much money to invest in the vision it was promoting.

7. A concern for continued development of the NII was that new network services to the home, including video on demand and home shopping, had been flops. Cable companies were now resigned to the fact that the only safe way to make money from the networks was to get it direct from the consumer by charging them $30 a month for Internet access, and then let them make of it what they would. Competition would be driven by the speed of access to the networks and cable companies were thus planning to install cable modems (for faster access) in 15 million homes over the next three years. At the same time, Intel had been lobbying telephone companies to make access to ISDN as widely available as possible.

8. Security had become a major issue, particularly for electronic commerce. Companies world wide wanted to have access to encryption so that they could use the Internet safely rather than have to put in their own networks. Dr Clark said that what was needed were levels of encryption appropriate to the material being transmitted. However, if you down loaded encryption software from the Internet it was almost invariably at near military levels and could not be exported from the USA. Indeed it appeared that the US government was trying to impede the roll-out of high level encryption technologies by being "actively inconsistent" in its approach to the problem.

9. Professor James Bruce (Vice-President for Information Systems at MIT) was also somewhat critical of governments in general for trying to control the Internet. Using the export laws on encryption as an example, Professor Bruce said that it was already possible for anyone wishing to lie about being a US citizen to import military style encryption software from the USA to their country over the Internet.

10. MIT's investment in the information superhighway has been considerable. Almost everybody was said to have access to the Internet and the internal electronic mail system handled more mail than the whole of some commercial networks. High bandwidth external connections had even been put in to link MIT with parts of the Boston suburbs, to the benefit of faculty working from home. Access to the MIT network was charged to staff and faculty at $25 a month [charging for access is a growing trend in American universities: *Nature* (6 June 1996) reported that similar charges are now being made throughout the University of California system]. MIT was now looking at the Internet as a means to reduce administration and teaching costs (e.g. through electronic ordering, and distance learning) and another possible development was a major electronic library that would be made available on a subscription basis.

11. Professor Bruce speculated that in the future many universities would become specialists in just a handful of subjects as a greater proportion of teaching moved away from the traditional university sites. The best courses in the most popular subjects from a range of universities would be converted into electronic multimedia format, and then be made available to other universities and individuals as CD ROMs or over the Internet. Funding for the development of these "super courses" would most likely be provided by major corporations.

12. Similar issues were discussed at the MIT Media Laboratory, where the Sub-Committee met Dr Walter Bender (Associate Director of Information Technology), Dr Mitchell Resnick and others. Dr Bender said that lectures were not everything in teaching: even if one used multimedia lectures from the country's best universities, interaction with human teachers would still be of greater importance. There was also little point in spending huge amounts of money on technology without making adequate resources available for training.

13. Dr Resnick demonstrated a computer-controlled Lego robot which was being used successfully in schools to give pupils hands-on experience of how technology worked. The programme apparently helped to draw members of the class together, and taught underlying principles through experiential learning. The most important theme of MIT's work in education was promoting the use of IT in structured projects. Emphasis was given to helping students at elementary levels to become good learners and to be interested in learning. In another demonstration the Sub-Committee was shown a personalised news system which trawled electronic news reports (from wire services and over the Internet) for items relating to the user's interests.

This system was linked to a database which provided background information to the news items and analogies to help the user interpret them in terms of their own reference frame. The system was likely to be an aid to both journalists and to the end consumer reading the news.

TERC (Technology Education Resource Centre)

14. TERC was established in 1965 as a private non-profit making organisation to promote science and mathematics in the class room. The meeting was hosted by Ken Mayer (from the Communications Office) and other members of TERC staff. The work of TERC was described as being driven by need rather than technology, although the activities described below all depended to a large extent on technology.

15. TERC is currently involved in an ambitious programme to expand educational access to the Internet by teaching children (14–16 year olds) to become experts in network design and installation, starting from simple communications using wires and lights. By the end of the project the children were able to, and did, install the local area network in their own schools.

16. The concept of telecollaboration was important in most of TERC's activities, including programmes to educate teacher trainers over the Internet, and to link schools across the world through an environmental awareness programme called GLOBE (Global Learning and Observations to Benefit the Environment, a programme initiated by Vice-President Al Gore). The inquiry and the data collection were described as the main parts of the programme, while the network aspects allowed one to extend the work and bring in comparisons from elsewhere. The educational content provided through such routes was said to be at least an equivalent to that of using traditional media, but in addition the children also developed good inquiry skills, made contacts with other schools (with something useful to exchange information on), and became excited about learning. The result was that children might then proceed to learn more of the fundamental science behind the basic projects.

Boston Public Schools

17. The Sub-Committee met Ann Grady, the Instructional Technology Director for the Boston Public Schools. Ms Grady's office had been responsible for setting up an access programme to bring the Internet into every school (123 schools) and each branch library (24) in the city of Boston. The programme was now running workshops on ethics and curriculum development etc., had set itself the goal of getting four computers into every classroom and was committed to promoting technology as a tool for teaching all subjects. The two main barriers that the programme was facing were insufficient funds, and the need to upgrade the electrical circuitry in most schools before computers and networks could be installed.

The Commonwealth of Massachusetts

18. The Sub-Committee was given an introduction to Massachusetts by Mr Louis Gutierrez, Chief Information Technologist, Commonwealth of Massachusetts. Mr Gutierrez described government as an information processing and transfer system (particularly if one counted money transactions as information), and it was thus highly suited to improvement and simplification using information technology. The barriers to accomplishing this were not technical, but human.

19. The Massachusetts government was seeking to provide a "one stop shop" for government information, and one of the main jobs of the Information Technology office was to co-ordinate activities. Libraries were seen as being suitable for general purpose public access points to the information network. The long-term aim was to encourage a full two-way flow of information with electronic commerce and access to government services including drivers licence renewal over the network. Mr Gutierrez said that the present arrangements were fine for low and medium security transactions (equivalent to using a credit card to order goods over a telephone), but that there were problems where higher levels of security were needed. For this they were looking for certification authorities to take care of authentication, although ultimately it might be the Massachusetts government that had to take on this role. An important development had been the passing of a digital signature act in Utah, giving digital signatures the same power as real ones. The uptake of similar legislation in other states was said to be rather slow.

20. At the Federal level, the presence of Vice-President Al Gore as a spokesman for the NII was at least having a loose co-ordinating effect between activities in each state. The concern was that

this might not be sufficient to make sure that full standardisation was achieved, and it was probable that "the wheel would be invented 50 times over".

Mass EdOnline

21. Mass EdOnline is a five-agency state task force on information technology and education. The Sub-Committee met Mr Mike Sentance (Secretary of Education and Education Policy Advisor to the Governor), Ms Lisa Blout (Assistant Secretary of the Department of Education) and Mr David Parker (Massachusetts Corporation for Educational Telecommunications: MCET). Mass EdOnline's three main goals were to enhance student learning, academic achievement and preparedness for the world of work; to promote the skills, knowledge and performance of teachers; and to improve the efficiency of education management.

22. Massachusetts was said to be significantly behind many other states in investing in technology for education (even though it had been the first colony to have an education mandate, in 1642). It was apparent that the school districts each had their own programmes, were organised very much on a local basis, and that because of this it was often difficult to introduce state-wide standards and initiatives. Poorer southern states were now using IT as a way of leap-frogging over the traditional high-achiever states. At state level, leadership was thought to be the main factor in developing and successfully using an education technology infrastructure, while funding should be predominantly a local matter.

23. Mass EdOnline was involved in evaluating educational software and doubts were raised over how useful some of the material was. The software market was dominated by the entertainment industry, with education accounting for less than 1 per cent of the market, so there had been little incentive to produce pure educational software. What had been produced was often entertaining add-ons ("edutainment") designed to promote a publisher's text books.

24. The main areas that Mass EdOnline wished to see developed were in basic skills training, including reading and writing. The Pittsburgh Urban Maths Programme was cited as a good example of how technology could work to develop such skills: the system used artificial intelligence to judge the skill level of the students and adjust the maths training and questioning programmes to a suitable level of difficulty, the system then continued to adapt as the students progressed.

25. Massachusetts would soon be holding a Net Day to promote the connection of public schools to the Internet. The state was providing $600,000 for equipment and services, but would seek donations of computers from local companies, and a significant amount of volunteer time to help with training.

WASHINGTON DC

26. The Sub-Committee was accompanied by Dr Don Rolt (Counsellor for Science, Technology, Energy and the Environment at the British Embassy) throughout the Washington and Raleigh parts of the programme.

The National Academy of Sciences

27. Dr Jack Halpern, Vice-President of the National Academy of Sciences (NAS), welcomed the Sub-Committee and provided an overview of their activities. Every report to come out of the NAS was now posted on the Internet and was freely available. The NAS was working to extend this accessibility to back reports and to include the journal Proceedings of the National Academy. Members of the NAS discussed information technology aspects of health, research, public policy, industry and education.

28. The two main concerns from the health sector were the need for a basic evaluation programme (to assess what were the real benefits of using information technology in health care), and for a system to protect the confidentiality of patient records while still making them accessible to both emergency services "in the field" and to researchers who needed anonymous data for clinical studies. Intellectual property rights were seen to be the main international problem. In public policy the main areas of concern were how statistics and databases should be managed, who should have access to them, privacy, confidentiality and how to maintain anonymity, and enhancing public confidence in information. From an industry perspective the Internet was viewed as a set of standards on top of which applications could be run. New applications would be limited by the

state of the physical network, and those that demanded a major upgrade of the network would have to demonstrate how the extra investment could be recovered. In education a serious problem to be faced was that most classrooms did not have even a simple telephone connection, let alone access to a computer network. The NAS were not involved in the validation of multimedia teaching material, partly because of the difficulty in deciding the criteria for measuring them against and the problem of not being seen to favour one publisher over another.

National Telecommunications and Information Administration

29. The Sub-Committee met Dr Bernadette McGuire-Rivera (Associate Administrator, Office of Telecommunications and Information Applications (OTIA) and other members of staff. The OTIA was looking for a standard to be set for a state average bandwidth, and for schools, libraries and health clinics to have access to the NII at discounted rates. The agency provided seed funding to enable schools to evaluate new technology, however the technological aspects of the NII were described as a small problem, the big issue now being the need to train the users. In terms of regulatory issues, the main barriers to further development were identified as: universal service and its potential impact on society; regulation of information content; and the need for applications to let electronic business take place more effectively, e.g. encryption software.

30. One of the current problems to be highlighted was that of Internet phone services and how or whether they should be regulated. Software was now available to permit fairly good quality voice communication over the Internet which meant that phone calls to anywhere in the world could now be made for the cost of a local call (i.e. "free" or at zero marginal cost in the USA). Such services were not subject to the same regulations and restrictions as standard phone services and this was causing major problems in some sectors of the industry.

The Sub-Committee attended a lunch hosted by HM Ambassador, Sir John Kerr at the British Embassy, Washington.

31. During the discussion, the Ambassador raised the question of how contacts between equivalent committees on either side of the Atlantic could be improved. This had been suggested originally by Newt Gingrich (Speaker of the House of Representatives) who was keen on fostering greater exchanges between legislators, as distinct from governments. The Sub-Committee took the opportunity to follow-up this suggestion with Congressman Brown the following day.

The Office of Science and Technology Policy (OSTP)

32. The Sub-Committee met Dr "Jack" Gibbons, Assistant to the President for Science and Technology, Dr Mike Nelson and Mr Tom Kahil from the OSTP. Mr Gibbons started by saying that the NII was useless unless it was connected to the outside world, and that the USA was now putting up funds to help 20 African states gain an Internet presence. In the US, government use of the Internet was growing fast and it was now typical for a speech by the Vice-President or President to be on-line within an hour of it being delivered. However, Dr Gibbons said that he "wished we were as far along as the United Kingdom on open competition and regulations".

33. During the week of the Sub-Committee's visit, the issue of encryption technology was in the public spotlight as Netscape and other organisations lobbied the US government to relax its export regulations (because they were in danger of losing sales if they could not use the same product for home and export markets, with the same high level encryption technology (see ITAA)). Dr Nelson said that the US would not completely remove export controls on encryption technology because of security and public safety issues. A "key recovery" system was favoured where the use of virtually unbreakable encryption would be permitted if a key was made available to security authorities. The question would then be under what circumstances (and by whom) the key would be authorised for use, and in particular whether foreign powers would be given access.

34. Also during the week, the Communications Decency Act (CDA), designed to restrict "indecency" on the Internet, was declared unconstitutional by a court in Philadelphia because its restrictions were considered to be contrary to the First Amendment rights on free speech. Dr Nelson said that posting indecent material on the Internet could still lead to individuals being prosecuted: in general, if something was illegal in print in the USA, then it was also illegal in cyberspace. There would, however, always be differences between geographic community standards and cyberspace (what was legal in one place could be banned in another).

35. As use of the information superhighway continued to grow, the OSTP was considering the possibility that it would become increasingly difficult to collect income tax and customs taxes. Workers might be employed over the Internet effectively for working abroad, and electronic material/software would cross borders freely without being subject to import/export taxes. In this scenario the only viable way to maintain government income might be just through taxing the consumption of physical goods.

36. Government involvement in the development of the information superhighway was to lead by example (e.g. to use the leading edge technology in the efficient delivery of services), in long-term research projects (10–20 years ahead), and in maintaining the obligations for telecommunications providers to serve rural and sparsely populated areas. Previous examples of computing/communications technology where research sponsored by the Federal government had led the field in what were later to become billion dollar industries were: networking, graphics, timesharing, Windows, and parallel computing. It was suggested that the development of standards for digital television (with the potential to turn a TV into a phone or computer at the flick of a switch) could provide the next major growth area for the communications and computing industries.

The National Science Foundation

37. The Sub-Committee met the Director, Dr Neal Lane, and other senior staff of the National Science Foundation (NSF). After complaints from researchers that bandwidth was filling up and the Internet was no longer as useful as it was, the NSF started a programme called "VBNS" (Very high speed Backbone Network Service) to link 100 research universities with at least 155 Mb/second connections. (The programme is similar to super-JANET in the United Kingdom.) Some of those connections would then be upgraded to gigabit levels, and the rest of the university system would be connected at megabit levels by commercial groups rather than the NSF. The NSF connections at 155 Mb/second would cost universities half a million dollars per year. Use of VBNS by industry would be restricted at first so as not to overload the system and priority of bandwidth would be given to university research uses. Industry was keen to collaborate, and technology which allowed bandwidth to be reserved for certain applications could be used to give industry greater access in the future. At this point the next level of high capacity bandwidth would probably be made available to university researchers.

38. Usage-sensitive pricing was likely to be the next important area for Internet economics. Pricing would be used to deal with overload, but some services such as electronic mail were likely to remain free. A premium would then be paid for high bandwidth uses (i.e. customers would buy access to extra bandwidth as needed) and bypasses to congested parts of the superhighway. The suggestion was made that if a connection was used at full capacity most of the time then the usage price might be tripled (thus providing funds for new infrastructure as it was required).

39. To improve its administration, the NSF had started conducting a trial on the electronic submission and review of research proposals. This had raised a number of questions about encrypting sensitive information and the verification of who was actually submitting or reviewing the proposals.

40. For educational purposes the information superhighway might eventually transform teaching and learning. The crucial step to take, however, was not with technology, but in understanding the processes by which humans (and children in particular) learn. Here there was a real need for collaborative work with the social sciences. If a viable theory was found then developing intelligent computer systems to exploit learning potentials to the full would be easy. At present though, education using information technology was in danger of being overtaken by the entertainment industry because of its new and trendy status.

41. Other areas that needed to be addressed in relation to the information superhighway included: the status of digital libraries and how they should catalogue and archive material that they did not own but, for example, had hypertext links to through other electronic documents; whether electronic mail should be archived; the social consequences of the information superhighway; verification of information; and exactly what role should be taken by governments.

The National Institute of Standards and Technology (NIST)

42. The Sub-Committee met Ms Cita Furlani, Chief, Office of Enterprise Integration. NIST provides the secretariat for the Information Infrastructure Task Force (IITF) which reports directly to the President and Vice-President. The IITF has committees on Information Policy, Telecommunications Policy, and Applications and Technology, which support a variety of working groups. The working group topics include intellectual property rights, universal access, international issues, network reliability and vulnerability, and privacy. The Committee on Applications and Technology (CAT) was tasked with increasing the use of applications, in particular through leading by example and expanding the use of the NII by all government departments. Other important applications being studied were telemedicine, standards in health care policy, and the development of a virtual library to provide a comprehensive on-line collection of resources on information infrastructure topics (including all NIST/IITF publications).

43. Ms Furlani said that the overall policy problem with the information superhighway was that one could not just have national policies, they must be global in nature to work. CAT was thus involved in G–7 initiatives on the information society, the first of which was to undertake an inventory of all national multimedia projects as part of the G–7 Global Inventory Project to determine exactly what was being done by whom and where.

44. The barriers to the development of applications using the information superhighway were also identified. In 1993, interoperability was perceived to be one of the main barriers, but this was being overcome. Now the barriers were moving away from technical issues. In health care, for example, the take-up of telemedicine was being seriously restricted because doctors were licensed to practice by individual state bodies, and thus could not practice electronically over state boundaries without also being licensed in the second state. In education one of the main barriers now was the lack of good (and approved) material for school level teaching, so the IITF was attempting to produce quality guidelines. Similarly, the Better Business Bureau was getting involved in certification for quality business software.

45. The greatest barrier though was user training. Investing in the "mental infrastructure" as well as physical infrastructure was critical, but it was something that accountants were apparently poor at recognising. The problem was that the training was very expensive, and the benefits would usually be spread over a whole organisation rather than being identified with a specific area of gain. Ms Furlani suggested that a change in mind-set was required on how investment in information technology and training was accounted for in the books.

Meeting with Congressman George E Brown Jr (D-California)

46. Congressman Brown warmly welcomed the Sub-Committee and discussed a number of aspects of his work with the House of Representatives Science Committee (Congressman Brown is the ranking minority member of the House Science Committee). To communicate its activities more widely, the Science Committee already had its own World Wide Web page (http://www.house.gov/science) and regularly received comments and information via electronic mail. Many of the topics being addressed by the Science Committee were similar to those covered by the Select Committee, and Congressman Brown expressed strong support for the idea of forming closer ties between the two committees (at the very least for the purposes of information exchange).

The Democratic Technology Communications Committee

47. The Sub-Committee met Mr Chris Casey (Technology Advisor) and Mr Paul Mann (Staffer to Senator Patrick Leahy). In addition to managing standard media activities for the Democrats, the group was heavily involved in giving all Senators an electronic presence on the Internet. Use of the Internet by Senators and Congressmen was said to be rapidly increasing as the elections approached and all now at least had their contact addresses posted on the World Wide Web. Mr Casey's group was involved in producing Web pages for Democrat Senators, including hypertext links to related pages and areas of interest. All speeches were being put on-line along with information relating to Bills and Committee work. This included sound bite voice recordings and pictures of the Senators in action.

48. Mr Casey said that the main job now was to keep the Web pages up to date (there was nothing more telling than a Web page proclaiming that it was last updated over a month ago!) The main Web site for the group can be found at: http://www.policy.net.capweb.

Lunch time meeting at the Centre for Strategic and International Studies (CSIS)

49. This lively and wide-ranging round-table meeting was hosted by Mr Stuart Schwartztein and was attended by a number of prominent members of the Law, Policy and Computing communities in the Washington area.

50. The best policy for paying for use of the information superhighway was suggested to be by level of usage, with very small charges perhaps being made by the number of Web links activated (the technology to collect these small payments already exists). A system of delayed charging, with access being provided free for a period of time, was also favoured so as not to discourage new users.

51. In education, the Internet should not be considered a panacea for all of the problems now faced. A rational approach was called for as to what should and should not, could and could not be done with the technology. Its main role was seen to be as an information resource and for augmentation of present teaching, rather than replacing the types of learning that require human interaction. The technology also excited children and teachers alike and this could be put to great advantage even at elementary levels: it was much easier to teach children who were willing to pull information off the Internet, instead of trying to force them to learn the same material by conventional means. The cost of bringing all schools up to the same level of technology and training was estimated to be around four per cent of the total education budget each year (the present allocation was around 1.9 per cent).

52. Unless another country "gave the world access to unbreakable encryption" and US policy was changed, key recovery encryption was likely to be the main method of securing information on the information superhighway. Thus, it was argued that governments should be discussing when and to whom the decrypting keys should be made available. Also if a key were transferred (for example to a friendly foreign state conducting a police investigation), should liability for any misuse (accidental or otherwise) also be transferred? Would governments also provide a level of fall-back insurance to protect users if they had used the approved level of encryption, but had still fallen prey to electronic damage?

53. Other areas discussed included: electronic commerce and the role of virtual corporations which operated with a minimum of job functions, thus having a major impact on employment; authentication and the need for agreed standards on digital signatures, including their acceptability in law; how to define what constituted a copy in electronic terms over a network; and the growing business of offering value-added services on the Internet.

54. A final comment was made on the problems of protecting freedom of speech on the information superhighway. As almost all large corporations (including governments) operated with interests on a global basis they were becoming ever more in danger of political blackmail in terms of what they might say on the Internet. A situation was foreseen where companies might censor all of the information they released electronically, in case it might be accessed from a country where different views were held on what was suitable, so as not to endanger trading links. It was suggested that serious consideration was now needed on how to preserve western values, rather than opt for the lowest commonly acceptable denominator.

Information Technology Association of America

55. Information Technology Association of America (ITAA) is a leading trade association with members ranging from the very small up to Microsoft. The Sub-Committee met Mr Harris Miller, President, and two Vice-Presidents: Mr Jon Enguland and Ms Karen Twenhafel.

56. Global solutions were called for, particularly in relation to the issue of liability for material available over the Internet. The Communications Decency Act had at least caused the industry to develop decency screening software, but service providers should not be liable for the content of material placed on the Internet by their customers: it would be an impossible monitoring task. The ITAA had also been lobbying the government over its stance on the export of encryption software. Stronger encryption was already available from Japan and South Africa and, as foreign countries were already going to such places for their software, it was estimated that the potential loss of business to the USA could be $65 billion by the year 2000. It was suggested that different levels of encryption should be made available for different purposes (e.g. private, business and military

use) and that, rather than restricting the availability of encryption, law enforcement groups should get better at breaking code.

57. The three main barriers to the development of the information superhighway were considered by the ITAA to be: encryption, the cost of universal access, and the problem of what was considered to be legal in different geographic areas. The loss of sales tax etc. might also become a problem.

RALEIGH, NORTH CAROLINA

58. In addition to Dr Rolt, the Sub-Committee was accompanied in Raleigh by Mr Mike Shingler (HM Deputy Consul-General, Atlanta).

Office of the Governor of North Carolina

59. The Sub-Committee met Ms Jane Smith Paterson (Chair of the North Carolina Information Policy Committee and Advisor to the Governor for Policy, Budget and Technology) and Mr Jon Hamm (Sprint Carolina Telecom). North Carolina is approximately as wide as England is long, it is the world's largest producer of fibre optic cables, hosts two of the USA's top ten research parks, and yet it is predominantly rural with a population similar in size to Scotland. Faced with the problem of trying to get education, health and government services to all areas at low cost, the state had decided to commit itself to a very high speed state-supported information superhighway. The state thus had a very proactive programme to link all of its communities together using the North Carolina Information Highway (NCIH). Keen interest and input from the Federal level (via Al Gore) was said to have been "marvellous at keeping a focus on the development".

60. The NCIH is an ATM-switched 155 Mb/second fibre optic highway, being upgraded to 622 Mb/second (it was said that at the upgraded level one could transmit the whole of the Encyclopaedia Britannica in 4.8 seconds). The network had been operational since August 1994 and up to 800 sites were expected to be connected by the year 2002. The connection cost was set as a flat fee of $1000 per site, and the eventual aim was to have no one in rural North Carolina being more than 12 miles away from a fibre connection. The prime purpose of the NCIH was to foster economic development by attracting industry, offering efficient government services, and improving education, health care etc.

61. In developing the NCIH there had been co-operation between all of the telephone companies, and between many of the potential users (e.g. education, commerce, criminal justice, medical and government) to develop a highly standardised system with little duplication of effort or resource deployment. Major users now were: telemedicine 17 per cent, community colleges 21 per cent, city/county governments 2 per cent, high schools 39 per cent. Most of the traffic on the NCIH was ultimately expected to be commercial, but the state government had guaranteed a certain level of usage to start the system moving. North Carolina is the G–7 test bed for telemedicine.

62. Mr Hamm said that the policy for the NCIH was to invest in the highest quality now so that one did not end up paying for the superhighway two or three times over as upgrades from narrow to medium to broad band were made. The benefits would also be immediate for all users. A key feature was that the NCIH was based on non-proprietary standards to ensure that it had the potential for a long lifetime. The trials stage had been relatively short, and the roll-out of the network quick, so that people could start to develop the applications that they needed.

63. One third of the NCIH development money had been set aside for training. The policy was that a site wishing to connect to the network would only be released funds for the infrastructure once a training plan had been agreed. Training in information technology was also being made compulsory for teachers (who would have to pass a test) and teacher trainers in general, and by the year 2000 no child would be able to get their high school diploma in North Carolina without passing a computer competency exam.

64. Technology demonstration. The Sub-Committee took part in a video conference over the NCIH with community members at the Montgomery College in Troy, North Carolina. The system provided very high quality video pictures and sound, with the capacity to link five sites together for simultaneous interaction or to link one site to many (in a more broadcast format). The system provided connections between dedicated technology rooms equipped with cameras, monitors and computers operated by a "facilitator" at each site. The NCIH system was said to be a great time and

money saver with uses including education and health care in prisons, telemedicine, community projects, special lessons for gifted students, education in the armed forces, and connecting local industries to distant markets. Fees for use were $25 an hour for in-house access, and $125 an hour for outside groups, which compared favourably to the $700-$1,400 per hour often charged for a satellite link.

65. In education, experience had shown that it was often possible to run classes with a team of teachers so that a highly qualified teacher in a subject at one site could give a lecture over the NCIH, followed by local teachers providing the back-up for experimental work at each location. The local teachers were also said to be benefiting from this arrangement and were using the opportunity to upgrade their own skills.

66. Quality pictures were considered to be the primary requirement for good communications, hence the use of a 155 Mb/second link. At the time of setting up the NCIH, digital compression technology was not thought to be good enough for them to risk installing at a lower bandwidth. However, the advent of new compression standards set by the Motion Picture Expert Group ("MPEG 2") meant that they could effectively multiply the capacity of the network by six and still maintain the quality.

Microelectronic Computing Centre of North Carolina (MCNC)

67. The Sub-Committee, accompanied by Ms Smith Paterson and Mr Hamm, met Mr Alan Blatecky and other staff at the MCNC for lunch. Some of the problems with the NCIH that were discussed included: overcoming interstate bureaucracy, for example with telemedicine and the lack of standardised licensing; education and the need to address such basic problems as scheduling lessons to begin at the same time in different school districts; maintaining interoperability; and designing experimental networks to replicate conditions in the real world.

68. North Carolina was said to have the second largest motion picture industry in the USA, and an NCIH application called "Film Scout" had been designed to help film makers find the ideal location. Film Scout provided on-line information combining a geographic information system and a resources database (of local businesses, skilled people, facilities etc.) to identify not just suitable locations but also to determine whether the necessary back-up facilities and people would be available locally. The system was also intended for use by industry looking for new factory sites etc., and an electronic museum was under development using the same technology.

North Carolina School of Science and Mathematics

69. At the MCNC offices, Dr Jeff Friederick described how a school for top science, technology and mathematics students was making use of the NCIH. Part of the schools charter was to improve science and maths in all schools across North Carolina and the school was now offering nine different courses over the NCIH, including some aimed at teachers. The classroom video conference system was convincingly demonstrated to be an effective teaching tool and the many benefits of the system were apparent. Adaptations including a computer-driven interactive drawing board (used to replace the black board), and the use of an overhead camera (to zoom-in on experiments) made the system highly functional for a variety of teaching applications.

70. The school was a test bed for information technology applications in education. To help spread the use of the new technology elsewhere, seven regional "cyber campuses" were being set up (linked back to the main school) where the technology could be seen and tested by local education groups. It was hoped that this would lead to new technology being phased in to all other NCIH sites. The first three years of this programme were being funded through industry money and donations, and only when the technology had been proven would the state be asked to contribute.

71. Preliminary results from application of the NCIH in education had shown that students who had been taught using it, and the associated technology, produced consistently better results than those who had not had access to it. These results were repeated across a range of levels of starting ability.

Final session at MCNC

72. In summing-up the North Carolina meetings, those present were asked to say what they would do differently if setting up the NCIH again from scratch. The main area they wished to change, right from the start, would be educating the legislators and their staff in the concepts of the information superhighway and what the benefits would be to the state. It was said that there was a real need for champions in the state legislature. Vice-President Al Gore provided a useful role at the Federal level, but there was still no Federal focus group to push technology within each state and draw funding bodies together. A need was also identified for a national Advanced Applications Centre where experience learned in other states could be exchanged.

73. It was clear from the meetings in North Carolina that the main driving force behind the NCIH initiatives was committed people like Ms Smith Paterson. While there was a role for visionaries at the Federal level, actual implementation of the vision still depended to a large extent on those who were prepared to promote the development in the field.

Printed in the United Kingdom by HMSO
Dd5065453 C/2 8/96 2200 47228 O/No 359932

ISBN 0-10-407796-4

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