King's Fund

The Future's Bright: The Future's Digital

Information technology and health information towards the millennium and beyond

Simon Wallace

Promoting Patient Choice

King's Fund
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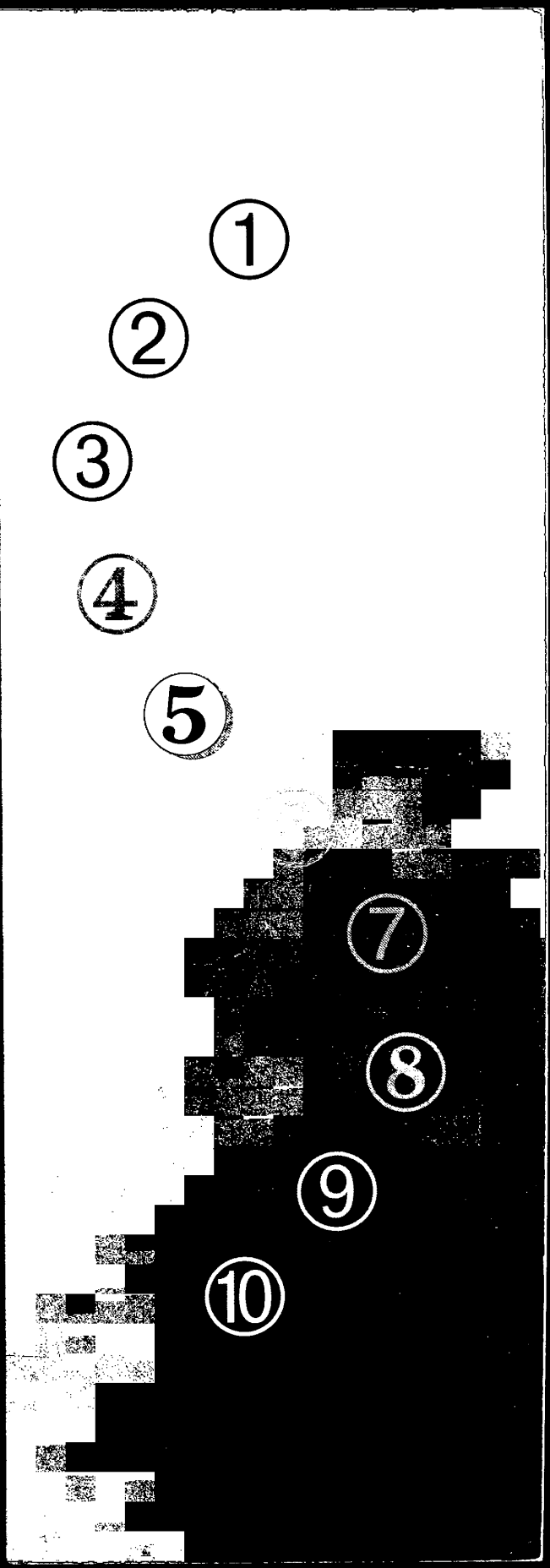

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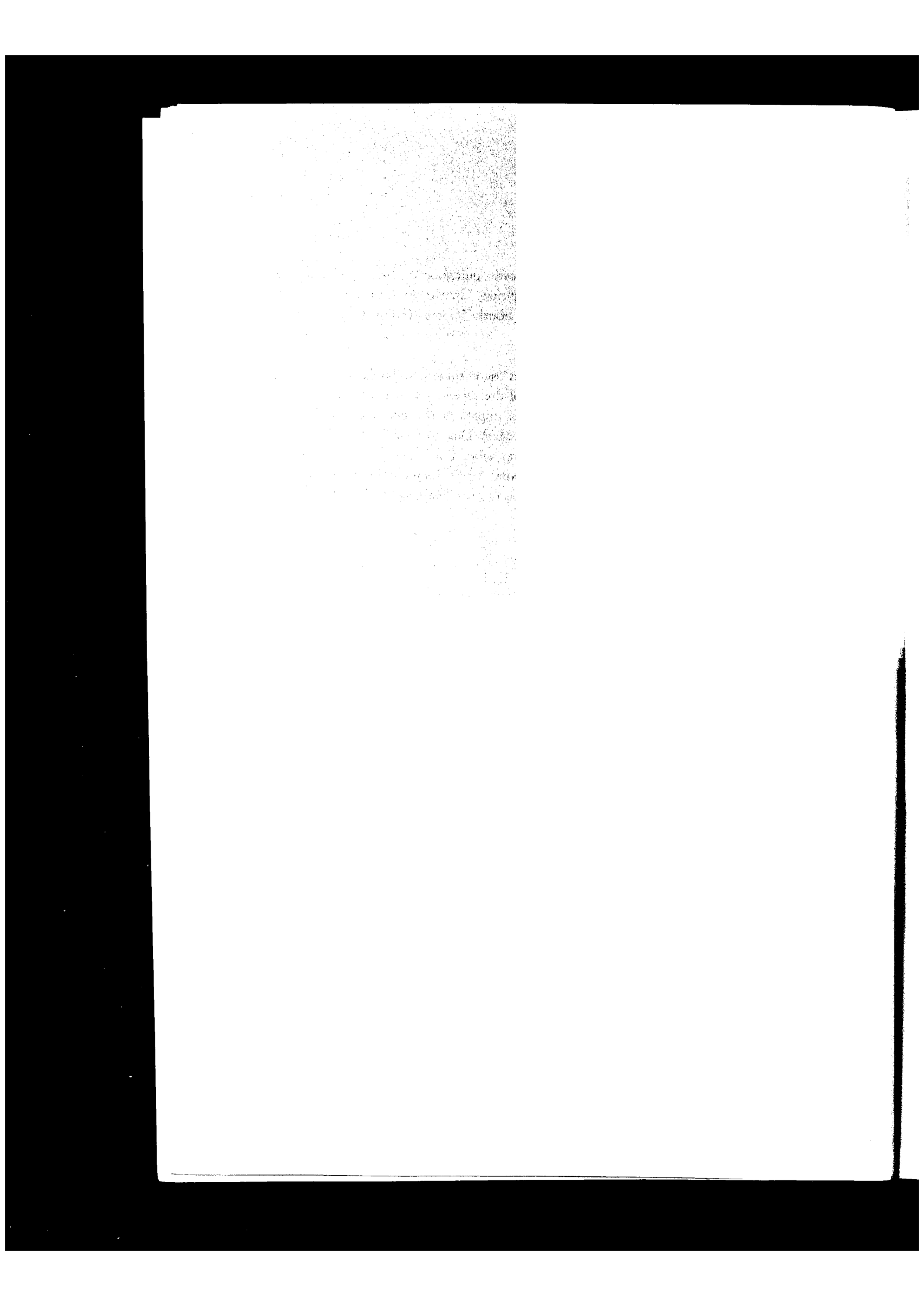

Introduction

The world today has been described as entering a new era called the Information Age. Changes in information and communication technologies are having profound effects on our lives and the way society operates. These changes not only involve provision of information, but the telecommunication and broadcasting industries. Already, this evolution is evident both at home and at work, and this process is likely to accelerate as we approach the millennium.

Commentators will argue the pros and cons of how society will benefit from such changes. Nevertheless, it is likely the computer, telephone and television will metamorphosise into a combined technology which will offer entertainment and services beyond the realms of today's reality.

In the field of medicine and health, clinical information systems, digitised imaging and telemedicine have already made their mark (Coiera, 1995). The new technology is now being used to provide patients and the general public with information about health and illness.

The King's Fund is an independent health charity with a special interest in promoting patient involvement in treatment choices. Within the Clinical Change Programme, evidence-based information for patients using linear videos, booklets and interactive multimedia packages is being evaluated. This report has been compiled as part of that work and provides an overview of the rapidly evolving information technology and its potential use in the field of health information. This expanding field is constantly changing and parts of this report will become quickly outdated. However, it is hoped that it will act as a foundation for those in the commercial, public and voluntary sectors to develop an IT and multimedia-based health information programme.

Health information

Patients and the general public have become increasingly interested in illness and health and want more information about these topics (Consumers' Association, 1995). This public need has been supported by a variety of national and international initiatives, including: the World Health Organization Alma Ata Declaration (WHO, 1978) and the Health for All initiative (WHO, 1985), Healthy Cities (Information in a Healthy Society, 1991; Ashton, 1992), *Health of the Nation* (Department of Health, 1992) and *The Patient's Charter* (Department of Health, 1991).

The benefits of providing information to patients are widely recognised (Morris *et al.*, 1989). Reported benefits include reduced numbers of admissions, reduced length of stay, fewer post-operative complications and less medication for pain (Devine & Cook, 1986; Osman *et al.*, 1994).

Computers have been successfully used as an adjunct to good doctor-patient communication (Jones *et al.*, 1992) and patient education (Gillespie & Ellis, 1993; Kahn, 1993), and increasing amounts of material can now be found on the Internet and a variety of CD productions. A small number of academic units, individuals and health authorities have developed such resources. For example, the Department of Public Health at the University of Glasgow has used touch-screen technology to deliver health information (Jones *et al.* 1993a; Campbell & Jones, 1992; Jones *et al.*, 1993b), and computer-produced patient-held records have been an effective feature of some clinical systems (McGhee *et al.*, 1991).

The King's Fund is evaluating a series of interactive laser disc videos designed to provide patients with information about their condition and the risks and benefits of various treatment options (Shepperd *et al.*, 1995). It has also funded a variety of health information projects with a multimedia component.

PatientWise is a disc-based resource for health professionals to offer patients and the public information about a wide range of diagnoses (Wise *et al.*, 1996).

Several publishers have produced CD-ROMs about the human body (Dorling Kindersley Multimedia, 1994). Other CD-ROMs exist with information about diet, exercise and other health-related issues. A wealth of information is stored on the Internet and covers a wide range of topics although its benefits and quality are just starting to be evaluated.

Pharmaceutical companies are producing multimedia materials for patients with conditions related to their drug products. In Europe, Germany has a cable-based health channel. In the USA, computerised health information has been available for some time to people using home computers and modems. However, users of these systems have mainly been white male professionals in the 25–35 age group and unrepresentative of the total population (Hekelman *et al.*, 1990; Robinson, 1989).

Information technology

The Victorians were filled with both excitement and fear about the prospect of entering the 20th century. They were reeling from the effects of the new social and economic system, the birth of photography and the telegraph. As for the telephone, it was said by one Home Secretary: '*It may be very useful in America, but in England we've got too many messenger boys*'. A slightly more optimistic politician declared: '*I look forward to the day when there is a telephone in every city*'.

As we approach the 21st century, significant changes in information technology have already taken place which will have a tremendous impact on our lives. However, the consequences on society of the information revolution similarly leave both experts and the general public with more questions than answers.

From the time when a mainframe computer occupied a whole room, the microchip has allowed computers to become desktop or pocket size, and memory, disc storage, speed and

monitor quality have dramatically improved. Machines today have CD-ROM drives and are networked, allowing access to huge amounts of data from all around the world.

Optical fibre and satellite are becoming instrumental in the future development of the communications and entertainment industry. Cable companies are digging up our roads and enthusiastically laying miles of cable.

There has been much debate about the potential impact of broadband technologies, personal electronic media, broadcasting and telecommunications. It is likely that our culture will inevitably move towards one which is more information-dependent and uses networked broadband multimedia technology.

The role for health professionals

As society changes to accommodate these new technologies, health professionals will need to understand their potential and how multimedia techniques can be used to provide information about health and illness for patients and the general public. This must be balanced with the needs of different population groups and complement conventional methods of health information provision such as leaflets, books and videos.

The challenge for health professionals is to anticipate this scenario and use the technology to meet the needs of patients and the general public. Already there is wide variation in the quality of health information on compact disc and the Internet. Health professionals need to ensure that information in electronic form meets certain standards, i.e. that it is evidence-based, user-friendly, entertaining and easily accessible by all sections of the public. It will also need to be regularly updated and produced by organisations which inspire public confidence.

It is hoped that health professionals will use this book to improve their understanding of these new technologies and the way in which they can be harnessed to provide health information and promote the health of the population at large. Chapter 1 explains the significance of information in digital form and the various transmission media available to deliver it. Chapter 2 looks at the computer's evolution and the resultant multimedia PC. Chapter 3 describes the concept of multimedia and the various compact disc technologies that are available. Chapter 4 looks at computer networks and describes the Internet and its various components. Chapter 5 offers an overview of the cable, satellite and telecommunication industries and the role they play in the new Information Age. Chapter 6 assesses where the various technologies are heading and their future penetration into the home. Chapter 7 describes a variety of health information products that have been developed using the new technologies. Chapter 8 draws together the various threads of the report and concludes by suggesting the need for a national strategy. A glossary is also provided to help readers understand the jargon that has emerged in this field. Finally, Appendix 1 contains web page addresses and Appendix 2 lists contact details of those mentioned in the report.

Chapter 1

Digital data and transmission networks

Driving the revolution of the new Information Age is the digitisation of data. This in turn has led to increased capacity of the computer chip and the various transmission networks – copper wire, coaxial cable, optical fibre and wireless technologies such as radio and satellite. Such advances have already been incorporated successfully into health initiatives such as information databases and telemedicine.

This chapter describes the concept of digitisation and the various transmission networks that are available.

The analogue-digital divide

In the past, telecommunications and broadcasting have sent information in *wave form* either down wires or over the radio spectrum. This is known as 'analogue' technology and is used in television, photography, video and vinyl records.

Today, this information is increasingly converted into *the bit* or *binary digit* by using the numbers 0 and 1 in a specific sequence. This is known as 'digital' technology and is used in compact discs and computers.

Unlike analogue technology, digitisation allows any variety of information (e.g. text, sound, graphics or video) to be delivered in the same basic format. This has many advantages, including:

- different types of data can all be produced to the same high standard;
- the quality of data reproduction is exact, can be preserved indefinitely and copied repeatedly without deterioration;
- a digital transmission network can operate at higher speeds, carry more information and be more reliable;
- different types of equipment (e.g. computers, telephones and televisions) can merge into a single operating unit yet still perform their individual functions.

On a global basis, analogue technology is tied to the incompatible broadcast standards of different countries. PAL is used in Britain, most of Europe and the Middle East; NTSC is used in North America and Japan; and SECAM is used in France and Russia. In contrast, digital technology is universal as it uses the basic binary language. Therefore a videodisk (analogue technology) made in the USA cannot be played in Britain unless the user has a dual-standard videodisk player. However, a compact disc (digital technology) made in the UK can operate anywhere in the world.

In the future, both the telecommunication and broadcasting industries will convert from analogue to digital technology. Only as this progression takes place will the true

potential and impact upon society of the various technologies become clear. Its effect on the provision of health information will be equally profound.

Transmission networks

Once information has been digitised, these bits of data need to be sent over different networks between users with different equipment. For this to work, all networks and technologies need to be:

- *compatible*, i.e. able to understand each other;
- *connected*, i.e. linked together physically so they can transfer data from one to another.

An effective transmission network depends upon *bandwidth* and *data compression*.

Bandwidth

Information sent from one point to another takes up space. Bandwidth is a measure of the amount of data that can be transmitted over a network in a specific amount of time, i.e. the number of 'bits per second' (bps) it can carry. A six-lane motorway has more room for vehicles compared to a country lane. The greater the bandwidth, i.e. the more lanes available, the more bits of information, i.e. cars, can pass in a specified period of time.

Speed of data transmission is dependent upon two factors:

- *the type of information*. Voice needs less than 64,000 bps, music about 1 million bps and good quality video up to 45 million bps;
- *capacity of transmission medium*. Copper wire has the lowest capacity and is described as 'narrowband', while optical fibre has the greatest and is described as 'broadband'.

Data compression

Compression (reduces the amount of digital data) and decompression (reconstitutes it to its full form for playback) techniques have been developed to increase the amount of information computer hard disks, CDs, networks, telecommunications systems and satellites can carry. For example, the amount of digital data comprising one hour of video is substantial. Compression removes or simplifies portions of the data that are either the same in any one frame or from one frame to the next.

Compression/decompression techniques are highly complex and include: lossless compression; and lossy compression (see the Glossary for a definition of both terms).

Today, compression ratios of 200 to 1 are possible with specialised hardware and software, enabling a basic CD-ROM to hold about an hour of audio and video (see Chapter 3).

Types of transmission networks

There are a variety of transmission media to carry information between two points, including:

- copper wire;
- coaxial cable;
- optical fibre;
- wireless – radio, satellite.

Each is made of a different material and has a correspondingly different bandwidth. Each can link together physically, allowing communication networks from different telecommunications companies to be interconnected.

Copper wire

Copper telephone wire (known as 'twisted copper pair') transmits information in electrical wave forms. Although the core of the BT telephone network is now mainly optical fibre, the access portion that runs from the exchange to customers' homes (the so-called 'last mile') is still dominated by copper wire. Whether it be the telephone or the computer, the message leaves the premises as an analogue signal and travels along the phone line to the exchange which digitises it. It then travels across the network to the receiving exchange, which converts it back to an analogue signal to travel the final distance along the receiving local phone line (Giles & Lewis, 1992).

In the UK, there are around 27 million copper access connections in nearly all office and residential areas. Although insulation of the copper wire can reduce loss and increase the distance, the analogue signals carried by the wire are susceptible to noise and electromagnetic interference.

Coaxial cable

Coaxial cable consists of concentric copper conductors, which gives greater resistance to interference and can carry signals over greater distances. It offers greater bandwidth than copper wire but less than optical fibre and is used by many cable television systems.

Optical fibre

An optical fibre network offers a high bandwidth, broadband service and far exceeds the capacity and capabilities of other transmission media. Optical fibres are the thickness of a human hair and use miniature lasers to transmit the bits of information as light pulses over very thin strands of glass. Today, one channel is big enough to transmit the contents of the Encyclopaedia Britannica in one second. With the potential to create thousands of channels within the same fibre, research suggests that optical fibre has a potential capacity rate of 1 trillion bps, i.e. infinite. A wholly fibre network would be able to carry computer data, television signals and telephone calls, fast and efficiently, allow complete interactivity and still have capacity to spare.

The principal disadvantage of optical fibre networking is that at any point where conventional copper wire takes over from fibre (e.g. into homes), a bottleneck is created and the system slows considerably. This can be overcome by completely replacing all copper wire with fibre. Although the USA and Japan have formulated policies for a national optical fibre network, Britain has no such plans and has left the development of the network in the hands of private enterprise.

Wireless

Wireless technologies such as radio, cellular, microwave and infrared offer potentially high bandwidth. The concept of telephone calls from mobile phones and television pictures using satellite links is common. However, the radio spectrum is limited by its finite nature, the need to avoid interference and by coverage issues such as poor reception and crowded airways that do not reach all destinations.

The Microwave Video Distribution System (MVDS) is a new television delivery mechanism which uses wireless transmissions at very high frequency. It will be an alternative to cable and satellite and could be used as a medium to cover those geographical areas not covered by the fifth terrestrial television network (Channel 5). However, if it is to compete with cable and satellite, then it must be capable of delivering at least 25–30 channels and be competitively priced.

Network services

Each of the transmission media described above is capable of carrying information in either analogue or digital form. Although the broadband capabilities of optical fibre are the ideal, replacing the copper part of the network would be extremely costly. This has led to improved techniques of transmitting digital data at high bit rates over the existing copper part of the BT network.

Examples include:

- ADSL – Asymmetrical Digital Subscriber Loop;
- ISDN – Integrated Services Digital Network.

Both can run over any of the four media described above.

ADSL

When ADSL is combined with the latest generation of video compression technology, delivery of broadband interactive multimedia services over the copper part of the network becomes possible. Trials by BT have recently investigated this potential (see Chapter 7).

Although not fully broadband, ADSL may offer the general public all they want and could prove an important transitional network.

ISDN

The ISDN network was launched by BT in 1985 to carry digital signals in designated channels over the local loop. Employed mainly by business customers, ISDN specifically offers:

- a high-speed, high-bandwidth (but less capacity than broadband) service on the same copper wires as the normal phone line;
- a relatively inexpensive digital service;
- a much faster call-connection time between two computers (because it avoids using modems);
- very fast transmission of large amounts of data (e.g. medical imaging, large file transfers);
- 'real-time' communication, such as videoconferencing.

At the moment, ISDN can offer most services envisaged on the 'information superhighway'. Such technology has been used in telemedicine by doctors in different parts of the country seeking a colleague's opinion. An enhanced version (B-ISDN) is due for completion in 1996 and will support higher transmission speeds and greater bandwidth.

A simpler version called ISDN2 is available to around 99 per cent of households in the UK over the copper network. However, better services such as quality video and interactivity will only be possible if ISDN has a greater number of channels. The present copper infrastructure can only support the more elementary levels of ISDN and a full interactive service would require a completely new access network.

Chapter 2

The silicon chip and computers

Originally employed as vast number crunches, computers have undergone a rapid metamorphosis since 1959, when the integrated circuit (the 'chip') was invented by Intel and Texas Instruments. In 1971, engineers were etching 6.5 micron-wide* lines in silicon. Seven generations of technology later, circuits 0.5 micron across can now be produced, which allows the integration of millions more transistors on a single chip. Today's personal computer is as powerful as a room-sized mainframe computer 15 years ago.

As technology marches on, chips of today will inevitably be replaced by even more powerful chips before the end of the century.

This chapter looks at the evolution of the silicon chip and the potential of today's computers to match the needs of the various transmission networks.

The personal computer

As the chip's capacity has increased, so has the power of the personal computer. Memory, disk storage, speed and quality of the monitors have all dramatically improved. At the beginning of the 1990s, 640K of RAM and a 20Mb hard disk were sufficient for any text-based application such as word-processing or spreadsheets. Not so very long ago, the 186 processor was a giant leap forward in processing speed. Since then, the 186 has been systematically replaced by the 286, 386 and 486. The 486 is now being succeeded by a new generation of processors called Pentium (technically the 586) – the multimedia personal computer. Its successor has already been launched by Intel and is known as the Pentium Pro processor.

Computers have also become easier to operate with graphical user interfaces adopting point-and-click and drag-and-drop principles.

Multimedia personal computer

Computer software, initially only capable of handling digital data relating to text, has been upgraded for use with the multimedia PC. This is capable of creating, manipulating, storing and transmitting digitised graphics, voice, music and video, thereby removing barriers to combining these media on a typical computer system.

The typical multimedia computer system will either be a Pentium PC class system or the equivalent Apple Macintosh. The system will include a CD-ROM drive, stereo speakers, a microphone, a fax modem, a network connection, and multimedia playback software such as Windows Multimedia Extensions or Apple's QuickTime to pull it all together.

* A micron is one-millionth of a metre.

Standards have been set to help hardware and software developers accommodate a greater number of computer systems. The original multimedia PC (MPC) Level 1 and 2 standards have now been outmoded by MPC Level 3, as computers have become faster with increased hard disk storage capacity. This standard includes 8Mb of RAM, a 75 MHz central processing unit and at least 540Mb of hard drive and allows an average user the capability of playing multimedia resources, interacting with the system, recording voice and transmitting multimedia files over a traditional data communications network.

Despite this minimum, a top-of-the-range computer in the latter half of 1996 included 16Mb of RAM, a 166MHz central processing unit and a 1.6 Gb hard drive.

As well as multimedia on the desktop, kiosk (e.g. at a busy airport, shopping centre) and wireless laptop facilities have also become available.

Apple Macintosh and personal computers

In 1970, the American Xerox Corporation established a computer research laboratory. Although essentially a photocopier company dependent upon the use of paper, Xerox executives were concerned about predictions that computers would take this essential commodity away and create the 'paperless office'.

In 1984, after several years of innovative design, a small company called Apple launched a computer called the Macintosh (after one of the co-founders' favourite apples). Unlike the early PCs, the Mac used a Motorola chip, had multimedia capabilities directly built into the computer and made minimal technical demands of the user.

The PC resulted from a merger between IBM and Microsoft. Microsoft had designed the rather cumbersome and unfriendly MS-DOS (Microsoft Disc Operating System). Bill Gates, Chairman and Chief Executive Officer of Microsoft Corporation, soon became aware of Apple Macintosh's superiority and developed Microsoft Windows. Although early versions allowed the PC to perform multimedia functions, extra facilities such as sound and video cards were required. Windows 95, the fourth and latest version, has been designed to make the PC as user-friendly as the Mac and incorporates the key multimedia components so that no specific technical knowledge is required to set up sound or video cards.

Despite their historic and present superiority, only about 10 per cent of computers sold are Apple Macintosh. This has tended to limit their choice of software, although most of the better titles are available on both platforms. Today, Apple is gradually marketing a series of products that include a genuine Windows PC card and thus allows PC software and titles to be used on their machines.

Impact of computers

Over the last ten years, a large proportion of the population have been exposed to computers either at work or at home. It has been estimated that 13 per cent of homes in the UK have a PC. Over the last three years, there has been an exponential growth

in computers sold with a CD-ROM drive. It is estimated that by the end of 1996, 1.2 million CD-ROM PCs will be sold, with around 80 per cent of these to the non-business sector.

Other developments

Personal digital assistants are devices which take the computer out of the office and into pockets or briefcases. Such devices are proliferating quickly and include Apple's Newton and IBM's Simon.

- Newton's first incarnation was the Messagepad – a hand-held, pen-based computer that accepts handwriting and rough sketches, and transposes them into clean typescript and graphics. It not only intelligently stores and sorts personal information, but offers an array of communications features such as fax/modem capabilities, e-mail link-ups, and the ability to be connected to a Macintosh and create, view, edit, synchronise and back-up Newton information.
- Simon is a fully integrated, hand-held cellular phone which has many features akin to Apple's Newton. It is not only a wireless fax machine, pager, e-mail device and calendar, but also an appointment scheduler, address book, calculator and pen-based note/sketch pad.

Nokia have developed a cellphone with a full 386 PC integrated into the unit which allows the user to surf the Internet and send e-mail while on the move.

As this is a fast and constantly changing field, the best sources of information about recent developments are the latest issues of the popular computer magazines and the regular articles to be found in the newspapers.

Chapter 3

Multimedia and compact disc technology

Multimedia is rapidly becoming the technology of choice for presenting information in an entertaining, interactive and timely manner. Definitions of 'multimedia' are as various as they are confusing. In the past it meant combining a set of slides, an audio or videocassette, a notebook and a packet of coloured pens. Today, this combination includes text, audio, full-motion video, animation and graphics.

The key element of any multimedia application is its interactive capability through the use of a mouse, joystick, keyboard or touch-screen. It enables the once passive viewer to become actively involved in a two-way conversation: to initiate and develop a dialogue, to ask questions, to consider problems, and to give and receive answers.

By utilising creativity and the notions of 'edutainment' (education entertainment) and 'infotainment' (information entertainment), the process of learning and acquisition of knowledge becomes more fun. This is of particular importance for children learning about different aspects of health and lifestyle.

This chapter looks at the various components of multimedia and different methods of delivering it on compact disc.

Components of multimedia

The components of multimedia fall into a number of broad categories: text, audio, still images, animation and video – each linked using software called 'hypermedia'. The ultimate application combining all these components is virtual reality.

Text

Text is used in multimedia applications in much the same manner as traditional presentations. Various font types, sizes, colours, 3-D effects, shading and other enhancements combine to add interest to the textual portions of the multimedia presentation.

Audio

The audio portion of a multimedia presentation appeals to our sense of hearing and speech capability. Using a 16 bit or greater sound adapter, the multimedia PC's software will digitise analogue sound so it can be either recorded, stored, retrieved, modified or played back.

Audio enhances multimedia applications in a variety of ways:

- voice recognition of computer commands;
- audio help functions;

- voice annotated documents and electronic messages;
- musical scores and sound effects associated with video and animation.

In health, it could help anxious parents distinguish a croupy cough in an unwell baby.

Still images

Still images or photographs are an important component of any multimedia application. Digital cameras and scanners capture still images or photographs and digitise them for use in multimedia applications. As the files tend to be large, compression techniques such as JPEG (Joint Photograph Experts Group), GIF (Graphic Interchange Format) and PIC (Picture Image Compression) are used.

Applications are wide and varied. For example, a user could take a self-guided tour through an art gallery, science museum or department store. In health care, it could demonstrate the appearance of a rash due to penicillin allergy.

Animation

Animation occurs when a still image is either altered in appearance or is empowered with movement. Two-dimensional (2-D) animation is the most common type and has height and width (e.g. cartoons). As processor speeds and memory capacity increase, 3-D animation will become more common and will add depth to an image, making it appear as a solid object and thus more lifelike.

It could be used for cartoon characters involved in sketches about the dangers of drugs and alcohol.

Video

Rapid advances in video digitisation technology have enabled video to be applied on the desktop. A typical multimedia PC with a CD-ROM drive can play back video sequences in a variety of forms. If, in addition to a CD-ROM drive, such a system has a network connection, a video digitiser and a camera, the user can view television broadcasts or engage in a videoconference while working on a word-processing document or spreadsheet.

Video delivered to the desktop can either be:

- viewed in real time; or
- stored and then delivered to the end-user at their request.

Delivering video in real time means that the presentation is seen as it is happening and requires a high-speed, high-bandwidth network. Examples of this include real-time video feeds used by the Cable News Network (CNN) and videoconferencing over ISDN. The latter can either be point-to-point, involving two users, or multipoint, linking numerous sites. This process is used in telemedicine when a dermatologist from a hospital base will consult with patients in rural GP surgeries (Jones *et al.*, 1996).

Store-and-forward technology allows users to access a repository or library of video in their own time. Consequently, the bandwidth and network speed requirements are proportionately lower.

Hypermedia

Hypermedia is software that enables a user to access and search for information in a non-linear manner within a multimedia application. By using ***hypertext links*** the user can click on a highlighted word, picture or button and be transported immediately to another area of the application to view either text, still image or a video clip relating to the original text. If you are surfing the World Wide Web (see Chapter 4), this link could be anywhere on the Internet – another town, country or continent.

Hypermedia allows a more structured approach to search for related pieces of information. For example, a user learning about asthma can click on a highlighted word and be transported to another area within the application which may show a video clip of inhaler technique.

Virtual reality

Virtual reality programs enclose a user within a 3-D simulated world of sight, sound, touch and movement. This virtual world is partly created by wearing a device that resembles wrap-a-round sunglasses. As the head moves, the user experiences matching scene changes, which gives the sensation of moving through a simulated world.

Virtual reality applications were first used in flight simulators to train pilots. Today, they are being developed for arcade games, museum tours, travel guides, phobia therapy, space exploration and education.

Methods of delivering multimedia

During its recent evolution, one practical problem of multimedia has been the amount of disk storage space needed for even a modest-size package. Delivery methods for multimedia have included:

- floppy disk;
- laser disc;
- compact disc – CD-ROM, SD-DVD (to be launched), CD-I, photo-CD.

Aspects of these are described below. The role of the Internet, cable and satellite for delivering multimedia will be discussed in Chapters 4 and 5.

Floppy disk

A floppy disk is capable of storing 1.4Mb of data. In the past, the advantage of distributing multimedia on floppy disk was that every stand-alone PC had a floppy disk drive. The disadvantage was the need to install the package on the computer's hard disk and

the considerable space it required. However, two methods have allowed fairly small multimedia packages to be distributed on floppies:

- compression techniques (as seen in Chapter 1);
- using more than one disk.

Laser disc

A forerunner of the audio CD and CD-ROM, the laser disc was the first multimedia system to put moving video on optical disc. Although the oldest multimedia technology, its distinct advantage to date has been its ability to give high-quality, full-screen, full-motion video in almost unlimited quantities.

Users need the following:

- laser disc player – Philips, Sony, Pioneer;
- computer – IBM compatible, Macintosh;
- input device – keyboard, touch-screen, mouse, tracker ball, lightpen;
- monitor.

A computer and a video program run in tandem. The still and moving pictures are stored on a laser disc, while the text and graphics are stored on and generated by the computer. The essential hardware/software component is the interface or overlay card which combines the analogue video signals with the digital computer text and graphics on the monitor. Each laser disc is 30cm (12") in diameter and can store up to either 55,000 still images, or around 70 minutes of video, or a combination of the two.

The key component is *interactivity*. This allows the user to give answers to questions and make decisions and choices so that no two users end up seeing the programme in the same way.

As laser disc players are not cheap, this technology has been mainly used by the professional market as either 'off-the-shelf' or custom-designed programs. They fall into four broad categories:

- training;
- marketing, including point-of-sale information, trade shows and presentations;
- education;
- museums and exhibitions, archival and resource or reference.

Estimates from Philips suggest that the total number of players in UK homes is around 15,000.

Compact discs

CD-DA

The most familiar and successful form of CD technology was launched in 1982 and is

called the compact disc digital audio (CD-DA), or simply the CD. Like video disk, CDs are read by a laser beam on a reflective optical surface and will not wear out like tape or vinyl records. Unlike video disk, CDs are smaller (12cm, 4.75"), and the data stored on them are digital, not analogue. The end product is 72 minutes of quality audio on a relatively cheap and durable player.

CD-ROM

The demand for greater storage capacity has resulted in the Compact Disc-Read Only Memory (CD-ROM). Derived from the CD, CD-ROMs have the same physical characteristics, disc size and read-out mechanism. They are used for storing large quantities of digital data in various forms and, as its name suggests, is a 'read-only' medium. This means that unlike a disk or tape, it does not allow you to store and record your own data.

A single CD-ROM can hold up from 650Mb of data, or the equivalent of 250,000 pages of text or 12,000 scanned images, and has become the medium of choice for distributing multimedia titles.

The original weakness of CD-ROM was its limitation in handling video. Each second of video comprises 25–30 individual images or frames, each image using 720 Kbytes. A minute of video comprises 1,500 frames, while an hour has some 90,000. This huge amount of data meant that an original CD-ROM disc could only hold 30 seconds of video. More critically, the CD-ROM data retrieval rate of 156 Kbytes per second meant that video could not be retrieved and played from a CD-ROM.

A series of advancements in CD-ROM technology during the last decade have led to improved sound and video facilities. Combined with compression techniques and the development of double-speed, quad-speed, six-speed, eight-speed and now ten-speed CD-ROM drives, the amount of video available on a CD-ROM has increased. However, high-quality, full-screen, full-motion video is still limited in length and quality.

There have been a significant number of health information titles produced on CD-ROM (see Chapter 7 for details).

SD-DVD – Super Density Digital Video Disc

The super density digital video disc or SD-DVD has been developed to overcome the limitations of video on CD-ROM. Its backers are Hitachi, JVC, Mitsubishi, Matsushita, Philips, Pioneer, Sony, Time-Warner and Toshiba. No bigger than an audio CD, the 12cm disc is made up of two discs bonded together, with dual-focus lasers reading both layers. Four types of disc, each with increasing storage capacity will be available. This will range from a 4.7 gigabyte disc capable of holding as much information as seven existing CD-ROMs or over 3,000 3.5" floppy disks. At the top of the range will be a DVD offering 17 gigabytes of storage or 28 times the capacity of a standard CD-ROM.

Retrieval of data will be faster and interactivity much greater. One hundred and thirty-three minutes of high-quality, full-screen, MPEG2 video can be viewed on either TV or computer screen.

SD-DVD drives will be backward compatible, i.e. capable of playing existing CD-ROM discs and audio CDs. It is thought that the first players will reach the US market towards the end of 1996 and Europe sometime in 1997. The discs will range in cost from £10 to £15 and the players will cost around £300–500, although no specific prices have been set. The price is likely to fall fast.

In 1997, there are plans for information to be directly written onto the discs, a function not seen with the standard CD-ROM (see Chapter 6).

CD-I – Compact Disc Interactive

CD-I was one of the first all-in multimedia platforms to combine text, still and moving pictures and sound on one disc. Launched by Philips in the early 1990s, it plugs directly into the TV and uses a handset similar to a TV remote control. Although completely independent of a computer, CD-I discs look similar to CD-ROMs and a CD-I player can also play CD audio, photo CD and video CD discs. It has been described as 'the logical extension of the CD and CD-ROM'. To differentiate itself from its rivals, Philips refer to multimedia packages as 'programmes' – the same spelling as for television programmes, not as for computer programs.

It employs its own proprietary operating system – compact disc real time operating system (CD-RTOS) to manage audio, video, text, graphics and computer data. The typical capacity of a CD-I disc equals (like other forms of CD technology) 650Mb of data (either 72 minutes of digital audio, 16 hours of mono speech, 6,000 television quality images, or any combination of these depending on the choice of quality levels for both sound and pictures).

CD-I has some distinct advantages compared with CD-ROM:

- full screen, full motion, good-quality MPEG video (Philips call it 'digital video' – DV);
- ease of use, both in its set-up and its running – 'buy me, play me';
- comparatively low cost – most people already have a TV;
- faster response time.

Some disadvantages include:

- lack of printer;
- relative complexity of developing CD-I packages.

Although originally intended for the home market as a games and 'edutainment' machine, a range of training and marketing applications targeted at the professional and business market have been developed by Philips. They have also launched a portable player of briefcase model size (CD-I 310) for that same market.

By June 1996, Philips claimed to have sold around 95,000 machines, mainly to the consumer sector. More than 4,000 schools in Britain have CD-I decks and there are over 100 educational titles.

Photo-CD

Photo-CD was originally developed by Kodak for the home market as a means of showing the family snaps on a television screen. It was not long before the commercial potential of archiving large collections of still images became apparent.

The original images, which can be prints, slides or unprocessed film, are transferred in digital format onto a disc which looks identical to a CD. A technology called WORM ('write once, read many') is used and involves 'burning' data onto the disc. There are two major differences with photo-CD technology:

- its contents are decided by the end-user, whereas a normal CD is bought already complete;
- the user can add more pictures until the disc is full.

The resulting CD can be used to display images on a computer, a CD-I player or a dedicated photo-CD player (which, like CD-I, plugs into a TV). Depending upon the quality required, a photo-CD can hold up to 800 images at TV resolution, or one hour of CD quality audio or any combination of images and sound.

Despite the flexibility of photo-CD, it has so far achieved limited success in the market.

Standards for multimedia and CD technology

A serious obstacle to the widespread deployment of multimedia applications has been the lack of a common set of international, dealer-independent standards. Such a set would enable files to be interchanged, with no loss of data integrity between different computer platforms and software packages. This diversity has evolved from major players such as Sony and Philips striving for commercially superior products. Ironically, years of fierce competition have actually resulted in several joint projects (e.g. SD-DVD).

As well as large corporations working together, a number of international groups (e.g. The International Standards Organisation (ISO), the International Telecommunications Union (ITU), and International Electrochemical Commission (IEC)) are working together to develop formats so that files can be exchanged, regardless of the application program or hardware platform the end-user possesses.

There are a range of file formats for text, graphics, sound and video. For example, Musical Instrument Digital Interface (MIDI) is a standard protocol for hardware and software involved in the exchange of sound between various musical devices. It is not the sound itself but a set of instructions describing the sound.

Under the auspices of ISO and ITU, the Joint Photograph Experts Group (JPEG) have defined a standard for compressing digitised still images. The ISO and IEC have similarly overseen the Motion Picture Expert Group (MPEG) develop a standard for compressing and storing video on compact disc. MPEG has three standards: MPEG1,

MPEG1.5 and MPEG2, with the latter poised to influence the interactive television market, as it provides a standard for set-top boxes and high-quality video-on-demand applications.

A series of physical formats have been developed for each new CD technology. Each applicable standard is informally named and commonly referred to as the colour of its publication's cover. Examples include:

- **The Red Book** – standard for CD-DA
- **The Yellow Book** – standard for CD-ROM
- **The Green Book** – standard for CD-I

NB. Originally, there was a separate standard for Apple Macintosh, which meant Mac CD-ROMs could only be viewed on their hardware platform. Market forces have resulted in Apple Mac developing machines which conform with other hardware platforms.

Chapter 4

Computer networks and the Internet

The preceding chapter has described how multimedia applications can be stored on compact disc and loaded as required. Although this singular approach has its advantages to the individual, it makes no provision for a large number of people simultaneously using the same multimedia program.

Over the last decade, organisations have become more decentralised, leading to the advent of distributed computing. This chapter considers the concept of networking and its structure in the UK and then looks at the Internet and the emerging online services.

A large amount of health information has appeared on the Internet, and this is briefly discussed in Chapter 7.

Local area network (LAN)

A LAN refers to a number of linked desktop personal computers within a room, office or building. With proper authorisation, individuals can access centrally-based software applications (electronic messaging, word-processing, spreadsheets), printers and fax servers rather than having separate programs on their own PC.

Wide area network (WAN)

A WAN is a collection of interconnected LANs and can span cities, countries and continents. Hardware devices called *routers* link the different networks to provide the most efficient path for transmission of data. The Internet is an example of a WAN on a global scale.

As discussed in Chapter 1, data can travel over a range of transmission networks, each having different bandwidths, geographical access and multimedia capabilities.

Network operators

Throughout the UK there are different network operators (National Consumer Council, 1996). At a national level, there are four types:

- BT, the dominant telecommunications network, with over 95 per cent of all residential lines (this will probably fall);
- alternative network operators such as Mercury, Energis and (in time) Ionica and AT&T, some combining bit transport with other utility functions such as electricity transmission and distribution;
- broadcasting transmission networks;
- new niche operators concentrating on transmitting particular types of data, or on particular regions of the country.

At a local level, there will probably be no more than three players in any given area (though big cities will attract more competition):

- BT, again, as the established telephone network;
- a cable company, if there is a franchise for one;
- in time, a wireless local loop company such as Ionica, which will use radio technology to deliver a full telecommunications service to the home.

Mobile cellular networks will offer alternative access for an increasing range of services, including fax and data. They will also compete with these businesses for part of the new information market (National Consumer Council, 1996).

Multimedia networking

Multimedia networking offers a radically new approach to the acquisition and sharing of knowledge. Uses and benefits of such applications include the following:

- collaborative computing;
- education;
- information access;
- information delivery;
- multimedia messaging;
- presentations;
- sales and marketing;
- training;
- videoconferencing.

The Internet

The Internet or 'Information Superhighway' is the largest computer network in the world and constitutes the ultimate wide area network. It links millions of computers through a mixture of private and public telephone lines and has a set of rules and protocols governing the exchange of information.

The type of information the Internet is able to transmit depends primarily on the speed of computers, modems and telephone lines used. At present it deals predominantly with text and graphics. In the future, the Internet will deal with more moving images, video-conferencing and increased interactivity.

Its component networks are individually run by government agencies, universities, commercial and voluntary organisations. No single organisation owns or controls the Internet, though there is an Internet Engineering Task Force that co-ordinates and sets standards for its use.

After the Russians launched Sputnik in 1957, the USA established the Advanced Research Projects Agency (ARPA) to undertake military research to regain the technological edge. The technology was multisite and the US Government and military

research centres needed to collaborate and exchange information. In 1969, four computers were connected into a network that became ARPANET.

Although linking various sites by computer seemed the answer, the systems were not necessarily compatible. A protocol (Transmission Control Protocol and Internet Protocol (TCP/IP)) was developed for the efficient transfer of information between often incompatible computing and operating systems.

The fast, high-volume telephone links proved reliable and the network was extended during the 1970s to connect 200 computers throughout the USA and overseas. Its success was based on the most popular online activity today – electronic mail or 'e-mail'. A message would weave its way over the telephone network, and providing it was correctly addressed, would reach the receiver with no human intervention.

Some US universities had set up their own systems and in the mid-1980s joined the research part of ARPANET to form the Internet. In 1984, UK universities and academic institutions established their own computer-linked system called JANET (Joint Academic Network), which has since connected to the Internet via its Internet service (JIPS).

The size of the Internet

Assessing the size of the Internet is difficult. Its growth has been exponential and at the beginning of 1996, there were an estimated 33.4 million Internet users worldwide, of whom 2.5 million were non-academic users in the UK (Durlacher Multimedia, 1996). There were about 30,000 business accounts, each having possible access for up to 200 users. At the time of the survey, there were around one million home users (Durlacher Multimedia, 1996).

Another survey in July 1996 estimated that 430,000 British households had joined the Internet and that 47,000 stated that they intended to subscribe during the following three months (GfK Marketing Services, July 1996).

Getting connected

There are four essentials for going online:

- a personal computer – a PC running Windows or an Apple Macintosh;
- a modem – to link the computer to the telephone line;
- a phone line – any phone line will do, although digital networks are more efficient for multimedia functions;
- an account and Internet access software with a company providing access to the Internet (see below).

The type of computer and modem required partly depends upon the intended use of the Internet. If it is for e-mail only, then an average computer and modem will suffice. If multimedia functions are required, then a Pentium PC/Power Macintosh and a modem with a high baud rate (i.e. the speed at which a modem can process data) are essential.

There are at least three levels of Internet access:

- e-mail only;
- shell account – the computer is not part of the Internet proper, but the connection gains text-only access to most Internet services;
- full Internet access – this is the most beneficial and requires software to handle the TCP/IP protocols.

Academic institutions are connected to the Internet via JANET and SUPERJANET. The latter was developed to provide a full broadband, multiservice network, capable of transporting all forms of complex digital information at remarkable speeds. Businesses, agencies and institutions are linking to the Internet through their own local network to benefit from the cheap and efficient international communications. Other organisations, such as health groups, political parties, pressure groups and voluntary organisations, have joined to get their messages across.

For these organisations and home users a dedicated organisation is required, whose service it is to provide Internet access. These service providers fall into two categories:

- online commercial networks – have their own information service and link into the wider world of the Internet;
- Internet service providers – simply provide a 'socket' directly into the Internet with little of their own information.

The commercial networks are like a private members' room in a library. Being a member allows you to enter the private rooms to read whatever you like as well as wander around the public part of the library. Service providers are like doorkeepers to the public section – they will let you in to see general information already on the shelves, but prevent access to the private rooms.

With the market estimated to be worth £1 billion by the year 2000, competition is fierce. CompuServe was the only significant online commercial network player in Britain and the rest of Europe in the early 1990s. It originally ignored the Internet as it felt its own service was superior, with its own e-mail and newsgroup (known as forums) facility. However, with the rapid growth of the Web, CompuServe and subsequent online services are now all Internet providers. Further details about specific online services are given later in this chapter.

As for the Internet service providers, there are almost 200 in the UK. The British standard-bearer is Demon Internet, which controls an estimated 70 per cent of this market.

At the beginning of 1996, there were an estimated 300,000 subscribers to consumer online services and about 100,000 signed up with Internet service providers.

Facilities on the Internet

The Internet has a wide range of facilities:

- e-mail and mailing lists;
- file transfer;
- newsgroups;
- gopherspace;
- World Wide Web;
- online services.

Although many of the above have been woven into the fabric of the Web, their individual importance still remains in countries where Internet access is slow or intermittent.

e-mail and mailing lists

e-mail is the simplest and most widely used application on the Internet. Messages can be sent in seconds to anyone in the world providing they have an Internet connection and an e-mail address. Messages can be sent simultaneously to different people on a mailing list. For example, patients with similar illnesses can and do communicate with each other about their conditions and treatment.

Advantages include:

- delivery is fast and avoids printers and fax machines;
- the system is cheap to use, costing only a few seconds of phone time whether the message is sent locally or abroad;
- sending multiple copies is as easy as sending one;
- incoming mail can be easily annotated and returned to the sender, or forwarded to other people;
- graphics, sound and word-processing documents can be attached to e-mail messages.

Disadvantages include:

- e-mail does not always get through (usually due to an error in the address);
- not everyone checks their e-mail regularly, while a letter on the mat by the front door will get read.

File transfer protocol – ftp

Throughout the Internet, *ftp* offers a standard way of accessing directories on remote computers and transferring files. Archie is the tool which finds a file stored somewhere on the Internet. It searches through a database that contains the names, locations and brief descriptions of the files stored in *ftp* sites. The database is stored on the 30 or so sites that act as Archie servers.

Newsgroups

Newsgroups consist of thousands of groups sharing information about a wide range of interests, activities and obsessions. They are accessed by an e-mail connection and organised into about 20 major divisions, subdivided by topic and subdivided again where necessary. Most newsgroups are part of the USENET system, one of the networks that originally merged to form the Internet. There are over 6000 USENET and other such newsgroups that can be accessed via the Internet.

As a subscriber to a newsgroup, you can:

- read articles by other people;
- post your own articles;
- respond to articles;
- join 'live' discussions.

A vast number of newsgroups cover a wide range of health-related topics – from common issues such as asthma to uncommon problems such as bone transplant. A review of these newsgroups with 'real' examples and helpful tips about using them has recently been published (Ferguson, 1996).

A different approach is taken by commercial providers. CompuServe have developed Forums which are grouped by topic and have messaging areas, libraries of files and online conferences.

Some newsgroups are very active, with hundreds of new articles each day, while others have much lighter traffic. In order to avoid ending up with vast quantities of articles that are of little interest to anyone but their authors, some groups are moderated, i.e. someone edits submissions and filters out irrelevant ones.

Gopherspace

The Gopher system was the forerunner of the World Wide Web and provided a unified system for accessing the wealth of information on the Internet. Its menu-based approach is neither as attractive nor as flexible as hypertext links, and over recent years has been overtaken in popularity by the Web. However, there is much valuable information here that cannot be found elsewhere at the moment.

World Wide Web

The World Wide Web (WWW or the Web) was developed in the early 1990s by European scientists at CERN (Conseil Européen pour la Recherche Nucléaire) who wanted an easier way of using the Internet. Since then, the Web has grown exponentially into a worldwide, Internet-based, multimedia presentation system.

It consists of several million *pages* (known as 'web pages') of information stored on host computers throughout the world. The pages contain text, graphics, video clips, sounds and most importantly *hypertext links* to other *pages*. Clicking on a link item calls up the related page, which may be on the same computer, or another machine the other side

of the world. The web page addresses are recorded as *uniform resource locators* (URLs), transmitted by *hypertext transfer protocol* (HTTP) and written in *hypertext mark-up language* (HTML).

Other components to the Web include the following:

Web Browsers: allow users to access the Web, interpret hypertext links and display web pages. Examples include Netscape, Mosaic and Microsoft Internet Explorer.

Net Directories: provide structured entries into the mass of pages. Yahoo ***(http://www.yahoo.com)*** is one of the most popular and provides a hierarchical index of the Web. Its opening menu has a link to health and, within this category, topic headings include medicine, drugs, diseases and fitness.

Search Engines (or web crawlers): designed to hunt specifically through the Web to track down pages that meet required specifications. InfoSeek Search ***(http://www.infoseek.com)*** (available on Netscape), Lycos ***(http://lycos.com)*** and Alta Vista ***(http://www.altavista.digital.com)*** are three examples. By typing in one or two words describing the health-related topic, a number of 'hits' will be shown, giving the title of the web page as well as the first few lines of text. Subsequent popularity of these engines has made accessing difficult and using them slow.

Bookmark: allows users to have their own directory of web page files and thus direct access. Pages can be quickly revisited and the slowness of the system avoided.

Web pages are set up for many reasons – as a public service, an academic exercise or resource, to advertise, to provide services, or simply as a means of sharing interests with others. Some pages are excellent sources of information, some are treasure troves of links to other valuable pages and some are pure trivia. Web-browsing is fascinating, but can be a time-consuming and costly activity.

There is a wealth of web pages covering health-related matters (see Chapter 7 and Appendix 1). Many of these are American and detailed in content (Ferguson, 1996).

Online services

One of the developing features of the Internet is the increasing number of online services. Dominated by CompuServe in the early 1990s, companies such as UK Online, America Online/Bertelsmann and Microsoft Network have entered the cyberspace battlefield, each offering their own range of services.

At present in the UK, CompuServe is the biggest commercial network with more than 300,000 subscribers – 4.7 million members worldwide (May 1996). It provides access to world news and weather services, shopping networks, technical support areas and even the AA's road database. The shopping directory includes audio equipment, books, gifts, health products, sporting equipment and travel.

UK Online, backed by Olivetti Telemedia, was launched in 1995 and is aimed exclusively at the UK market, particularly families. Their own research suggests that 64 per cent of UK families would prefer British to US content and 93 per cent of parents want some control over information their children find on the Net.

Through a deal struck with Energis, the telecommunications arm of the national grid company, UK Online is available to 40 million people for the cost of a local phone call. They have established partnerships with companies and organisations to provide British-originated news, information and entertainment (including lifestyle sections), games and education. These include deals with Dillons, Sony, Great Universal Stores, United Newspapers and Compton's Interactive Encyclopedia. Comptons produce an interactive encyclopaedia on CD-ROM and plan to use UK Online to update its customers.

America Online is America's largest online service provider and was launched in Europe in early 1996. They have spent significant amounts to make their service user-friendly; for example, Joanna Lumley's voice welcomes the user and gives advice about the service.

Microsoft has also entered the market by launching Microsoft Network alongside Windows 95. It originally led to fears that Microsoft would gain not only a dominant share of the commercial online services, but also dominate the Internet. However, UK users initially discovered poor connections, high prices and weak content, particularly lack of full Internet access. Less than six months after its launch, Microsoft admitted it could not compete with the Web and now offers full Internet access with the online service included as a bonus.

Despite the choices available, online services have been slow to take off in the UK. Argos had sold only 22 items in the first nine months its catalogue had been on the Web. This was partly due to unfamiliarity but also to practical problems. For example, purchasing online does not allow the user to feel or try on products over a modem link. With the time it takes to download graphics and the relatively poor image resolution, the initial attraction is almost lost. Products sold on the Web at the moment tend to be those which might otherwise be sold by mail order or telephone. If multimedia techniques (e.g. pictures, sound and video) are to improve a company's sales and marketing capacity, then the inevitable move from using traditional telephone lines and modems to high-speed data lines such as ADSL, ISDN and optical fibre into the home will be required.

Security on the Internet

All electronic information is vulnerable to infringement. The manner in which organisations keep unauthorised people from accessing information is crucial. Malicious or unintended abuse and accidental destruction need to be avoided in order to maintain an organisation's integrity and the general public's confidence in such a system.

However, such concerns need to be kept in context. Sending a highly confidential letter by fax or leaving the office unlocked seem obvious security issues that have been overcome. One way to secure an electronic system is to use a 'fire wall' which acts as a gateway between the protected network and the Internet. Trusted individuals are allowed the relevant level of access to complete their professional duties and have e-mail access to the outside. Those from the outside can return e-mail but are prevented from any further access to the network.

The NHSnet is currently employing such a scheme where NHS employees can access global information and communicate with other colleagues around the world, but sensitive local information is, in theory, secure (see Chapter 7).

A second problem has been the security of online credit-card transactions. A few well-publicised cases of credit-card fraud have made people cautious about online transactions. The process of encryption can protect credit-card numbers (and documents) so that they can be as safe as telephone or mail order transactions. However, it will take time to build public confidence in such a system. Despite such techniques, the innovative skill and persistence of 'hackers' will mean the issue of security will always be high on the agenda, particularly as the public are increasingly encouraged to use this powerful form of electronic media.

Cost of being connected

The cost of being connected to the Internet depends on the kind of service you choose and how often you go online.

Online commercial service

CompuServe:	£6.50 per month, including five hours 'free' online. After that, it costs £1.95 per hour. For a frequent user, £17.95 per month, including 20 hours 'free' online. After that, it costs £1.50 per hour.
UK Online:	£9.99 per month with ten hours free access or £14.99 per month with unlimited access. Unlimited web space is also provided.
America Online:	£5.95 per month, including five hours online. After that, it costs £1.85 per hour.
Microsoft Network:	£14.95 per month or £149.95 per year with unlimited access.

As well as these the standard charge for use of the telephone line still apply, usually at local rate.

These prices are as of September 1996 and are likely to change.

Internet service providers

After an initial registration fee of around £25, two types of service are available:

- a basic monthly fee (typical rates are around £10–15 per month) and unlimited access. This is the option for those who will be playing games or browsing the Web

for hours at a time. Usually half a megabyte of web space is also provided at no extra cost.

- a charge for online time at 5–10p per minute (with a monthly minimum charge of around £5). This is a sensible option where the main use of the Internet is to send and receive e-mail.

As services and prices offered by access providers vary widely, careful consideration of individual packages is required. The cost of using the telephone line still remains. However, most providers have several 'points-of-presence' around the country, which the subscriber can dial to gain unlimited access for the price of a local call.

As commercial provision of Internet services is a fast-moving field, the best sources of advice, including up-to-date lists of providers, are the latest issues of popular Internet magazines, such as *.net* and *Internet*.

Cybercafés

Over the past few years, a number of cybercafés have been set up in cities and large towns around the UK. In each café, there are a number of computer terminals which have access to the Internet. For a small fee, you can 'surf the Net' while drinking a cup of cappuccino or a beer.

Chapter 5

Cable, satellite and the telecommunications industry

Over the last 15 years, Britain has become extremely competitive in the world of telecommunications. Both cable and satellite are being developed as an alternative to the traditional television channels of the BBC and the independent television companies. As well as offering a greater variety of programmes (including health matters), the introduction of a digital service will provide a wider range of value-added services in the home. This will include interactive multimedia-based health information.

This chapter describes how the cable industry has developed and its relationship with traditional telephone providers such as British Telecom. It briefly reviews the satellite industry and the commercial battle being waged with cable.

The cable industry

Perhaps surprisingly, the cable industry started back in 1925 with the opening of the first UK commercial cable system for relay of 'wireless'. This was followed in 1951 by the first city-wide network in Gloucester. In 1961, the science of optoelectronics (amalgamation of light and electricity) led to the development of the first light-emitting diodes (LEDs) – the first step towards the modern-day optical fibre.

British Telecom, Mercury and the cable industry

The Government has encouraged the development of a competitive marketplace for a national optical fibre telecommunications network.

Under the Telecommunications Act 1984, regulations for cable franchises offering a broadband service to a specified geographical area were set out. At this stage, the Act did *not* include voice telephony (telephone services) as the Government felt that a 'duopoly policy' licensing only BT and Mercury to provide such services would be enough to encourage competition. Cable operators could provide telephone services, but only in conjunction with one of these two national trunk networks.

In 1991, the 'duopoly policy' was reviewed and changed (Competition and Choice, 1991). As well as providing broadband services, cable operators were now allowed to run their own telephone system, giving the general public an alternative network to BT and Mercury. The document also recommended continuing the ban on BT (and other national public telecommunications operators) transmitting broadband entertainment services (e.g. cable TV) on their telephone network until 1998 and actually providing them until 2001 (this of course being dependent on no change of government). The 'asymmetry rule', as it has become known, was reaffirmed in 1994 by a Government Policy Document (Cm 2734) (Creating Superhighways of the Future, 1994).

The challenge for the Government has been to reach a balance where the continuation of the ban has given cable companies a period of grace to become established. As well as a rapid building programme of cable systems, the option to sell a telephone as well as a television service has helped to underpin huge levels of investment by the cable operators. However, the expense of optical fibre itself has meant that many operators are laying coaxial cable instead and thus limiting the full broadband potential offered by optical fibre. This is further discussed in Chapter 6.

The marketplace has matured relatively quickly and has been monitored by the Office of Telecommunications (OFTEL) and the Independent Television Commission (ITC) (the Cable Authority prior to 1990).

As well as cable operators, BT and Mercury face competition from others. The National Grid Company (owned by the regional electricity companies) has invested £200 million to set up Energis, which is building a 1,800 kilometre optical fibre network by wrapping the cables around overhead electricity cables (at a quarter of the cost of digging up the roads). To further complicate matters, British Rail, British Waterways and others have telecom aspirations. As previously mentioned, radio, cellular, microwave and infrared networks are also being built.

Success of cable

The success of cable can be assessed at different levels: the number of franchises and homes passed, penetration, viewing figures and the number of users who use cable telephone.

At the end of 1995, around £5 billion (part of a £10 billion investment by the year 2000) had been invested to build cable networks in the UK. By April 1996, there were 148 cable franchises, of which 109 were operating. Many of the franchises are operated by the same cable company (MSO – Multiple Systems Operator). The five main companies responsible for around three-quarters of the franchises include TeleWest, NYNEX, Comcast, Videotron and SBC Cablecomms.

The total number of homes passed refers to the total number of premises with potential connection to the cable system. From 0.7 per cent of TV homes passed in 1986, this had steadily risen to just below 32 per cent by April 1996 and represents 7 million homes (New Media Markets, June 1996). The Cable Communications Association (1995) suggest that this increase would have been greater if some operators had not had to suspend new building activity while they fitted telephone services to existing cable TV-only systems.

A more realistic measure of success is penetration. This is the actual take-up of cable services and is represented by the number of subscribers expressed as a percentage of homes passed. By April 1996, penetration had risen to 1.5 million homes (i.e. 21.6 per cent of homes passed had subscribed to cable) and represented around 5 per cent of the total number of TV homes. This rise was the first year-on-year increase for the industry. Penetration has been disappointingly slow. Although over 40 per cent of homes passed

have tried cable television, overall penetration has remained at just over 20 per cent. This is due to a high rate of churn – the proportion of subscribers who disconnect from a cable system. Rates have fluctuated between 30–45 per cent and indications suggest that poor programming has been responsible.

Cable telephone service

By April 1996, 102 of the 148 franchises offered telephone services. They have installed over 1.5 million lines and claim substantial savings on calls – typically 15–25 per cent.

The use of cable for telephone has become more popular than television. By April 1996, UK cable operators added more residential telephone than television subscribers, reflecting the recent trend of telephone doing well and television badly.

The percentage of homes receiving either cable television, cable telephone or both was 30.6 per cent as of April 1996.

The satellite industry

Developments are taking place in the satellite industry that will transform telecommunications. The concept of telephone conversations on mobile phones or watching television images (known as 'direct-to-home' (DTH)) routed from other countries by a satellite link is now well accepted.

In 1989, Sky Television launched a four-channel service (Sky News, Eurosport, Sky Movies and Sky One) on the Astra satellite and sold these services either direct to homes or cable operators. In 1990, British Satellite Broadcasting (BSB) launched a five-channel service (Galaxy, The Sports Channel, Now, Power Station and The Movie Channel), initially on cable but then on satellite. After a brief period of fierce and unsustainable competition, Sky Television and BSB merged to become British Sky Broadcasting (BSkyB) and in 1991 launched a five-channel service (Sky One, Sky News, The Movie Channel, Sky Movies and Sky Sports).

During 1992 and 1993, a wide range of new channels were launched. BSkyB acquired exclusive coverage of major sporting events (e.g. boxing, football and cricket) from the terrestrial channels, and became attractive to both potential sponsors and subscribers.

In 1994, BSkyB announced a marketing tie-up with BT to offer discount telephone services to DTH (via a dish aerial) subscribers. BSkyB has recently tried a pay-per-view concept: viewers paid a set fee to watch the World Heavyweight Boxing Championship between Frank Bruno and Mike Tyson. This facility is likely to become more widely used in the future.

The ASTRA satellite system

The ASTRA satellite system is operated by a private company based in Luxembourg called Société Européenne des Satellites (SES). It leases channels to both television and radio broadcasters across Europe, who in turn generate revenue by selling advertising

space on their channels, or in the case of premium programming, by collecting subscription fees from their audiences.

Programmes are provided from four satellites: Astra 1A, 1B, 1C and 1D, which are co-located at 19.2° East orbiting 36 kilometres above the Equator. Astra 1E, was launched in October 1995, and another two are planned over the next couple of years. These three new satellites will transmit digital services once consumers have the necessary technology in place in their homes.

At present, the Astra satellite offers around 60 TV channels and 50 radio stations. It provides broadcast satellite services for TV homes throughout the UK and has the advantage of reaching those who live outside cabled areas. Figures for the number of installed dishes vary, but by June 1996, around 3.7 million or 17 per cent of TV homes were linked.

Range of channels on cable and satellite

The programming landscape on television has changed dramatically over the past ten years. As well as the four terrestrial channels (plus the recent successful application by Channel 5 Broadcasting Limited for a fifth channel), there is a growing number of cable and satellite channels. They can be delivered to the home by either technology or by a combination of the two (satellite signals are received at the cable system control centre and then distributed to the home down cable).

There are around 40 English language channels (some of them part-time), covering a wide variety of subjects such as movies, arts, sport, shopping, music, news, parliament, religion, travel, documentaries and general entertainment. There are channels for different target audiences: children, 'adults only' and ethnic minorities (e.g. TV Asia, The Chinese Channel).

Of the available channels, 15 are presently cable-exclusive, with the remainder used for both cable and satellite transmission systems.

On the Astra Satellite, choice varies from Sky Premium Channels (e.g. Sky Movies, Sky Sport, The Disney Channel), the Sky MultiChannel Package (choice of 20 different channels, e.g. Sky One, Sky Travel, Sky Soap, UK Living, The Family Channel), to independent channels (e.g. CNN International, The Adult Channel).

Viewing figures

Viewing figures for cable and satellite channels have been mixed and often disappointing. An Independent Television Commission's recent annual survey (Continental Research, 1995) showed that viewing share taken by cable and satellite channels in cable homes was 39.6 per cent. Earlier surveys had given a viewing figure of 34.9 per cent for 1994 and 42.1 per cent in 1993. More detailed research by Zenith Media has found that the younger the viewer, the greater the percentage of their viewing will be to cable and satellite channels.

Compared to terrestrial channels, part of the problem has been a continuing fragmentation of the cable/satellite audience as new channels start up. This has been compounded by poor-quality programming, high pricing and a weak marketing and sales strategy. The consequences of this are discussed further in Chapter 6.

Chapter 6

Towards the millennium and beyond

Traditionally, 'telecommunications' meant voice telephony delivered by a copper network (POTS – Plain Old Telephone Service). The technological requirements were that:

- it made one-to-one connections between pairs of individual users;
- it was fully interactive;
- it had a low bandwidth. (National Consumer Council, 1996)

'Broadcasting' meant national radio and television networks delivered over the radio spectrum from a remote distribution point (e.g. hilltop transmitter). The technological requirements were that:

- it offered point-to-multipoint transmission of a limited range of scheduled services to all users;
- it was non-interactive;
- it had a high bandwidth. (National Consumer Council, 1996)

Today, the new technology means these distinctions are no longer necessary. The historic dividing lines between different media no longer make technical or business sense, because every type of data can be expressed in the same unit, ***the bit.***

This chapter assesses likely future developments in the communications industry and looks at disc technology, cable and satellite and the likely convergence of the various technologies. It includes a section about digital terrestrial television and its impact on cable and satellite. All these future developments will affect the way in which professionals communicate health information to patients and the general public.

Digitisation

The traditional use of analogue technology in telecommunications and broadcasting is increasingly being replaced by digital technology. Most of the UK's telecommunications infrastructure is now digital, and we are on the edge of digital terrestrial broadcasting (see below).

Over the next ten years analogue technology will fade into the background. The pace at which this occurs will depend upon cost (to both the industry and consumer), consumer demand and the various regulatory authorities (e.g. OFTEL and ITC).

Transmission networks

A key component of the Information Age is the ability to deliver information regardless of when or where the request was made, thus giving access to data which is independent of time and location.

Although a wholly optical fibre network would be the ideal, the cost of such an investment is somewhat prohibitive and dependent on a high financial yield. BT calculates that it would cost £15 billion to offer such a service to all homes throughout its network. Cable companies expect to invest £10 billion connecting over two-thirds of the country (but this will be often less than full broadband, e.g. coaxial).

Commercial companies will inevitably develop a high bandwidth infrastructure in areas where they can be sure of a high early return – primarily large towns and business centres. BT already offers optical fibre access links to businesses with five or more telephone lines. In commercially less attractive and remote parts of the country, access to new services could be slower. In such cases, Ionica's proposed radio network may provide an alternative and possibly cheaper broadband network.

Utilisation of the more traditional communication networks (e.g. copper wire) to provide the range of new services remains uncertain. The development of ADSL and improvements in data compression technology have given copper wire greater capacity to offer a broadband-type service. Such a service has recently been evaluated in BT's interactive TV trial (see Chapter 7).

Although cost would appear prohibitive and consumer uptake uncertain, it is inevitable that the transmission network with the greatest and most efficient capacity will win the day. Transmission of large amounts of complex data at high speed with a large element of interactivity will demand this. It is likely that services such as ADSL and ISDN over the present copper network will be an incremental stage to the ultimate high bandwidth optical fibre or radio network of the future. Even in 1994, BT acknowledged that if a company was going to remain in the telecommmunications business in the next century, then upgrading their old copper local telephone lines to optical fibre would be inevitable (Cable Communications Association, 1995).

Silicon chip and CD market

The capacity and processing speed of today's computer continues to increase rapidly with seemingly no technological limits. A fundamental reason for the increase in popularity of the PC has been their relative decline in cost. Fierce commercial competition and technological advances have resulted in a more user-friendly PC becoming an integral part of many people's lives, both at home and at work.

Computers today have multimedia capacity and are sold with CD-ROM drives. Sales forecasts for CD-ROM PCs during 1997 are 1.5 million, rising to 1.8 million during 1998. The upward trend in the number of multimedia personal computers with CD-ROM drives sold will continue.

By the end of the century, futurologists are predicting a decline as information is distributed directly over high-speed networks to the home or office. Such a system will allow information to be regularly and immediately updated. Larry Ellison, head of Oracle Corporation, has called this system a network computer (NC). Others have

called it Web TV. It will be connected via a network to a central server from where software applications are accessed and personal files stored.

However, at the third International Publishing and New Media Market (MILIA) held in Cannes in 1996, the consensus seemed to be that disc technology does have a future. Reasons for this include the frustrating length of time it takes to download information using phone lines – even using high-speed ISDN. The imminent release of the SD-DVD will allow increased amounts of more complex data, particularly video, to be stored and retrieved. CD-ROMs have now become available as WORM – 'write once read many'. This means that information can be recorded rather than 'read only'. This same facility will also become available on the SD-DVD. Finally, CD-ROM titles such as *Encarta* now come with free updates that can be downloaded from the Internet.

The CD-ROM market for referenced material is well established. Its use for delivery of general interest, recreation and leisure is in its infancy and being driven by the games market despite premium-quality titles earning praising reviews. A report (*Independent on Sunday*, October 1996) has highlighted a recent reversal in fortunes for CD developers. Sales of CD-ROM titles continue to increase, but profits are slim, due mainly to the huge development costs – £500,000 for a decent title.

Although around 95,000 CD-I machines have been sold in the UK, the future market remains uncertain. When CD-I was conceived, no one imagined that so many homes would have a PC, or that home computers would become powerful enough for multimedia. CD-I has also suffered from a flawed marketing strategy that saw its main market as education rather than entertainment. As a result, Philips launched many worthy titles, not realising that most people want to be entertained rather than educated in their living room.

New applications of the technology are regularly appearing. Recently, Bellcore announced that its experimental video-on-demand (VOD) system delivers multimedia information, including full-motion video, to a Philips CD-I player over today's copper telephone lines by using ADSL technology.

A direct competitor to CD-I is the 3DO Interactive Multiplayer which is intended for use in the living room and schools, delivering interactive entertainment, learning and information using a variety of transmission networks.

The first 3DO player known as REAL is available in the USA under the Panasonic brand name, plugs directly into the TV and claims to deliver 50 times the performance of existing games machines and PCs in terms of graphics and animation image processing speed.

The Internet

The unprecedented growth of the Internet presents a defining moment at the end of the millennium (Coiera, 1996). A report from City brokers Durlacher & Co Ltd (Durlacher Multimedia, 1996) suggests that Internet access will be a £1,000m a year business in the

UK within five years. Although numbers connected in the UK may appear relatively small, this rate is increasing exponentially. Durlacher estimate that the Internet will grow annually by around 54 per cent and reach around 10.7 million non-academic users by the year 2000. In the UK, it is expected that the number of corporate subscribers linked to the Internet will rise to about 40,000 in five years, while dial-up subscribers will top 5.5 million (Durlacher Multimedia, 1996).

There are currently over 100,000 web sites, and Durlacher estimate that this is doubling in size every three months. However, retail sales via the Internet are still very low and once issues such as security standards have been addressed, this will grow.

The arrival in the UK of large commercial online services will threaten those businesses that make their living as intermediaries between suppliers and consumers: shops, travel agents, publishers, estate agents and banks. It could also be used to replace travel, thus threatening couriers, airlines, car manufacturers and public transport.

However, a recent survey by the International Visual Communication Association (1996) on behalf of Sony suggests that the commercial sector have been slow to use the Internet. Reasons for this include security of information, copyright protection and to some extent speed of downloading images, particularly for complex, detailed and moving images.

As these issues are resolved, and services increase, widespread adoption of the Internet by the corporate sector seems assured (International Visual Communication Association, 1996). This will involve the use of high-speed data lines (e.g. ISDN, optical fibre), as multimedia-based services with a large degree of interactivity become more popular. Its use will spread throughout society if the Internet becomes the predicted seamless, intrinsic part of every communicative and collaborative aspect of our lives.

The Internet as a source of health information will become more apparent. By 1994, 46 per cent of patients in one Californian clinic had access to e-mail, 89 per cent of them through their place of work (Fridsma *et al.*, 1994). A similar pattern is likely develop in the UK. The facility of e-mail, patient newsgroups and multimedia-based health information will give greater versatility to the delivery of health care. However, as the Internet becomes more popular, the quantity of information will increase – some of it good, some of it rubbish. The system's integrity will depend upon the quality of that information and the ease with which it can be found.

A major criticism of the Internet has been the speed of downloading graphics, sound and video. The potential multimedia interactivity of the Internet and online services is therefore being hindered. This can be partly alleviated by using a more powerful modem. Although Philips have recently released a user-friendly 28,800 kbps device for around £150, further upgrades are of limited value because standard phone lines are unable to carry much more data. The potential use of ISDN, coaxial or optical fibre will need to be addressed.

Cable and satellite

Despite the potential advantage of increased bandwidth, the cable industry has not seen the expected financial returns. Estimates of cable television penetration have been too optimistic, revenues low and a solitary TV service unsustainable. Following the duopoly review in 1991 (see Chapter 5), the addition of telephone services now seems to be making a significant difference.

The Independent Television Commission anticipates that around 14.5 million homes or just over 60 per cent of TV households will be passed by 2001. Goldman Sachs predict that this figure will be almost 70 per cent. They also predict that broadband cable TV penetration will steadily increase towards the millennium, reaching 41.6 per cent of homes passed by cable by 2003 (29 per cent of UK TV households).

Who's Who in Cable (Cable Communications Association, 1995) have predicted that TV penetration will only slowly increase during 1996 and 1997, becoming more substantial in the last three years before the millennium and reaching 42 per cent of the projected 14.9 million homes passed by the year 2001.

Goldman Sachs estimate that by the year 2003, cable telephone will have increased to 38 per cent for residential and 20 per ,cent for business. *Who's Who in Cable* (Cable Communications Association, 1995) have predicted that telephone penetration will only slowly increase during 1996 and 1997, becoming more substantial in the last three years before the millennium and reaching 38 per cent of the projected 14.9 million homes passed by the year 2001.

As with cable, it is likely that satellite penetration will increase over the next few years. According to the Continental Research Satellite Monitor, 1.48 million households say that they are intending to purchase a dish. ASTRA predict that by the year 2006, just under 6 million households in Ireland and the UK will be connected to satellite.

Future development

Competition in the cable and satellite industry will be fierce and potential profits vast. The future will not just be about the extension of programme services. Already the industry is a provider of telephone, and its ability to supply a range of value-added services, be they entertainment, shopping, health information or educational applications should mean significant growth of penetration rates beyond their present disappointing levels. Analysts feel that the market needs to steer away from programmes people have either avoided or seen before, and move towards new channels such as Rapture (cable channel to be launched in late 1996) aimed at 12–20 year-olds before it will take off.

Over the next 10–15 years, it is likely that networks delivering telephone-only services will be a relic of the past, due to their inability to compete with networks carrying a wide range of other services at lower unit costs.

The market in the cable sector is thought to be so great that BT, Mercury and the cable operators plan to invest over £20 billion over the next six years in networks that will carry voice, video and data to businesses and homes. At £300 per home, they will need to develop innovative products and build maximum flexibility into their networks for the delivery of as yet unknown added-value services. Providing there are sufficient new services, the incremental cost of delivery and the high churn rate will fall.

The Government therefore has an important role to play in deciding when to allow BT to provide full broadcast services; too soon and all the fledgling competition would be stifled, too late and BT's presence could be seriously threatened. The cable industry will need to take full advantage of this window of opportunity to build a big enough share of the market and use the sale of telephone as well as cable television to underpin their investment. Meanwhile, BT is looking at ways of improving their copper wire network to provide a broadband type service.

Ultimately, the general public will select the service that best meets their needs. They will be looking for a single full-service provider for telephone, video and interactive services, as well as any other viable services that may come along. The provider with the most cost-effective, attractive range of services and most user-friendly delivery system will win the day.

The Broadcasting Bill – digital terrestrial television

At the end of 1995, the Government published the Broadcasting Bill 1995. With a regulatory framework already in place for cable and satellite, the Bill aims to establish a similar framework for and encourage the development of terrestrial digital television.

There will be initially six frequency channels ('multiplexes'), each able to carry at least three television channels, i.e. a potential of 18–22 channels. A multiplex provider will manage the process of developing a transmission network to maximise geographical coverage and act as an intermediary between the broadcasters.

The multiplex with the greatest geographical coverage will be offered to the BBC. Channel 3 will be offered half of the multiplex with the second greatest coverage, while Channel 4 will be offered the other half. Channel 5 will be offered half of the multiplex with the third greatest coverage. Total coverage is likely to vary from 70 per cent to 90 per cent of the population.

The BBC started digital radio broadcasting in September 1995 and will probably initiate television towards the end of 1997. Digital cable and satellite will probably be available earlier.

Although current programmes will be watched on existing sets, viewers will need either a set-top box or a new TV set to receive digital channels. It is expected that the set-top box will cost between £300 and £500, although prices will fall as sales increase. A combined cable/satellite/terrestrial set-top box would be the best option, a view supported by the British Broadcasting Corporation.

Digital terrestrial television will provide increased quality, be more suited to portable reception and reach places not easily or cheaply accessible to either cable or satellite. It will also use existing aerials and not require a satellite dish or cable. Interactive services such as home shopping, business information, improved teletext and education will be available. A service to provide information about health and illness would also be possible.

However, the industry is concerned about enough people being interested in digital terrestrial television. For the foreseeable future, terrestrial services will be the only ones going into every home, either in analogue or digital form. The success of any digital broadcasting service will be determined by the market. The market share and penetration of the three key players, terrestrial, cable and satellite will be determined by the quality, variety and cost of the service. If such service benefits are appreciated by viewers, then its popularity will increase and prices will fall. Only when this has occurred to a significant degree will the switch from analogue to digital take place. One historic precedent is colour television. In 1970, only 2 per cent of households had colour TVs; by 1987, it was 90 per cent.

Convergence of technologies

The magic of the microchip and the digital standardisation of data mean that many items of consumer equipment can become interchangeable. The telephone, television and computer need not be separate pieces of equipment in future. Receiving television signals on a computer screen is already possible, and the first combined TV/PCs are becoming available commercially. All three devices are, essentially, doing the same thing – processing bits of data. It will become possible for many other items of consumer equipment to be instructed from the same controls.

It is difficult to predict how such convergence will affect both our working and social lives. Transmission capacity and computing processing power are doubling every few years. Technologies that were in their infancy a decade ago now form the basis of communication networks. The pace of innovation shows no signs of slackening. The impact of newer technologies such as voice recognition and holography is even more unpredictable. What the effects are of the information revolution will need to be assessed continually in the light of new technology and changing consumer demand.

Chapter 7

Health information using the new technology

Meeting the demands of patients and the public for health information is now a recognised aim. Computers have been extensively and successfully used for diagnostic interviews (Mathiesen *et al.*, 1987; Erdman *et al.*, 1985; Lucas *et al.*, 1976; McClymont *et al.*, 1980; Bassham & Fletcher, 1989) and for patient education within the confines of health service settings (Deardorff, 1986; Chen, 1984; Rippey, 1987; Hayes, 1989; Stanley, 1991). In the USA, computerised health information has been available using home computers and modems (Hekelman, 1990; Robinson, 1989). In the UK, increasing numbers of commercial, public and voluntary organisations are securing funds for the development of more multimedia-based health information products.

This chapter looks at how the technology has been used to provide information about health and illness for patients and the general public. The first section includes results from a short survey of health authorities and the commercial sector about work they have undertaken. After a brief review of health initiatives on CDs and the Internet, specific examples are described. It does not attempt to provide a comprehensive catalogue, and detailed evaluations have not been made.

Survey of health professionals and the commercial sector

A survey of multimedia-based material produced for the general public about health and illness issues was undertaken at the end of 1995. A short questionnaire was sent out to the following organisations:

- public health departments (district, region and academic) in Britain;
- commercial organisations, such as publishers, multimedia and medical education companies.

Those organisations who had not replied by the specified closing date were sent one reminder. No evaluation has been made of any product returned with the questionnaire.

Of the 175 questionnaires sent to public health departments, 97 (55 per cent) replied. Of the 127 questionnaires sent to commercial organisations, 97 (76 per cent) replied.

Of those public health departments who replied, 14 (14 per cent) had been involved with a multimedia-based information product for patients or the general public about illness and/or health issues.

Of those commercial organisations who replied, 11 (11 per cent) had been involved with a multimedia-based information product for patients or the general public about illness and/or health issues.

Examples of topics covered include the following:

Public health departments

- Touchscreen technology covering illnesses and lifestyle issues.
- Interactive computer game about sex and HIV.
- Touchscreen technology about sexual health.
- Touchscreen technology about health and health services.
- A-Z of health issues on computer hard disk.
- CD-ROM on alcohol, drugs, smoking and unprotected sex.
- Internet access about coronary heart and rehabilitation.
- CD-ROM on cardiopulmonary resuscitation.
- Creation of a web page on the Internet.

Commercial organisations

- CD-ROM/CD-I on diseases, treatments and information sources.
- CD-ROM called *Dr Schueler's Medical Advisor* which gives advice for the prevention, early detection and management of illness.
- CD-ROM x 2 called *The Ultimate Human Body* and *American Medical Association's Family Medical Guide*.
- CD-ROM on various laparoscopic procedures.
- CD-ROM on health and safety in the business environment.
- CD-ROM on rheumatology and ophthalmology.
- Interactive laser disc covering AIDS, alcohol abuse, smoking and drugs.
- CD-ROM about dental care.
- CD-ROM on sex education.

CD-ROM Directory

The CD-ROM Directory is a disc-based catalogue which gives a complete guide to CD-ROM and multimedia titles currently available worldwide. In the February 1996 edition, around 13,000 titles were listed. There are around 100 titles related to health information for the public, the majority of them from the USA. Overall sales figures are unknown.

The Internet

The Internet is rapidly becoming an information source about health and disease (McKenzie B, 1996), but is often of variable quality and relevance (Weale, 1995). Numerous electronic discussion groups already allow patients to share experiences and some health-related Internet sites offer e-mail advice on a fee-for-service basis (Coiera, 1996). Providing information on health will no longer be the exclusive remit of health care professionals.

There has been much activity in the USA. A number of US government agencies, as well as voluntary organisations and university clinics, are now providing their patient information and handouts in an electronic format on the Web. The information

available covers a wide and comprehensive range of health-related topics. The content is aimed at a US audience and depends on either the health professional or the individual having access to the Internet.

In Europe, a new web site called Health on the Net ***(http://www.hon.ch/more.html)*** has been established by a non-profit organisation based in Geneva. The Health on the Net Foundation is funded by the Swiss Government, American Telephone and Telegraph (AT&T) and the Aga Khan Foundation. Its purpose is to advance the development and application of new information technologies, notably in the fields of health and medicine. It is aimed at both health professionals and the public and emphasises the need for a neutral and independent body to validate the information it provides.

In Britain, a database of electronic contacts of a wide range of health-related organisations has been compiled for those working in the field of public health (Pencheon, 1996).

A comprehensive review of sources of health-related material on the Internet (newsgroups, web sites and online service providers) has been compiled (Ferguson, 1996). The Help for Health Trust has also compiled a list of useful addresses on the Internet as part of the Trust's central support role for the NHS Health Information Service (see Appendix 1). Other examples include:

- ***http://oncolink.upenn.edu*** Information about adult and paediatric cancers for medical professionals, patients and their families, including data on the latest clinical trials and 'how-to' guides on using statistical information;
- ***http://www.sechrest.com/*** Images and descriptions of the anatomy, diagnosis and various treatments of several syndromes;
- ***http://cancerguide.org*** Steve Dunn, a patient with metastatic renal disease, has prepared a user-friendly, 'how to get the best care' guide for the newly diagnosed cancer patient;
- ***http://www.comed.com/prostate/*** Information about prostatic cancer, its treatment and access to support groups;
- ***http://www.net-advisor.com/mammog/*** A user-friendly, illustrated guide to performing your own breast examination;
- ***http://www.pslgroup.com/DOCGUIDE.HTM*** Doctors' interactive information line, from which they can access news alerts, discuss cases and post advertisements;
- ***http://www.durex.com*** Surfers will find regularly updated news, information and graphics on the benefits of condoms and safer sex. Users can see how condoms are made, participate in a fun romance quiz and interactively learn about safer sex;
- ***http://www.auburn.edu.pcs.html*** Identifies a large number of patient education system developers, e.g. Mayo Clinic;
- ***http://www.healthtouch.com.*** Gives details about a touchscreen information kiosk for pharmacies providing disease and drug information to patients;
- ***http://medweb.bham.ac.UK/cancerhelp/index.html*** A free information service about cancer for the general public and health care professionals;
- ***http://www.pharmweb.net/*** PharmWeb provides pharmaceutical information for both patients and health professionals.

Information about health and illness

The following examples give a flavour of how various aspects of the emerging information technology can be used to provide health information for patients and the general public. Contact details are given in Appendix 2.

Healthpoint

Healthpoint is an arcade box public access health information system developed in the Department of Public Health at the University of Glasgow. It gives information to the public on a range of topics, including smoking, alcohol, AIDS, women's health, travel abroad, back pain, hay fever and 'embarrassing' subjects, such as sex, piles and bedwetting.

Using touch-screen technology, the opening menu consists of an alphabetical index with examples of health-related topics ('trailers'), some of which have further submenus. For example, 'Women's Health' has a submenu covering a variety of female-related topics. Each topic typically has 6–8 screens of information presented in colour text and cartoon graphics. An editorial board of 20 health care professionals has edited the screens before release.

A range of public and health-based sites have been used and a number of evaluations undertaken. Overall the results appear favourable with one study estimating that 17 per cent of a local community had used Healthpoint over a five-month period. The most popular sites were shopping malls, chemists, post offices, health centres, hospitals, supermarkets and libraries. The least popular was staff canteens. The most popular topics included sex, smoking, alcohol, AIDS, women's health, travel abroad, vaccinations, stress and drugs. The least popular were menstruation, glaucoma, diabetes, cystitis, leukaemia, pericarditis, menorrhagia and pethidine.

At present there is no specific evidence that users' learning increased or that they took any action as a result of using Healthpoint. However, most recent studies suggest that average daily use was 65 'episodes', with a total of 117 people using Healthpoint each day. By the end of 1995, Healthpoint was based in 37 sites, including hospitals, health authorities, community health projects and occupational health sites. It is planned to upgrade the present package using Windows and various multimedia capabilities and support this with a marketing strategy for a nationwide distribution.

Patient workstation

One difficulty with health information is that it is over-general and not targeted at the particular patient's problem or interest. The University of Glasgow is working on the development of a patient workstation from where patients can get online access to an explained version of their medical record with supplementary patient education as health promotion material. The approach is based on 'text generation' techniques developed in computational linguistics and artificial intelligence. The layout is tailored to the individual patient's clinical conditions and includes a range of multimedia applications.

INTOUCH with Health

INTOUCH with Health is a touchscreen patient information system combining six well-known databases:

- *PatientWise* – developed by John Wiley & Sons and giving information on 300 medical conditions.
- *Satisfax* – developed by Scalpel Information Systems and covering 400 surgical operations.
- *Healthy Living* – created from material provided by the Health Education Authority.
- *Travel Clinic* – adapted from information provided by the London Hospital for Tropical Diseases.
- *NHS A-Z* – by the Help for Health Trust (Chapter 7).
- *Helpbox* – again by the for Help Health Trust; or *Guide*, by Gloucestershire health and social services, giving information on local support groups.

INTOUCH uses the latest multimedia communications and aims to provide patients with easy-to-access information. GPs complete forms recommending the information the patient should access with explanations about how to do it.

A national pilot of 10–15 sites is planned for the latter part 1996. All kiosks will be networked to a central office so users can be sent daily changes in information.

HEBS on CD

The Health Education Board for Scotland (HEBS) is responsible for health education in Scotland. The HEBS Information Service has produced a CD of its databases for health professionals and the general public. The information is varied and includes:

- self-help groups;
- HIV/AIDS projects;
- health information leaflets;
- journal articles;
- projects: health in school age children;
- videotapes;
- oral health resources;
- Scotland's health statistics;
- HEBS adverts.

Six months after its launch in March 1995, HEBS on CD was being used in 350 sites in Scotland (health promotion departments, shops, libraries and general practices). Each site was using the CD on average about five times per week suggesting a potential of 80–90,000 enquiries per year. The CD is updated four times per year and 1,000 sites are planned by the end of 1996.

HEBS is also part of a European initiative called Co-operative Health Information Network (CHIN) whose overall goal includes '*creating a comprehensive integrated*

telematics-based set of services which will support the acquisition and distribution of information by which to improve the health of the population...'

As heart disease is the main health problem in Scotland, a website is being created to give comprehensive information on this subject. It will act as a template for other health topics such as cancer and healthy eating. Initially aimed at health professionals, it is hoped that the general public will use it as a source of health information in the future.

PharmAssist

PharmAssist is a touchscreen, multimedia system designed to educate patients, particularly those from ethnic minorities, about the taking of medicines (Duman, 1995). Produced by Lewisham Hospital Pharmacy, patients use the system in a private room located in the outpatient area of the pharmacy. A wide range of information about a large number of drugs in a variety of languages is available. On completion of the session, a game-type scenario appraises patient understanding in a non-threatening manner and a personalised patient information leaflet is printed. A programme of evaluation is under way.

Jubilee Arts

Jubilee Arts is a community-based team of professional art workers who use multimedia technology in productions about cultural, social and educational topics. They have worked with the health service, education, prisons, the probation service and the general public on a range of health-related topics.

Working with Sandwell Health Authority, they have produced an interactive, multimedia CD-ROM about HIV and AIDS called *Sex Get Serious*. Young people were actively involved in its production in an attempt to make it more relevant and appealing to the target audience (14–25 age group).

The computer program takes the user on an 'interactive' journey around 'Kooltown', a fictional urban setting. By opening the doors of the nightclub, newsagent's, youth club, health centre or home, touch-screen technology allows the player to engage with characters, stories, games, songs and images to access vital information about HIV and AIDS. The material covers areas that may be difficult for parents and teachers to talk about.

It can be used in a wide range of health education settings within the public and voluntary sectors and at present requires an Apple Macintosh computer with a CD-ROM player. Production for IBM computers is presently being discussed.

The £50,000 project took two years to complete and has not been widely distributed or formally evaluated. However, feedback from users has been extremely favourable.

An additional section to the CD-ROM is planned as part of the 'Lifting the Weight' project. Jubilee Arts will be working with Shropshire Health, a theatre company, IBM and a local prison to produce a CD-ROM for offenders, raising awareness and providing information about drug misuse, sexual health, relationships and attitudes towards HIV and AIDS.

British Telecom's interactive TV trial

BT have recently completed a trial evaluating an interactive TV service delivered down both ordinary copper wire and optical fibre in more than 2,000 homes in Ipswich and Colchester. Unlike traditional television which is linear, scheduled and mass-produced, interactive television is on-demand – delivered when and how you want it. The service is described as narrowcast and therefore avoids the present broadcast restrictions.

To use the service, the viewer was supplied free with a standard TV set and telephone line as well as a special processing set-top box. Nine main services from 150 content providers were offered: films and television programmes on demand, children's TV, education, music videos, information on local events and services, home shopping, home banking, online games and an interactive advertising service.

Using an interactive menu and a remote control, the nine main services were further subdivided into 450 topics and included 2,500 stills and 400–500 video clips. Health and lifestyle issues were included within Local Life and consisted of a wide range of information. The service was regularly updated depending upon the need of specific topic areas (usually weekly or monthly).

Those involved in the project included high-street names (National Westminster Bank, Thomas Cook, Selfridges, WHSmith); television programme-makers (the BBC and BSkyB); educational organisations (the Open University, children's publisher Dorling Kindersley); and a wide range of others (Age Concern, Colchester Chamber of Commerce, Benefits Agency, Eastern Electricity).

Reactions have been mixed. During popular times, rather like the Internet, the system tended to be slow or unresponsive. The shopping channel has been described as similar to using a shopping catalogue (*Guardian*, 1996).

This £55 million trial has been a legitimate way for BT to use their communication infrastructure to enter the entertainment business and assess what customers are willing to buy and how much they will pay for these premium services.

Cambridge Cable

Cambridge Cable is offering a similar service to BT, but only to 100 homes. It has joined forces with Cambridge and Cambridgeshire local authorities and Pipex, an Internet provider. More than 4,000 voluntary and self-help groups, clubs and societies provide information through Cambridge OnLine, as well as the benefits agency and local authorities themselves. Information is also provided on local events, job vacancies and accommodation in the area.

New Brunswick Province, Canada

New Brunswick was the first area in North America to have a wholly digital network. A new programme has been promoted by the New Brunswick telephone company and uses interactive technology for economic and community development. Health*Net,

for example, enables hospitals and other health care providers to communicate about patient care, by sharing X-ray images. TeleEducation NB provides a variety of educational support projects to more than 50 educational sites. These include delivering school, college and university courses by audio, video and computer teleconferencing. Medianet is a facility that allows teachers to preview more than 10,000 audiovisual products for use in the classroom.

NHS-wide network

The NHS-wide network programme aims to be the 'information superhighway' for the NHS. As part of the NHS Executive Strategy for Information Management and Technology (IM&T), the *NHSnet* covers the whole spectrum of NHS communications activities – telephone calls, computer networking, mobile communications and the electronic transmission of images. The initial requirement of the NHSnet is to provide an infrastructure that allows the flow of e-mail and electronic data interchange (EDI) across the entire NHS, both for administrative and patient-related information.

The *NHSweb* is a collection of sites (an Intranet rather than an Internet) sitting on the NHSnet, each with its own NHSweb address, offering information and services designed for NHS purposes and aims to provide a range of information:

- knowledge bases;
- electronic books;
- bulletin boards;
- news groups;
- education and training material.

An *NHSweb Directory* is being developed to guide users to information resources located on both the NHSnet and the Internet. It will do this by using two types of support tools:

- a set of user profiles – user perspective (e.g. doctors, dentists), organisation perspective (e.g. NHS trusts, health authorities) and geographical perspective (e.g. different regions);
- a search engine.

The aim is for users in the NHS to find information and services they need quickly on both the NHSweb and the Internet.

As well as reduced costs, faster and more accurate information exchange, it is hoped that the NHS will have a network which conforms to common standards, ensuring compatibility across and between organisations. A secure gateway will enable NHS staff to communicate with external organisations and provide access to the Internet, while at the same time preventing unauthorised access to the NHS network. External organisations will be able to send e-mail to NHS addresses, but will not be able to access the NHS network without the appropriate authorisation. The concept of encryption is presently being studied, results of which may lead to NHS-wide encryption provision.

Time will be the best judge to assess how effective the network functions are and whether its expectations have been met.

The network's framework has been developed to allow growth and development in the 21st century. Despite this potential, there are no plans at present to provide services direct to the general public. Although its main function is to meet the needs of health service professionals, once security issues have been addressed, the network could offer a unique opportunity to develop an information service about illness and health for the general public.

The Health Channel

Over the last five years, the Health Channel has gained much experience providing a bureau service to health authorities, trusts and health boards. This has involved communicating information to patients using videotaped programmes via TV monitors in hospital/GP waiting areas.

They have now formed a partnership with NAHAT and Planet Online Ltd to offer a one-stop Internet solution for the NHS and those closely aligned with health care services. It will allow direct public access to a wide range of health information and offer a service not yet available on the NHSnet.

The World Health Network

The World Health Network is a federation of health care professionals linked by a commercially operated communications system called Healix. Healix is an intelligence exchange network providing members with a range of services, including:

- daily bulletin of topical and emergency information;
- interactive television education;
- various databases;
- travel clinic;
- hospital intelligence;
- mail service and events diary;
- virtual Internet;
- patient bulletin boards and patient support.

The last of these provides GPs with health information for their patients. The Patient Bulletin Board publishes a single-page summary of important topics which have appeared in national newspapers, radio and TV. It can be posted in the waiting-room or given directly to the patient. It operates in association with the patient support database and provides the primary care team with single-page information sheets for patients and carers on topical subjects as they hit the national press.

Healix will use a combination of telecommunications, computer and broadcast satellite technologies to transmit interactive television programmes. It will be broadcast each

day, throughout the world, but filtered and personalised to each individual member of the network.

Healthwise

Healthwise is an independent health promotion organisation based in Liverpool and is involved in a range of activities, including the promotion of health and lifestyle issues using a range of multimedia technologies.

Healthwise helpline

Healthwise has developed a regional health information database called 'Picture of Health' which runs online on IBM compatible computers. Updated daily, it contains information on hospital waiting times, patients' rights, health and community care, consumer rights and the standards of service of health and community organisations. The database also has information on a wide range of illnesses and lifestyle issues with many leaflets available if required.

It is used in conjunction with the Health Information Service national freefone (0800 665544) which Healthwise are contracted to run by the North West Health Authorities for the north-west area of England.

They are presently working with Sefton Health on a second generation Windows keyboard and touchscreen version which will be available to the general public and professionals in a variety of community locations (e.g. health centres, libraries, pharmacies and a local primary care resource centre). The new version will enable the public to learn more about their own health and the services provided for them. It is similar in principle to the University of Glasgow's Healthpoint but is more specific to local information needs and carries a great deal of local information.

Health-related computer games

Healthwise have produced a range of computer games for children about health-related subjects such as drugs, smoking and alcohol.

Wrecked is a game about drugs and is similar in style to Sonic the Hedgehog. Jo is the central character and on his way through the game, encounters all sorts of drugs trying to kill him.

Every time he takes drugs he is harmed, although the extent of harm depends on the drug and how often he takes it. Sedatives will slow Jo down, while stimulants speed him up. Drug interactions are complex and unpredictable and like in the real world, Jo can either survive or take increasing amounts of drugs and eventually die. Recovery takes place if he abstains and adopts a healthier lifestyle. The game uses the fascination that many young people have with computer games and gives important information about the drugs themselves.

Tobacco Quest is an interactive computer game played on a PC using either a touch-screen, mouse or keyboard. Aimed at children, correct answers to a range of questions

allow the player to travel through countries involved with the tobacco industry. A second component to the game is called matching pairs and involves matching randomly placed cards with pictures of heart disease, lung disease and other topics related to smoking.

At each stage in the game, the player earns points and in the process of scoring, learns important facts about tobacco and the industry.

Sloshed is an arcade-style game similar to *Wrecked* but focusing on alcohol abuse and its problems. It was funded by the HEA/Portman Group and evaluated in schools in Sefton by Liverpool University.

Drug data is a multimedia programme giving a wide range of information about all varieties of drugs. It is contained on four ordinary floppy discs and runs on a 386 computer with Windows 3.1 (or later versions). It details a wide range of information about drugs, including symptoms, getting help, potential harms, legal status and harm reduction. It is menu-driven and contains hypertext links to related pages, pictures and images.

The Help for Health Trust

The Help for Health Trust was set up as a British Library project in 1979 to assess if the provision of consumer health information was a service required by the community. It now operates as a fully independent organisation (registered charity) and provides a wide range of services including the Regional Health Information Service national freefone (0800 665544) for the residents of the south and west of England and Oxfordshire. It also provides a comprehensive database and health tapes service.

Database services

Helpbox is Help for Health's leading database of self-help groups and publications and is subscribed to by over 300 organisations across the UK. Built up over 14 years, it contains over 6,500 regularly updated written records covering a wide range of health issues. The database comprises five files containing national and local self-help groups and voluntary organisations, books, leaflets and audiovisual aids. A Helpbox Plus is available which includes a blank local file to enable users to edit their own data.

Helpbox is available on either 3.5" or 5.25" discs, and updates are sent to subscribers on a quarterly basis. To run Helpbox, at least 12Mb of free hard disk are required on the PC.

In February 1995, Help for Health launched its newest database called NHS A-Z. First published as a 200-page manual, it is now available as a full text database (3.5" disk) containing information to help the general public find their way through today's changing health service. It aims to help people use health care and treatment services, improve their knowledge about healthy lifestyles and inform them about the way the NHS is funded and administered.

Health tapes directory

The Help for Health Trust provides a health tapes service of recorded health information which is produced and updated by The College of Health, a London-based charity. Nearly 400 tapes cover a wide range of health conditions, diseases and treatments as well as information on healthy lifestyles. The tapes vary in length from 5 to 15 minutes and the service is available 24 hours a day. Users access the 'tapes' (in fact recorded on a PC sound board) via touch-tone telephone without the need to go via an operator.

Chapter 8

The way forward

Twenty-five years ago, there was no such thing as a personal computer, mobile phone or fax machine. The international communications industry was so primitive that TV companies were stretched to send film around the world by satellite. Today, mobile phones, PCs and fax machines are standard consumer items capable of handling voice calls, faxes and running a small business.

Many have speculated about the future (Gates, 1995; Negroponte, 1995). The computer, television and telephone will merge into a single 'interactive TV'. Behind the merged technology will be an electronic infrastructure of wires, radio frequencies and software connected to a control panel. This user-friendly, voice-activated panel will be linked to household items such as the cooker, fridge, central heating and front-door intercom.

You could ask for the sitting-room to be made cooler or the latest gas bill to be displayed on screen, query it and then pay off an instalment. Newspapers, magazines and books will be accessed on screen as will any film or TV programme as and when you wish to see it, i.e. on demand. Such 'armchair' mentality could include shopping, visiting museums, looking up information about health, visiting your favourite holiday resort and anything else you care to think about that takes your imagination beyond the realms of today's reality.

Although this vision of the future is technologically possible, it is difficult to predict how far or how fast people will embrace such an information society. Despite the great potential for these technologies to benefit people's lives, such developments could deepen divisions in society if, for example, people in disadvantaged groups are excluded access to these services.

In this final chapter, the various threads of the evolving information society and their consequences are drawn together. It concludes by suggesting how these technologies can play a role in the area of information about health and illness for the general public and suggests a possible way forward.

Information society

The Information Age has been described as significant as the Industrial Revolution. The term 'information superhighway' suggests that in the future the free flow of *information* will characterise society, rather than the free flow of goods (National Consumer Council, 1996). Although only a small proportion of the population have access to the Internet or possess a computer with multimedia capabilities, this will all change over the next decade. However, there is concern that this increase will only be seen in certain sections of society and that elderly people, disabled people and those on lower incomes will miss out (National Consumer Council, 1996). This could have significant implications on meeting health information needs.

A new culture is developing where business and individuals will use both information and technology as naturally and instinctively as they now use transport and language. Although this will influence many aspects of daily life, whether it be entertainment, education, business or health, it is difficult to predict the advantages and disadvantages, or how far or how fast people will embrace such an information society.

The evolving information society has been much criticised. In a scathing terrestrial TV programme produced by Janet Street-Porter in early 1996, she described the whole culture as *'an environment for nerds keen to avoid social contact who prefer a poor substitute for the real thing'*. The Information Superhighway is a *'system which often crashes, is slow and full of uncensored rubbish'*. *'The poor graphics of pixilated Picasso's replace real art and virtual reality is full of empty promises'*.

Although there may be some truth behind these graphic statements, the overall picture needs to be kept in context against a background of hype and media publicity about the emerging culture. As we approach the millennium, our culture will inevitably change but only at a pace which the markets dictate. That pace will be dependent upon consumers making judgements about which aspects of the technology will benefit them most.

The information technologies

The different technologies that deliver telecommunications, information and broadcasting are undergoing a similar evolutionary process as television and video during the 1960s and 1970s. The computer, telephone and television are converging into a single-access digital technology (e.g. television broadcasts can already be viewed in small windows in personal computers). Networks have vastly increased their bandwidth and transfer speed. Cable television, telecommunication, and cellular phone companies along with a host of computer hardware and software vendors are merging and establishing partnerships to compete more effectively for hardware, software and network connectivity.

The effect will be a service distributing high-bandwidth, high-speed, interactive networking capabilities which will revolutionise the way information, education, media, commerce and entertainment are channelled into the 21st century office and home. There will be interactive TV, video on demand, universal electronic messaging, desktop videoconferencing, and a plethora of electronic media, such as electronic newspapers, shopping and banking brought to us by means of public networks.

How this growth will occur and at what pace is difficult to predict. Ask senior executives in the communication industry where they think the technology will be in five years' time and they shrug their shoulders. Not because they are protecting corporate secrets, but because the technology is moving so fast that having a business plan for any more than one year verges on crystal-ball gazing.

Although interactivity is one of the main advantages of this new technology, it is unclear how much domestic customers will want. ADSL technology can use existing copper wire to deliver two million bits per second into the home – more than enough

for video transmission but not for full interactive video. Although less than ISDN standard, it may offer users all they need.

ISDN offers greater bandwidth access and could, except for full interactive video, deliver most services envisaged for an 'information superhighway'. At present, ISDN is regarded as a business technology in the UK. In the future, business is almost certain to require full broadband services using optical fibre. In time, optical fibre may cost as little or the same as ISDN.

About two-thirds of the country are covered by cable franchises and in these areas a competitive market will develop quickly. There are certain areas where the local access network is insufficiently attractive to business to bring more than one terrestrial network operator. In such cases, Ionica's proposed radio network may provide an alternative broadband service to terrestrial networks (National Consumer Council, 1996).

The crux of the problem is twofold. First, most people do not know what is possible and therefore do not know what they want. Second, the cost of laying optical fibre is relatively expensive and businesses investing in networks are likely to put their money where they believe it will make most profit.

Although a full broadband quality service would be the ideal, it is more likely that over the next few years, a near-broadband alternative will fulfil this role in the inevitable evolution of such a service by the early 21st century.

As well as predicting the marketplace, other issues will need to be addressed and resolved, including network speed and bandwidth, server capabilities, industry standards, legal issues and confidentiality, pricing and uniform access.

As for the next few years, the PC and the Internet will both play an important role. Health-related CD-ROM titles will continue to be produced. Once the SD-DVD is launched, commercial organisations will be keen to incorporate full-motion video and interactivity into their health products.

Health care information on the Internet will continue to flourish with possible major benefits. As well as materials on a range of health-related topics, electronic discussion groups will allow patients to share experiences. With its ability to be regularly updated, the Internet has the potential to inform both health professionals and the public about 'hot' topics. Over recent months, the oral contraceptive pill scare, BSE and baby milk formulations have left everyone needing simple, unsensational facts quickly. A credible and respected national body is required to take on this responsibility.

Although health will have the potential to move to the *virtual surgery*, it must not be seen as a substitute for consultation with the health professional. This must be developed as complementary to the visit so that better-informed patients can play a greater part in their own health and disease management. In a health service where resources are limited, the conflict between patients' expectations and the provision of health care is likely to be aggravated (Coiera, 1996).

Finally, the role of interactive television has yet to be established. Its potential to supply video on demand, Internet access, online services as well as information about health and illness is huge. BT is hoping that results from its trial in Ipswich and Colchester using ADSL technology (on their universal copper network) will prevent it from having to rebuild its network from scratch. Some analysts are sceptical that unit cost savings using ADSL will be any greater than building an optical fibre network.

Technology is only one part of the equation. Other interactive television trials such as Bell Atlantic in Virginia and TCI/Microsoft have been scaled back or cancelled because poor content has led to poor demand. The technology may be capable of incredible feats, but if the programme content is poor and the public do not feel they need it, then the concept will founder.

The political agenda

There have been a number of UK government initiatives regarding the development of an information society. The co-ordinating agency responsible, CCTA (Central Computer and Telecommunications Agency), is currently engaged on a major evaluation of public and private sector superhighway trials.

In February 1996, the Department for Trade and Industry launched the Information Society Initiative, which will run for four years. The Government is putting up to £35 million of public funding into new investments with expectations that industry will at least match this amount. Prior to its launch, the Multimedia Industry Advisory Group promoted the benefits of using the emerging information technology and multimedia for providing health information for the general public (Department of Trade and Industry, 1995).

The Prime Minister announced in February 1996 that a ministerial group is being convened 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' (Parliamentary Answer, 29 February 1996).

As described in Chapter 5, the Government has legislated to create a competitive marketplace for a new communications infrastructure offering broadband services in the UK. Much debate has ensued about its implications. One concern from BT is the possibility that new local monopolies of broadband services held by cable companies could in time replace BT's former narrowband telephone monopoly.

In 1994, the parliamentary Trade and Industry Select Committee recommended that this restriction should be lifted on a franchise-by-franchise basis as cable companies fulfilled their build obligations. The Government rejected this. However, the Labour Party endorsed it in an informal agreement with BT in return that schools, libraries, medical services and other community institutions would be entitled to free broadband access. (BT says it had made a similar offer to the Government, who rejected it.)

At a European level, there have been a number of developments. Based on a report (Europe and the Global Information Society), the European Commission have developed a plan (Europe's Way to the Information Society) which provides a general framework for action within the European Union, including the development of networks and applications, and the social aspects of these. Numerous initiatives have also been funded under different programmes of the European Commission.

At an international level, the G7 Ministerial Conference on the Global Information Society made a commitment in 1995 to establish adaptable universal service frameworks to ensure that all citizens have access to new information services. As a result, eleven joint application projects were launched in areas such as electronic libraries, education and training, health care and management of environmental and natural resources (G7 Information Society, 1995).

The future of health information

In a recent lecture, Dr Ilona Kickbush, Director of Health Promotion, Education and Communications at the World Health Organization, emphasised the need to maximise the potential benefit of the evolving information technologies as a means of improving public access to information and care (Kickbush, 1996). Many health professionals have raised concern about the role the new technologies will play in the delivery of health information to patients and the general public.

However, a hypothesis for the year 2005 could be:

> *Information about health and illness will be available in electronic form in the home. It will be interactive and consist of video, sound, text and graphics. As well as general information, lifestyle advice will be personalised and linked to the individual patient record. The service will be delivered to a combined television/computer/telephone and will include an e-mail and newsgroup facility so that users can communicate with each other. Health information will also be available on the new disc technology.*

The challenge for health professionals is to anticipate this scenario and develop a health information strategy that meets the needs of patients and the general public. Whether we like it or not, the technology is here to stay and we are simply following in the evolutionary footsteps of other well-established technologies.

As we approach the millennium, our culture will inevitably move towards one which is more information dependent and uses networked broadband multimedia technology. The information society is currently being driven by the entertainment industry. We will become familiar with and accept video-on-demand and home shopping. Such behaviour will be second nature to the younger generation. An increasing proportion of the population will have access to multimedia PCs and the Internet.

As the technology becomes increasingly integrated into daily life, the concept of electronically accessed health information will become more acceptable to both health professionals and the public. The perceptive way forward is to develop multimedia-based

health information materials to meet the needs of target groups within a population. This does not imply that traditional resources such as leaflets, posters and linear videos should be abandoned. Indeed, the new technologies are likely to augment rather than replace conventional video (International Visual Communication Association, 1996).

In the future, there will be a wealth of health information available electronically. Some of it will be of high quality, but much will be misleading, inaccurate and unhelpful. The most important factor will be the quality of the health information. If this is fulfilled, then any of the technologies described in this report can be used. Health professionals have an opportunity to take an active role in the development of a public service providing information about health and illness using the evolving technology. Such a service will need to be multi-disciplinary and the information evidence-based, user-friendly, entertaining and easily accessed by all sections of the public. It will need to be regularly updated and from a respected organisation which inspires public confidence.

A strategy for health information in the Information Age

A national strategy needs to be developed which addresses health information in the new Information Age. Such a strategy will need commercial, public and voluntary bodies to collaborate. It will also need full political support, to be high profile and to be seen as acceptable by the public as well as health professionals and the commercial sector.

Important components of such a strategy could include the following.

- ***Executive Committee*** of members from key organisations in the relevant public, commercial and voluntary sectors. Each should have a proven track record for innovation and bringing about change. They should be senior enough to influence policy both within their own organisation and at a national level, particularly among politicians.

- ***Working Groups:*** assigned to chosen areas. These could include the following:

  Information Technology Group: to monitor the evolution of the various information technologies, their penetration and their various general applications. This could include progress with digital technology, hardware and software, the Internet, cable, satellite and radiowave. It could monitor penetration into the home, health care environment, schools and other public access areas such as libraries. It could also monitor the development of general applications such as video-on-demand and online services such as home shopping, banking and how these are affecting society.

  Resource Monitoring Group: to develop and update a database of health information material available in electronic form. This could include CD-based products and the wealth of information scattered over the Internet. A set of 'national standards' could be developed for health information in electronic form which complement the industry standards which have been developed for hardware and software.

The standards could be used for three purposes:
- as a quality measure of information already available;
- as a guide to those developing such material in the future;
- as a 'kite mark' for both health professionals and the public to identify acceptable, quality health information in electronic form.

Research Group: to assess the needs of the general population for health information in electronic form. This group could also evaluate the effectiveness of new products on various aspects of health outcome. This group would undertake these tasks to ensure that the large resources being spent in development are being appropriately used.

Development Group: to produce health information for patients and the public in electronic form. The function of this group could be twofold. First, it could develop an overall health information service available electronically. Components would include a multimedia-based database covering a wide range of illnesses and lifestyle issues, a newsgroup and an e-mail facility. Second, specific products could be developed to meet the needs of target groups. For example:
- different target audiences: children would be an ideal group, as computers are a familiar part of their everyday life. They are also a difficult group to provide information about health and lifestyle issues for. Work by Healthwise and Jubilee Arts have already demonstrated how interactive computer games can deal with sensitive issues such as smoking, alcohol, drugs and sexual health (see Chapter 7).
- specific topics: certain disease states, such as diabetes and hypertension can be quite complex and the use of personalised management plans can help with an individual's understanding of the disease process and management.
- demonstrate techniques: certain disease management techniques such as the use of inhalers in asthma can be complex and confusing. The application of multimedia principles using video and sound can be used to overcome these.
- urgent updates on public health issues: health-related topics, particularly 'health scares' have achieved high-profile media attention over recent few years. The general public need simple, factual information on real issues that takes away the sensationalisation portrayed in the press. An online service such as the Internet would be an ideal medium for meeting this need, providing the information was seen to come from a credible body and the public could access it.

Product development would be multidisciplinary, involving a combination of specialists, educators and end-users.

Marketing Group: to increase both health professional and public awareness of the various technologies and to promote access. Part of this role would be to ensure that all members of society have access to this technology and to minimise the gap between the information-rich and information-poor.

Each working group could contribute to each other's strategy and development. The Information Technology Group would influence which technologies the Development Group would adopt for various health information projects. The Research Group would influence the development of new products by assessing their need. They would also

evaluate new products and use the findings to advise on further developments. The Resource Monitoring Group would be able to advise if such products were already available and could be appropriately adapted. All groups would regularly report to the Executive Committee who would have overall control on policy.

The long-term objective of the strategy is to develop a program which delivers health information into the home over a variety of transmission media. As this is dependent on a large proportion of the population having the relevant technology, such a service may be incremental and initially targeted at GP surgeries, hospitals, libraries and other public access areas. It should include a variety of databases and be easy to use. Over time the public would become more comfortable accessing this information from home, providing the equipment needed to do this had become affordable.

Conclusion

Information and communication technologies are developing in ways that will significantly affect each of our lives. If their positive potential is developed to the full, the health benefits to the population at large could be huge, providing issues such as quality, equity, access, security and cost are met.

However, just because we have the tools, does not yet mean everybody has the requisite skills or money to use them effectively. Similarly, just because high-powered technologies exist, does not mean that a simple booklet or linear video will not meet different needs under different circumstances.

The challenge for health professionals is to harness the potential of the new information technologies and integrate them with the more traditional methods to meet the needs of their target audiences. Effective communication and positive health gain will only occur if the most suitable media are used for appropriate target audiences.

As for the road ahead, all health professionals should become familiar with the developing Information Age and harness its potential power to meet the needs of their local population. A national strategy, developed and supported by a credible, multidisciplinary organisation or group of organisations, would be the first step in this direction.

Health professionals must embrace the huge public health potential of the new information technology; not tomorrow, but today: the future's bright; the future's digital.

References

Anthony D (1996). *Health on the Internet*. Oxford: Blackwell Science.

Ashton J (ed) (1992). *Healthy Cities*. Milton Keynes: Open University Press.

Bassham S, Fletcher LR, Dietetic patient interview by computer (abstract). In: *Current Perspectives in Health Computing*. Conference Proceedings. 12–14 April, p.11. Published by *British Journal of Healthcare Computing*.

Broadcasting Bill (1995). London: HMSO.

Cable Communications Association (1995). *The Cable TV and Telecom Year Book*. Dunstable: The WOAC Communications Company.

Campbell G, Jones RB (1992). A computer-based patient education system in the radiology department. In: B Richards (ed) *Health Computing 92*. Weybridge: BJHC Books, pp.142–52.

Chen MS, Houston TP, Burson JL, Comer RC (1984). Microcomputer-based patient education programs for family practice. *Journal of Family Practitioners* 18:149–50.

Coiera E (1995). Medical Informatics. *BMJ* 310:1381–7.

Coiera E (1996). The Internet's challenge to health care provision. *BMJ* 312:3–4.

Competition and choice: telecommunications policy for the 1990s (1991). Cm1461. London: HMSO.

Consumers' Association (1995). The NHS: what's the verdict? *Which? Way to Health*. June, pp.80–3.

Continental Research (1995). *The Annual Cable Diary Study conducted on behalf of the ITC by Continental Research*. London.

Creating the superhighways of the future: developing broadband communications in the UK (1994). Cm 2734. London: HMSO.

Deardorff WW (1986). Computerised health education: a comparison with traditional formats. *Health Education Q*. 13:61–72.

Department of Health (1991). *The Patient's Charter. Raising the standard*. London: DoH.

Department of Health (1992). *The Health of the Nation: A strategy for health in England*. London: HMSO.

Department of Trade and Industry (1995). *Multimedia Industry Advisory Group Report*. London.

Devine E, Cook T (1986). Clinical and cost-saving effects of psychoeducational interventions with surgical patients: a meta-analysis. *Research in Nursing and Health* 9:89–105.

Dorling Kindersley Multimedia (1994). *Ultimate Human Body*. London: Dorling Kindersley Multimedia.

Duman M (1995). New Multimedia Patient Counselling System. *British Journal of Healthcare Computing and Information Management* 12(8):30–2.

Durlacher Multimedia (1996). *The Internet in 1996. An investment perspective*. London.

Erdman HP, Klein MH, Greist JH. Direct patient computer interviewing. *Journal of Consulting and Clinical Psychology* 53:760–73.

Ferguson T (1996). *Health Online. How to find health information, support groups and self-help communities in cyberspace*. USA: Addison-Wesley Publishing Company.

Fridsma DB, Ford P, Altman R (1994). A survey of patient access to electronic mail: attitudes, barriers and opportunities. Proceedings of the Symposium of Computer Applications in Medicine. *Journal of the American Informatics Association* (symposium supplement), pp.15–19.

G7 Information Society (1995). G7 *Information Society Pilot Projects Progress Report*. G7 Summit June 1995. Canada.

Gates B (1995). *The Road Ahead*. England: Viking.

GfK Marketing Services (July 1996). *GfK Home Audit*. London.

Giles WD, Lewis R (1992). Influencing corporate direction: a case study from British Telecom. *Marketing Intelligence and Planning* 10(4):23–35.

Gillespie MA, Ellis LBM (1993). Computer-based patient education re-visited. *Journal of Medical Systems* 17:119–25.

Guardian (1996, Jan 18). Video Off Demand.

Hayes G, Richards B (1989). Health education while waiting to see the GP. In: Current Perspectives in Health Computing. Conference Proceedings. 12–14 April 1989; pp.32–4 Published by *British Journal of Healthcare Computing*.

Hekelman FP, Kelly R, Grunder TM (1990). Computerised health information networks: house calls of the future? *Family Medicine* 22:392–4.

Independent on Sunday (1996, October 20). Is the game over for the CD-ROM?

Information in a Healthy Society (1991). *Health in an Information Society*. Proceedings of a Healthy Cities Conference, Nijmegan, Netherlands. Published by Knegsel, Netherlands: Akontes Publishing, 1991.

International Visual Communication Association (1996). *Pictures that move business*. Report of the Survey into the Use of Visual Communications Technologies by UK Business. London.

Jones RB, Campbell G, Navin LM, Ritchie J, Kelly MPT (1992). Touch-screen multimedia systems for patient and health education. In: *Proceedings of 'Second Asia-Pacific Medical Informatics Conference'*. Hong Kong, pp.311–18.

Jones RB, Navin LM, Murray KJ (1993a). Use of a community-based touch-screen public-access health information system. *Health Bulletin* 51:34–42.

Jones RB, Lawson A, Navin LM *et al.* (1993b). Stomacare Healthpoint. A computerised education system for stoma care. *WCET Journal* 13(1):25–8.

Jones DH, Crichton C, Macdonald A, Potts S, Sime D, Toms J, McKinlay J (1996). Teledermatology in the Highlands of Scotland. *Journal of Telemedicine and Telecare* 2(1):7–9.

Kahn G (1993). Computer-based patient education: a progress report. *MD Computing* 2:93–9.

Kickbush I (1996). *New Players for a New Era. Responding to global public health challenges*. Queen Mother Lecture. Faculty of Public Health Medicine Spring Conference. Newcastle.

Lucas RW, Card WI, Knill-Jones RP, Watkinson G, Green GP. Computer interrogation of patients. *BMJ* 2:623–5.

Mathiesen KS, Evans FJ, Meyers K (1987). Evaluation of a computerised version of the diagnostic interview schedule. *Hospital and Community Psychiatry* 38:1131–315.

McClymont W, Van Rijsbergen CJ, Gray WM, Asbury AJ (1980). Development of a computerised pre-anaesthetic screening system – PASS (abstract). In: *Lecture Notes in Medical Informatics* 40:801. Eds R O'Moore, S Bergstsson, JR Bryant, JS Bryden. London: Springer-Verlag.

McGhee SM, Hedley AJ, Jones RB, Cheng KK (1991). Patient-held records: their current status and implications for health care in Hong Kong. *Hong Kong Practitioner* 13:1374–81.

McKenzie BC (1996). *Medicine and the Internet. Introducing online resources and terminology*. Oxford: Oxford University Press.

Morris J, Goddard M, Roger D (1989). *The benefits of providing information to patients*. Discussion Paper 58. York: Centre for Health Economics, University of York.

National Consumer Council (1996). *The Information Society: Getting it right for consumers*. London: Hodder & Stoughton.

Negroponte N (1995). *Being Digital. The road map for survival on the Information Superhighway*. England.

Osman LM, Abdulla MI, Beattie JAG (1994). Reducing hospital admissions through computer-supported education for asthma patients. *BMJ* 308:568–71.

Pencheon D (1996). *Electronic Public Health*. Cambridge: Institute of Public Health.

Rippey RM, Bill D, Abeles M (1987). Computer-based patient education for older persons with osteoarthritis. *Arthritis Rheumatism* 30:432–5.

Robinson TN (1989). Community health behaviour change through computer network health promotion: preliminary findings from the Stanford Health-Net. *Computer Methods and Programs in Biomedicine*. 30:137–44.

Shepperd S, Coulter A, Farmer A (1995). Using interactive videos in general practice to inform patients about treatment choices: a pilot study. *Family Practice* 12(4):443–7.

Stanley I, Tongue B (1991). Providing information and detecting concerns about health in general practice populations using a computer system in the waiting area. *British Journal of General Practitioners* 41:499–503.

Telecommunications Act 1984. London: HMSO.

Weale S (1995). Surfer, heal thyself. *Guardian* Sept 20, p.13.

Wise P, Pietroni RG, Bhatt VB *et al.* (1996). Development and evaluation of a novel patient information system. *Journal of Royal Society of Medicine* 89:557–60.

WHO (1978). *Alma Ata Declaration*. Copenhagen, Denmark: Regional Office for Europe.

WHO (1985). *Targets for Health for All* (revised 1992). Copenhagen, Denmark: Regional Office for Europe.

Glossary

ADSL (Asymmetrical Digital Subscriber Loop) – allows digital data to be transmitted at high speed over the existing copper part of the BT network.

Analogue technology – information is sent in *wave form* either down wires or via the radio spectrum. It is used in television, video and vinyl records.

ASTRA – a satellite system which leases channels to both radio and television across Europe. BSkyB in the UK uses it.

Bandwidth – a measure of the amount of data that can be transmitted over a network in a specific amount of time: the number of bits per second (bps) it can carry. It ranges from narrowband to broadband.

Baud Rate – the speed at which a modem can process data.

Bit (BInary digiT) – a unit of digital information represented either by the number 0 or 1. It is the smallest piece of information accessible by a binary computer.

Broadband – a transmission medium with high bandwidth, capable of carrying large amounts of complex data at great speeds, e.g. optical fibre.

Byte – a measurable number of consecutive bits. One byte represents eight bits and is called a 'character'. 1000bytes = 1 kilobyte. 1000 kilobytes = 1 megabyte. 1000 megabytes = 1 gigabyte.

CD (Compact Disc) – is used for data storage. Data of any kind are digitally encoded on the bottom of the disc as a series of microscopic pits representing different sequences of 0s and 1s. The disc is covered with a transparent coating so it can be read by a special laser beam. Examples include CD-DA, CD-ROM, CD-I.

CD-DA (Compact Disc-Digital Audio) – is the compact disc format for storing high-quality digital audio. It can hold 72 minutes of sound.

CD-I (Compact Disc-Interactive) – is a compact disc format designed by Philips with multimedia capabilities. A set-top box plugs directly into the television and a handset similar to a TV remote control is used. The disc can hold 650Mb of data in the form of 72 minutes of digital audio, 6,000 television images or various combinations of the two. Its advantage over CD-ROM is that it can play full-screen, full-motion, good-quality video.

CD-ROM (Compact Disc-Read Only Memory) – is a compact disc format and playback hardware designed to store large quantities of digital data (from 650Mb). It can hold the equivalent of 250,000 pages of text or 12,000 scanned images. The 'read-only' means

that you cannot store your own data on a CD-ROM. Its weaknesses include the poor quality and scarce amount of video it can hold.

CPU (Central Processing Unit, also known as 'microprocessor' or 'chip') – is the main working part of the computer and dictates the speed of the machine. A bigger chip can perform more instructions, and in theory do the same work faster. A 486 is faster than a 386 but slower than a Pentium. The clock speed measures (in megahertz (MHz)) how fast program instructions are carried out.

Churn – the proportion of subscribers to a cable network who disconnect.

Coaxial Cable – consists of concentric copper conductors, which gives greater resistance to interference and can carry signals over greater distances. It offers greater bandwidth than twisted copper pairs but less than optical fibre and is used by many cable television systems.

Compression/decompression – to handle motion video, computers need to be able to compress or reduce the quantities of digital data that make a video frame and then decompress these and reinstate them to its full form. In simple terms, this process involves taking a sample or simplifying a portion of data that are duplicated. Compression also allows data to be more easily transmitted or distributed via computers, CDs, hard disks, networks, telecommunications systems and satellites.

- *Lossless Compression* – preserves all the data in the data file. It is more suited for data such as spreadsheets or medical images where loss of any data would render the file unsuitable or inaccurate. Therefore, compression ratios are small, usually only 2 to 1 at most.

- *Lossy Compression* – consists of using geometric algorithms to interpret the data file and actually removes some data, either between adjacent images or from within each image. Most images contain more detail than the human eye can discern and despite some loss of detail after decompression, quality is generally acceptable. Compression ratios of 180 to 1 are possible using this technique.

Copper Wire – transmits information in electrical wave form (analogue) and is used in the telephone network between the exchange and the home (the so-called 'last mile').

Cybercafé – cafés in towns and cities around the UK that have computer terminals linked to the Internet. People 'surf the Net' while having a cappuccino.

DTH – 'direct-to-home' refers to a home satellite dish receiving programmes direct from a satellite system (most likely ASTRA).

Digital Technology – information is defined using 0s and 1s in a specific sequence and is used in compact discs and computers.

Digital Terrestrial Television – at present the BBC and independent television companies transmit programmes in analogue form. In the Broadcasting Bill 1995, the framework was set for up to 18–22 terrestrial channels to transmit in digital form. NB: A similar regulatory framework had already been established for cable and satellite.

Edutainment – education entertainment.

e-mail – a method of sending information (including files as attachments) between two computers anywhere in the world over a telecommunications network. Depending upon which transmission network is used, this generally involves a modem. The system tends to be slow and unsatisfactory for transmission of sound and video.

Encryption – encoding information for security purposes which can only be decoded by a program with the proper key or password.

Fire Wall – a security technique which acts as a gateway between a designated electronic network (e.g. NHS-wide area network) and the Internet. Users of the protected network can access the Internet but are guarded from unwanted intrusion.

Floppy Disk – now known as a 'diskette', this 3.5" disk can store 1.4Mb of data and transfer files between computers.

GIF (Graphics Interchange Format) – was created by CompuServe and is the standard graphics format for most electronic bulletin board systems. It compresses line art and simple, cartoon-like images more effectively than JPEG which is best suited to full colour.

Gopherspace – a forerunner to the Web and provided a unified system for accessing the wealth of information on the Internet.

HTML – HyperText Markup Language is a simple program used to create pages on the World Wide Web. It defines general layout such as font style and creates the links to other documents.

HTTP – HyperText protocol is used to transfer information on the World Wide Web.

Hard Disk – the fixed disk where the computer stores its files and software programs permanently until you decide to erase it. Although in 1996 computers are being sold with 500Mb of disk space, machines with 1000Mb (1 gigabyte) of disk space and above have now become available.

Homes Passed – the total number of homes which could connect to their local cable system if they chose.

Hypermedia – software that enables a user to access and search for information in a non-linear manner within a multimedia application by using HyperText links.

HyperText Links – allows the user to click on a highlighted word, picture or button and be transported to a related piece of either text, still image, or video clip. If using the Web, this could be anywhere in the world.

ISDN (Integrated Services Digital Network) – carries digital signals over the analogue-based copper loop of the telephone network without the need of a modem.

Information Superhighway – see Internet.

Infotainment – information entertainment.

Internet – the largest network in the world and links millions of computers through a mixture of private and public telephone lines. Facilities include e-mail, newsgroups, file transfer, the World Wide Web and a range of online services.

JPEG (Joint Pictures Expert Group) – is a standard for compression and storage of digital images and is widely used on the Internet. Compared with an older standard called Graphics Interchange Format (GIF), it takes less time to download and less room on the hard disk.

LAN (Local Area Network) – refers to the linking of hardware such as PCs, printers and fax servers within a room, office or building. Instead of having separate software programmes on individual PCs, those connected can share software applications such as word processing, e-mail and spreadsheets.

Laser Disc – as a forerunner to the audio CD and CD-ROM, this was the first multimedia system to put moving video on optical disc. It has mainly been used by the professional market and has been replaced by newer technologies.

Mb – Megabyte. See Byte.

MPC – a multimedia personal computer is a PC which has been designed for multimedia use. It is fitted with a quality monitor, sound card, video facility and a CD-ROM drive. There will be a choice of RAM, CPU and hard disk size. There has been no equivalent of MPC on the Mac platform as Macs have always had multimedia capability.

MPEG (Motion Picture Expert Group) – has developed a standard for compressing and storing video. The standard is used in the broadcast, cable, phone, multimedia, games and consumer electronic industries. MPEG has three standards – MPEG1, MPEG1.5 and MPEG2, each with a different application.

MS-DOS – Microsoft Disc Operating System is the operating system designed by Microsoft to control the computer and define which software can be used. Windows 95 integrates the operating system within the Win95 software and allows the user to avoid the often cumbersome language of DOS.

MVDS (Microwave Video Distribution System) – is an alternative television delivery mechanism to cable and satellite which uses wireless transmissions at very high frequency.

Macintosh – the Apple Macintosh has been a direct rival to the personal computer. Although its multimedia capabilities were superior, Microsoft has caught up and in 1995 released Windows 95. Despite a historic technical superiority, Apple Mac only commands 10 per cent of the market and they have now developed a new system capable of supporting PC-based software.

Modem (the MOdulator-DEModulator) – sits between the computer and telephone line, translating the computer's digital information into an analogue format so that it can be passed through the normal telephone system. A second modem receives the analogue information from the telephone line and converts it into digital information before passing it onto the next receiving computer.

Monitors – the quality of the computer screen depends upon its resolution. Resolution is expressed as the number of pixels which can be fitted across and down the screen. For example, Super VGA can be expressed as 1024x720 resolution.

Multimedia – a program combining text, sound, video, animation and graphics. The key element of any multimedia application is its interactive capability which enables the user to become actively involved through the use of a mouse, joystick, keyboard or touchscreen. Multimedia can be accessed from CD-ROM, CD-I or the Internet, although the quality of video and sound is only fair on the Internet.

Multiplex – as part of the planned digital terrestrial television, a multiplex will be able to carry at least three television channels.

Multiplex Provider – will manage the process of developing a transmission network to maximise geographical coverage and act as an intermediary between the broadcasters.

NTSC (National Television Standard Committee) – used in the USA and Japan for the transmission of video and television.

Net Directories – provide structured entries into the large number of web pages on the Internet by providing a hierarchical index (e.g. Yahoo).

Newsgroups (or bulletin boards) – are accessed by e-mail and consist of thousands of groups, each sharing information about a wide range of interests and activities.

Online Service – provide the subscriber with a range of different services, e.g. news, shopping, weather, information and entertainment, games and education. Organisations offering services include CompuServe, UK Online, America Online and Microsoft Network.

Optical fibre – fibres the thickness of human hair which use miniature lasers to transmit the 'bits' of information as light pulses. As a broadband transmission medium and with its potentially limitless capacity, a wholly optical fibre network would be able to carry large amounts of data (particularly video), fast and efficiently, allow complete interactivity and still have capacity to spare.

PAL (Phase Alternating Line) – is the video standard used in Western Europe and Australia.

POTS (Plain Old Telephone System) – is the copper wire part of the telephone network.

Pay-per-view – incorporates the concept that each programme seen is paid for by the viewer. This is being considered by cable and satellite companies and was recently tried by BSkyB for the World Heavyweight Boxing Championship between Frank Bruno and Mike Tyson.

Penetration – is a measure of the take-up of cable services and is represented by the number of subscribers expressed as a percentage of homes passed.

Personal Digital Assistants – devices which take the computer out of the office and into pockets or briefcases.

Photo-CD – allows prints, slides or unprocessed film to be transferred into a digital format on a disc and shown on a computer or television screen (the latter uses a dedicated Photo-CD player).

Pixel – the smallest point on the screen.

Platform – refers to computer hardware and its associated software. PCs and Macs are examples of two platforms.

RAM (Random Access Memory) – is the computer's short term memory and what it uses to run its software. Combined with the size of the CPU, RAM is an important determinant of speed. With insufficient RAM, certain software programmes are either unable to run or do so inefficiently. For example, Windows 95 best runs with 16Mb of RAM.

SD-DVD – super density digital video disc is a new super-density CD which will hold over ten times as much digitised information as a CD-ROM. Its strength will be the amount of quality full length video it can hold and the increased interactivity.

SECAM (Sequential Couleur A Memoire) – television format used in France and Russia.

Search Engines (or web crawlers) – are designed to hunt specifically through the Web to track down pages that meet required specifications (e.g. InfoSeek Search and Lycos).

Set-top box – is a device which converts signals from one medium so that they can be transmitted on another (e.g. satellite signals shown on an ordinary TV screen).

TCP/IP (Transmission Control Protocol and Internet Protocol) – is a protocol for connecting systems on a network and is the foundation for connecting to the Internet.

Telemedicine – permits medical staff working in hospitals and clinics to exchange information at a distance, whether it be voice, an image, elements of a medical record or commands to surgical robot.

Terrestrial channels – television channels such as the BBC1, BBC2, ITV, Channel 4 and the planned Channel 5.

URL (Uniform Resource Locators) – are the standard form of address used in HyperText links to retrieve or send information. Most URLs contain three pieces of information:

protocol://server name/path e.g. Internet BMJ address is: http://www.bmj.com/bmj/

VOD (video-on-demand) – uses interactive TV technology and lets viewers choose which film and when they want to watch it.

Videoconferencing – a system for viewing and talking between two or more parties over a long distance.

Virtual Reality – uses computers to simulate real systems, forms and places. For example, a computer user can participate in 'virtual reality' by using a head-mounted device and a power glove to be totally immersed in and navigate through an electronic shopping centre.

WAN (Wide Area Network) – is a collection of interconnected LANs and can span cities, countries and continents. The Internet is an example of a WAN on a global scale.

Web Browser – a programme that can interpret HyperText Markup Language and display web pages (e.g. Netscape).

Windows – an operating system developed by Microsoft.

Wireless – technologies such as radio, cellular, microwave and infrared.

World Wide Web (also known as 'WWW" or 'the Web') – was designed in the early 1990s as an easier way of using the Internet. It consists of several million pages (known as 'web pages') which contain text, graphics, video clips, sound and HyperText links to other pages. It contains a wealth of information, some good but much poor and uncensored.

Appendix 1

Quality health information web sites

AHCPR Clinical Guidelines (US Agency for Health Policy and Research)
http://text.nlm.nih.gov/ahepr/guides.html

Bandolier (full text)
http://www.jr2.ox.ac.uk/Bandolier

Blue Cross and Blue Shield Wellness Information on the Internet
http://www.bcbsma.com/yh/wellness.htm

Breast Cancer Information
http://doric.bart.ucl.uk/web/breastcancer/aware.html

British Medical Journal (includes full text of selected articles)
http://www.bmj.com/bmj

Cancer Help UK
http://medweb.bham.ac.uk/cancerhelp/

Cochrane Collaboration
http://hiru.mcmaster.ca/cochrane/default.htm

Department of Health
http://www.open.gov.uk/doh/dhhome.htm

Global Health Network (public health and prevention worldwide)
http://www.pitt.edu/HOME/GHNet.html

Health on the Net
http://www.hon.ch/more.html

Institute for the Study of Drug Dependence
http://www.globalnews.com/isdd/

Medweb: Consumer Health (consumer health and other medical information sources site set up by Emory University, USA)
www.cc.emory.edu/WHSCL/medweb.html

National Association of Health Authorities and Trusts (NAHAT)
http://www.nahat.net

NHS Centre for Reviews and Dissemination
http://www.york.ac.uk/inst/crd/welcome.htm

OMNI Project: Organising Medical Networked Information (gateway to quality UK Internet resources in medicine and health)
http://omni.ac.uk/

Oncolink (US cancer information site)
http://cancer.med.upenn.edu/

Patient Education Resources
http://www.nmh.org/netreach/patient.html

Samaritans
http://www.compulink.co.uk/~careware/samaritans/

South and West Healthcare Libraries (good starting point with links to many health-related websites)
http://cochrane.epi.bris.ac.uk/rd/links/

UK Clearinghouse for Health Outcomes, Leeds
http://www.leeds.ac.uk/nuffield/infoservices/UKCH/oad.html

UK Primary Care
http://www.compulink.co.uk/~hold/

World AIDS Day (Health Education Authority)
http://www.wad.hea.org.uk/pages/home/

World Health Organization
http://www.who.ch/

Source: Help for Health Trust

Appendix 2

Useful contacts

British Telecom Interactive TV
Mr Keith Silver
British Telecom
PP501 Holborn Centre
120 Holborn
London EC1N 2TE
Tel: 0171 356 5000
Fax: 0171 356 5520
e-mail: silverk@hlcec1.agw.bt.co.uk

Health Channel
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Information technology offers major opportunities for health professionals as we approach the millennium. In *The Future's Bright: The Future's Digital*, Simon Wallace explains the maze of jargon surrounding the new technologies and reviews their actual and potential use for health professionals. The report shows how health information could become accessible to the public through GP surgeries, hospitals or libraries, and ultimately on compact disc, the Internet, cable or satellite in the home.

***The Future's Bright: The Future's Digital* will be useful reading for all those who provide health information to patients and the general public. The report is part of a series of eight titles from the Promoting Patient Choice programme at the King's Fund.**

Promoting Patient Choice

The publications in the Promoting Patient Choice series are part of a continuing programme of work within the Clinical Change Programme at the King's Fund Development Centre. For the past five years, the programme has been promoting concepts and materials which help patients and the wider public to become involved in their own treatment and health care decisions. Government initiatives such as *The Patient's Charter* and *Local Voices* have created major changes in patients' rights and responsibilities and have sought to involve the public in decision-making on a wider scale. The Promoting Patient Choice programme has supported a number of projects, including the use of interactive videos for shared clinical decision-making and a survey of consumer health information services. Each book in the Promoting Patient Choice series tackles a specific set of issues and is intended to help change and develop professional and public attitudes towards patients' involvement in health care.

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