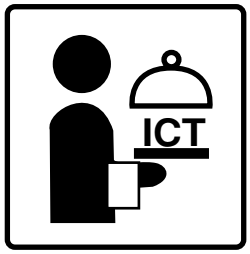
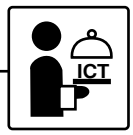
Chapter 14

Services





Contents

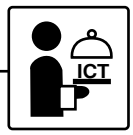
Introduction

The main focus for this section is access to services for people with disabilities and older people using telecommunications. Typically, the use of telecommunications by people with disabilities and older people is characterised as an access problem to the telephone terminal. But due to the increasing sophistication of network technology this approach needs to be changed. It is now necessary to consider how the person, with a physical or sensory impairment, interacts with the whole system at a service level. (See Fig 14-1 below). Access barriers or ease of use problems may arise within the network resources that a customer needs to invoke to carry out the communications task he or she wishes to use the public network for.

For this reason five distinct groupings of service are considered in this section. Firstly, the most fundamental service is that which connects two or more users in a real time conversation over a distance. For many groups of elderly and disabled people, voice is combined in various ways with text in what are known as Total Conversation services, and these can be seen as an extension of such mono-media services. Secondly, network services. These range from basic supervisory tones which give feedback on the progress of a call, e.g. ringing tone, to more advanced level network services to enhance use of the network, e.g. ring back when free. Thirdly, interactive speech services. These can be as diverse as banking, home shopping, directory enquiries, information services, etc. Fourthly, healthcare services. These are services designed to allow frail, elderly or disabled people to maintain independence and quality of life through the use of ICT. Finally, the integration of computing and telecommunications. This technology has the potential to improve access to the workplace, education, community services, shopping, etc. for people with special needs. But in order to realise these benefits there needs to be a greater involvement of people with special needs within the research, development, design and standardisation of these services. “Design for All” in this way will drive up quality and accessibility and drive down costs.

The use of any service using telecommunications can be considered as having two components. The first is access to suitable terminal equipment and the second is the user interface presented by the service provider. However, there are other issues that must be addressed for services to be supplied on an equal basis. These are such issues as availability, affordability, awareness and legislation. These issues are beyond the scope of this report, although affordability is mentioned briefly below in the context of “Universal Service”.

In addition to the telephone network many of the services mentioned below are also accessible via the Internet. Guidelines for access to



the internet are being developed by the Web Accessibility Initiative (WAI), but this topic is outside the scope of this section of the report. For a full description the activity in WAI see Section 15.3 “Access to the Internet” in the section of this report on “Internet and Electronic Commerce”. (Further information of the WAI guidelines can also be found at http://www.w3.org/WAI/References/).

The legal background

The liberalisation of telecommunications services across Europe has resulted in a more open market. The quality of these services has been influenced more by the forces of competition than any requirement that they should be accessible to all users. This has come about because the existing obligations placed on national regulators and service providers are more about fair trading conditions rather than the accessibility of the services.

The next stage in the liberalisation of telecommunications is a requirement for “Universal Service”. This is defined as a minimum set of services available to all users at an affordable price regardless of their geographical location. EU members will be required to ensure access to, and affordability of, these services for people with disabilities. Proposals for a directive on ‘Universal Service’ are currently being considered, but at the time of writing there is no implementation date for this Directive.

Service Sectors

Total Conversation

Many users need text as a medium in conversation, because of a disability in hearing or speech or for other reasons. By including text conversation facilities in the design of communication devices and telecom services, they can be “designed-for-all”, thus satisfying the needs of both disabled and able-bodied users. Text conversation may be provided in new environments, like mobile networks and the Internet. Then, it is natural to establish inter-working functions for communication with text telephones in the telephone network, in the same way as is done for voice telephony. Only by accepting that there are people who cannot use voice telephony fully, and need other media for distant conversation, can the needs of these users be satisfied. Many more users than those who use text telephones today will be attracted by the possibilities of combining text, voice and video simultaneously in innovative ways. It still needs to be a telecom service if it is to utilise the same support from society as voice telephony gets. Online text communication over the internet is becoming an important alternative, but the need to build proper services with defined addressing, possibility to call users between networks and with a defined quality of service is the same for IP text telephony as for IP telephony. Therefore Design for All for conversational services and communication devices can only be achieved by including text in the general offerings.

Network services

Users of telecommunications networks have access to a wide range of services that are directly related to their use of the network. The most basic of these are supervisory tones that give feedback on the progress of a call. For example, dial tone, ringing tone, engaged tone, etc. In particular, textphone users are unable to monitor the progress of their call because most text phones cannot distinguish between different network tones. Text terminals need a visual display of the line status, i.e. dialling, busy, connected, etc. Across Europe there are approximately 2 million deaf people who could benefit from using text communication.

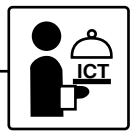
At a more advanced level, network operators may offer services to enhance use of the network. For example, ring back when free, calling line identification, call diversion, conference calling, charge-card calls, etc. Many elderly and disabled people have problems using these services. This is often due to the poor design of the user interface that fails to take account of the needs of elderly and disabled people with cognitive impairments. These can be categorised as memory, perception, problem-solving and conceptualising impairments. Also included in this group is dyslexia, which can cause significant problems in remembering number sequences. It is estimated that across Europe there are 9 million people with cognitive impairment.

Interactive speech services

Many services are accessed via the telephone network. There are many emerging applications for interactive speech services. These include:

Type of service	Examples
Voice store and forward	CallMinder UK network based telephone answering service.
Finance	Banking, stocks and shares, insurance quotations, credit cards
Entertainment	Betting, horoscopes, games
Information	Timetables, yellow pages, news
Telemarketing	Promotions
Tele-shopping/Reservations	Theatre, airlines, catalogue shopping
Field operations	Data operation and retrieval, job despatch, voice access to email
Automatic operator	Network services, call centre.

Figure 14-1



There is an increasing trend for callers to these services to be greeted by an automated call handling system that asks for responses either as DTMF tones via the telephone keypad, or as voice responses. At present the vocabulary that can be recognised by such systems is limited, but future systems will be able to handle much larger vocabularies and in a natural dialogue style.

The benefit of speech technology when used to search for and retrieve information is that it makes the technology accessible to people who are not computer literate. It hides the complexity of real systems and services behind a very natural interface. It has the additional advantage for people with limited dexterity that it offers an alternative to the telephone keypad, the standard 102 key keyboard and the mouse as input devices. Because it is hands and eyes free, it enables information to be retrieved with just a microphone and a communications channel. This will ultimately lead to the development of small mobile devices and wearable computers.

However, interactive speech based services present significant barriers for deaf and hard of hearing people as well as people with speech impairments. The complexity of some voice services is also a barrier to people with cognitive impairments such as memory, perception, problem-solving and conceptualising disabilities. It is estimated that in the European Union there are 6 million people with visual impairments ranging from moderate impairment to blindness and 9 million people with cognitive impairment.

Healthcare services

Telematic technology is becoming increasingly used in the area of healthcare. This has the potential benefit of allowing frail, elderly or disabled people to maintain independence and quality of life. The use of telematics in this sector is still relatively new and very few specific standards exist. The rapid growth in telematics healthcare services has been market lead rather than dictated by standards. However, there are still many existing standards in other fields that are applicable to some healthcare services. For example, a public booth offering walk-in health monitoring would need to be accessible to wheelchair users and have an interface that was adaptable to individual needs such as large text, voice input, etc.

One topic that it is generally agreed requires standardisation is the electronic handling of health care records. The health care of a patient may be shared by several organisations, but their patient records will be held on a wide range of incompatible systems. To provide the highest possible level of care these systems need to be able to share information and a standard protocol for transferring electronic records is needed.

Another area that requires standardisation is medical imaging transmission over public networks (teleradiology). This is a growth area thanks to the recent developments in broadband technologies such as ADSL.

Computer telephony integration (CTI)

This technology has the potential to improve access to the workplace, education, community services, shopping, etc. for people with special needs. Since 1960 our ability to transport information over any distance has doubled each year. A low-cost electronic wrist watch now has more processing power than a mid-range computer of the 1960s, whilst the personal computer is now realising a processing, storage and display ability that surpasses mainframe computers of only ten years ago. If elderly and disabled people are to share the benefits of CTI their needs must be taken into account. The hardware needed to access information via CTI is already the subject of a wide range of standards.

Existing Standards and Guidelines

ISO

The majority of ISO standards relating to elderly and disabled people are concerned with the physical aspects of disability. For example, ISO/TR 9527:1994 Building construction -- Needs of disabled people in buildings.

Relevant standards
ISO/IEC 13714 “User interface to telephone based services – voice messaging applications.”

ETSI

The majority of standardisation work in ETSI relating to the needs of elderly and disabled people in carried out by Technical Committee Human factors (TC/HF). Founded in 1989 the terms of reference of TC/HF cover user interface (Man-Machine Interface - MMI) standards and guidelines for telecommunication equipment and services, including the requirements of people with special needs (i.e. the elderly and disabled). For a list of published and current work items see “Relevant ETSI recommendations” in the section of this report on “Communication Devices”.

In addition to TC/HF there is the ETSI User Group. The term “user” has various possible meanings ranging from a manufacturer using a standard to produce a product or service, to the end-user (or consumer) of such a product or service. The User Group in ETSI gives guidance on how user requirements can be taken into account during the standardisation process.

Relevant standards
EG 201 219 “User requirements; Guidelines on the consideration of user requirements when managing the standardisation process”.

ITU-T

The majority of work that is relevant to services is taking place in ITU-T Study Group 2 “Network and service operation”.

Question 5/2	Network related quality of service aspects of facsimile communication”.
Question 10/2	Management and development of PSTN-based telecommunication services”.
Question 11/2	New services and service enhancements brought about due to ISDN capabilities”.
Question 12/2	New services for broadband ISDN (B-ISDN)”.
Question 13/2	Mobile/personal telephone, telegraph, telematic, data, audiovisual and multimedia services”.
Question 15/2	Universal personal telecommunication (UPT) service”.
Question 16/2	Human factors issues in telecommunications affecting multiple services or not related to specific services”.
Question 17/2	Human factors aspects of voice and non-voice services using public terminals”.

Figure 14-2

Published Recommendations

ITU-T E.121 (07/96) - Pictograms, symbols and icons to assist users of the telephone service.

ITU-T E.133 (11/88) - Operating procedures for cardphones.

ITU-T E.134 (03/93) - Human factors aspects of public terminals: Generic operating procedures.

ITU-T E.135 (10/95) - Human factors aspects of public telecommunication terminals for people with Disabilities.

ITU-T E.136 (05/97) - Specification of a tactile identifier for use with telecommunication cards.

ITU-T E.137 (User instructions for pay phones) (Oct. 1997).

ITU-T E.138 (Public terminals for the elderly) (Sept. 1998).

ITU-T F.901 (Usability evaluation of telecommunications services).

ITU-T F.902 (Interactive services design guidelines).

Guidelines

Dialogues 2000 “Dialogues engineering style guide”, edited by Martin Bartholomew (Periphonics), Chris Durrant (BT) and Mervyn Jack (CCIR). This set of guidelines for voice based services has been developed jointly in the UK by Periphonincs, BT and the Centre for Communication Interface research (CCIR) at the University of Edinburgh. The style guide defines three main issues in dialogue engineering, ease of learning, consistency & reliability and cognitive load.

Ease of learning

Ease of learning is encouraged by building on prior experience with similar services, considering commands, terminology and dialogue structure.

Consistency & reliability

Consistency and reliability comes about by creating designs which are externally consistent with other systems and internally consistent within themselves.

Cognitive load

Cognitive load is about recognising that users should not have to learn long lists of instructions. Services should be structured so that a variety of paths can be followed through the dialogue.

Figure 14-3

Outputs from Projects

COST 219

The work in COST 219 had two aims. Firstly, to investigate how telecommunication services and terminals could be made accessible to people with disabilities and older people. Secondly, to investigate how telecommunication and teleinfomatic services could support people with disabilities and older people in their daily lives. A number of reports produced by COST 219 are relevant to the area of services.

"Telecommunications as a means for independent living" March 1994
"Smart cards and disability" November 1994
"Speech technology applications for disabled and elderly people" March 1995
"Services for independent living" June 1995
"Databases and information systems for people with disabilities" November 1995
"Universal services issues – a theme paper from COST 219bis" February 1998.

EURESCOM

"Telecommunications for elderly and disabled people, recommendations for the role of EURESCOM (Task T1.4 Final Report)"

This document reports the results of the work of EURESCOM project team S33 which investigated the current situation in Europe. It describes the ideal situation for disabled and elderly telecommunications users and the barriers to attaining it. From this base the team was able to identify the opportunities and challenges for EURESCOM in moving towards the ideal situation.

In order to face the challenges of provision and build the market opportunities for European PNOs EURESCOM needs to be active on 3 levels.
Immediate actions - inclusion of activities in work programme
Strategic actions - building the research base in Europe
Internal organisation - enhance EURESCOM sensitivity to this area

The barriers to access do not just appear at the terminal interface. With the increasing sophistication of the network they are moving into the network to be a function of the service being employed. A simple model is shown in Fig 14-4 to indicate the major interfaces, from the user perspective, where barriers may arise.

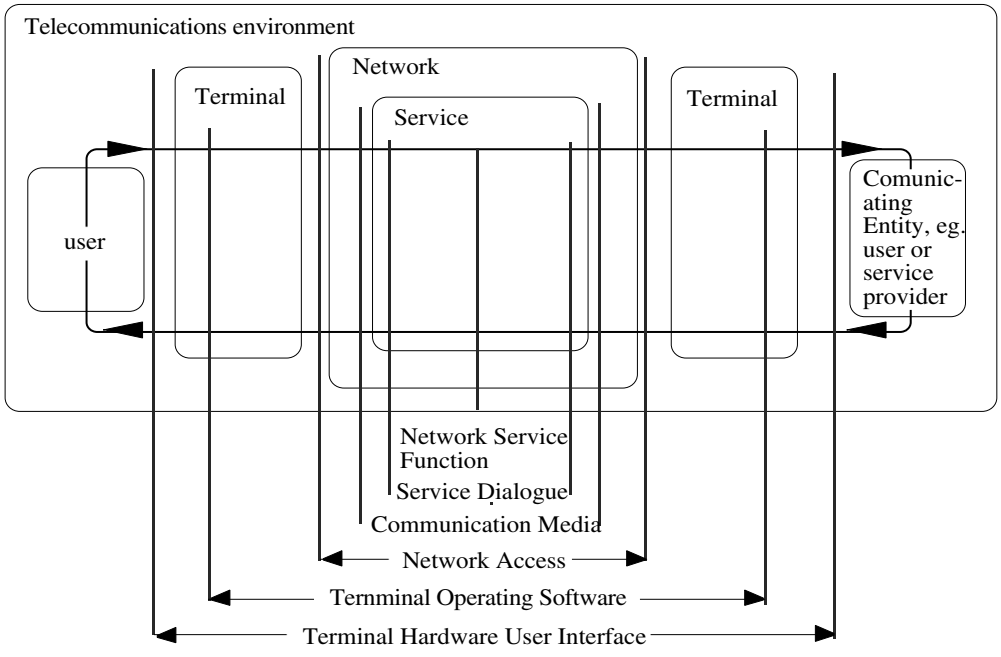
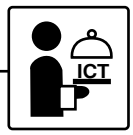


Figure 14-4: A simple model of the barriers faced by disabled and older people



HEART

(Horizontal European Activities in Rehabilitation Technology)

The HEART study was an interdisciplinary investigation of the rehabilitation technology situation in Europe. It was funded by the TIDE (Technology Initiative for Disabled and Elderly persons) programme. One of the six lines of the HEART study was Line A "Standards, testing and certification/specification of rehabilitation technology". Of particular relevance to services is Report A.3.4 "A model for user influence on standardisation". The recommendations from this report are included in the conclusions at the end of this chapter.

VISTEL

(Visually Impaired Screen based TELephony)

The VISTEL project (Visual Impaired Screen based TELephony) which began in January 1997 is investigating the adaptation of new "screenphones' with graphical displays, for blind and deaf-blind users. The project aims firstly, to clearly identify the barriers faced by visually impaired and deafblind people in gaining access to screenphone technology and to gather specific user requirements to facilitate this access. Secondly, the project will implement appropriate adaptations to services, network components and terminals and potential users will evaluate these in a number of European countries.

Data is currently being analysed from a questionnaire study which sought to identify the problems foreseen by visually impaired and deafblind people in the use of screenphones, as well as to establish the considerations they feel are important to ensure their access to this technology. The results of this survey are being used to identify possible solutions and to develop prototypes for evaluation. One possible solution to the problem of screenphone access for visually impaired and deaf-blind people is to provide Braille output and experiments are being conducted to investigate the acceptability and ease of use of different Braille solutions. Finally, appropriate methodologies are currently being devised for the evaluation of prototypical solutions as they are developed.

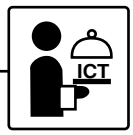
Workshops

The EU/ETSI workshop on "Standardisation and disability in Europe" (Amsterdam 1996) produced a set of fourteen recommendations that fell into three categories;
Market awareness,
Improvement of the standardisation process, and
Need for legislation.

The recommendations were directed at the EU Commission (1, 2, 4, 8, 11, 12, 13), CEN/CENELEC/ETSI (3, 5, 6, 9, 10), national governments (11, 12, 13, 14) and national standardisation bodies (3, 5, 7). The recommendations directed at CEN/CENELEC/ ETSI and national standards bodies (3, 5, 6, 7, 9, 10) are detailed below.

Market awareness
Recommendation 3
The standardisation organisations – both European and national – should make necessary information about ongoing standardisation work and its output easily accessible to everybody, i.e. at low costs, including electronic means (such as WWW).

Improvement of standardisation processes
Recommendation 5
Organisations of users and people with disabilities and older people should participate in standardisation work on the European level and be supported on the national level:
programming/planning by European user organisations and expert institutes/R&D etc.
technical work by experts (coming from manufacturers, user organisations, expert institutes, etc.)
The same applies to organisations which produce specifications (x-open, ATM forum, etc.)



Recommendation 6
Contacts/interaction between user organisations for people with disabilities and older people and standardisation bodies (technical experts) should be organised via reference groups in CEN, CENELEC and ETSI. The same applies to specification providers. These reference groups could also monitor progress.

Recommendation 7
A focal point/reference group on the national level managed by the national standardisation organisations is strongly recommended. At the same time research into the best ways of involving users in the process should continue.

Recommendation 9
Additional areas where standardisation work is needed were identified by the workshop and should be taken into consideration.

Recommendation 10
The pre-eminence of world-wide standards is recognised. However, where world-wide standards are not available, European standards should initially be produced, which could later contribute to world-wide standards.

User Requirements

Physical Handling of the Terminal

Home Environment

- A suitable terminal for accessing the service, adapted to the users needs.

Public Environment

- Same as for home, but with physical access to the terminal, e.g. access to buildings and access from a wheelchair, as additional requirements.

Mobile Environment

- Factors such as weight, display size and key size must meet the needs of the individual.

Requirement	Standards

Physical

- None identified.

Auditory

- Noise excluding handset.

Visual

- Enlarged keys.

Dexterity

- Ergonomically shaped handset.
- Lightweight handset.

Requirement	Standards
Cognitive	
- Keypad not in the handset in order to avoid problems with timeouts.	
Combination	
- None identified.	
Speech	
- Non-slip base, especially when terminal contains QWERTY keyboard.	

User Interface (UI)

Home Environment

- Exchange information in a format and at a pace which suits the needs and abilities of the user.

Public Environment

- Must take account of environmental conditions and need for confidentiality.

Mobile Environment

- Must be adaptable to a user-defined profile.

Requirements	Standardisation

Physical

- None identified.

Auditory

- Amplification, inductive coupling, visual/tactile key feedback, use of text via keyboard and visual display.

Visual

- Enlarged keys, tactile key markers, high contrast lettering, large text, tactile display.

Cognitive

Dexterity

- Dial out buffer memory (as used in mobile phones). Longer time-outs.

Requirements	Standardisation

Combination

- None identified.

Speech

- Text sending via keyboard combined with a visual display of text.

User Dialogue

Home Environment

- Should support the user in achieving their goal.

Public Environment

- Should be tolerant of background noise.

Mobile Environment

- Should support a range of dialogue methods.

Requirements	Standardisation

Physical

- None identified.

Auditory

- Accept input from a textphone.

Visual

- Provide spoken instructions.

Cognitive

- Wording of the dialogue should be unambiguous and avoid the use of double negatives.

Requirements	Standardisation

Dexterity

- Time-outs should allow for slow responses.

Combination

- None identified.

Speech

- Accept input from a textphone or speech synthesiser.

Adaptation to a User Profile

Home Environment

- User preferences stored by service provider and invoked automatically (e.g. by using CLIP to identify the caller and their pre-defined requirements).

Public Environment

- Facility to adapt public terminals to a user profile, possibly through use of a smart card.

Mobile Environment

- Mobile terminals adapted to user preferences using smart card.

Requirements	Standardisation

Physical

- None identified.

Auditory

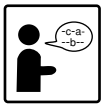
- Provide amplification and/or alternative outputs, e.g. text, sign language, etc.

Visual

- Provide speech output, larger text, high contrast displays, auditory key feedback and tactile markers.

Cognitive

- Provide sub-sets of functions and simplified instructions. Set longer time-outs to allow more thinking time.

Requirements	Standardisation
 **Dexterity**	
- Set longer time-outs to account for slower movements.	
 **Combination**	
- None identified.	
 **Speech**	
- Use alternative inputs, e.g. text, DTMF, etc.	

Security

Home Environment

- User identification should be appropriate to the abilities of the user.

Public Environment

- Public terminals should ensure privacy of personal information.

Mobile Environment

- Mobile terminals should support a range of authentication methods.

Requirements	Standardisation

Physical

- None identified.

Auditory

- Provide text based authentication.

Visual

- Provide security of spoken output in public places. Consider alternative outputs such as Braille.

Cognitive

- Use of iris scan, finger print or voice print for secure identification.

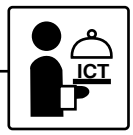
Requirements	Standardisation
 **Dexterity**	
- Use of iris scan or voice print for secure identification.	
 **Combination**	
- None identified.	
 **Speech**	
- Use of iris scan or fingerprint for secure identification.	

Dialogue Principles

Dialogue is defined as “The interaction between a user and a system to achieve a particular goal.” The following seven principles have been identified to be important for the design and evaluation of system dialogue.

Dialogue principle	Description
Suitability for the task	A dialogue is suitable for the task when it supports the user in the effective and efficient completion of the task.
Self-descriptiveness	A dialogue is self-descriptive when each dialogue step is immediately comprehensible through feedback from the system or is explained to the user on request.
Controllability	A dialogue is controllable when the user is able to initiate and control the direction and pace of the interaction until the point at which the goal has been met.
Conformity with user expectations	A dialogue conforms with user expectations when it is consistent and responds to the user characteristics, such as task knowledge, education and experience, and to commonly accepted conventions.
Error tolerance	A dialogue is error tolerant if, despite evident errors in input, the intended result may be achieved with either no or minimal corrective action by the user.
Suitable for individualisation	A dialogue is capable of individualisation when the interface software can be modified to suit the task needs, individual preferences and skills of the user.
Suitability for learning	A dialogue is suitable for learning when it supports and guides the user in learning to use the system.

(Source: ISO 9241-10)



Conclusions

Equality of access to services for older people and people with disabilities can be considered under four headings:-

• Terminal equipment (used to access the telecommunications network);

• User interface (designed by the service provider);

• Support services (e.g. billing in alternative forms such as audio or braille);

• Legislation (e.g. the Display Screen Equipment Directive and the multi-part standard ISO 9241).

The following is a combined list of demands that the terminal manufacturers, network operators, service providers and standards bodies must address.

• The standardisation organisations – both European and national – should make necessary information about ongoing standardisation work and its output easily accessible to everybody, i.e. at low costs, including electronic means (such as the Internet).

• Consumer organisations and organisations representing elderly and disabled people should participate in standardisation work on the European level and be supported on the national level.

• Contacts/interaction between organisations representing elderly and disabled people and standardisation bodies (technical experts) should be organised via reference groups in CEN, CENELEC and ETSI. The same applies to specification providers. These reference groups could also monitor progress.

• A focal point/reference group on the national level managed by the national standardisation organisations is strongly recommended. At the same time research into the best ways of involving users in the process should continue.

• The pre-eminence of world-wide standards is recognised. However, where world-wide standards are not available, European standards should initially be produced, which could later contribute to world-wide standards.

• Operators of services should be made more aware of the requirements of elderly and disabled users. They should be encouraged to develop and present business plans in the area of special services for elderly and disabled users. They should also develop and present business plans to give elderly and disabled users access to other services.

• Inductive coupling in all telephones.

• Variable amplification in all public telephones.

• A mandatory European communication protocol for text telephones.

• Public text telephones in selected sites.

• Network facilities to provide text information in parallel with (or in place of) voice information.

• Notched cards for all payphones and tactile identifiers on other pay cards.

• Specialist directory enquiry and service help facilities.

• Standardised layout on keypads.

• Prohibition of disconnecting telephones for outgoing calls.

• Bills available in alternative formats, e.g. large text, audio, Braille.

• Access to directory enquiries for text telephone users.

• A national text relay service for deaf, hard of hearing and speech impaired people.

• Alternatives to PINs for user identity verification.