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ETSI

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Foreword

This ETSI Technical Report (ETR) has been produced by the Human Factors (HF) Technical Committee of the European Telecommunications Standard Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or I-ETS.

Introduction

ETSI standardisation activity is proceeding particularly in the technological areas, but human factors and, in particular, related issues for handicapped and elderly people, is considerably under-represented.

It is now widely recognised that people with special needs may have problems in using the telephone and other telecommunications facilities. The introduction of new telecommunications services and devices may extend the difficulties for such people, since their use is very often rather complex. Therefore, it can be anticipated that people with special needs will increasingly be excluded from using telecommunications facilities in the future.

In the light of this situation, the European Commission requested ETSI to investigate the standardisation situation for people with special needs and to identify needs for additional standards and recommendations. The project was established as a project team reporting to ETSI TC-HF, which, as part of its remit, is considering the issues relating to people with special needs within the field of telecommunications.

An evaluation methodology for the collection of relevant material in the area of people with special needs was developed and a database established.

In a second stage, the members of the project team and additional co-operating partners from several countries of the European Community (EC) and European Free Trade Association (EFTA) improved the methodology and passed the accumulated material through the classification scheme in order to identify the current situation regarding standardisation activities for people with special needs. The gathered information was then analysed, and conclusions were drawn.

This ETR is based upon the results of the first stage, but includes the most important records held in the database. Since the results of the project were delivered to TC-HF, the database has been reduced down to the most pertinent standards material and is now maintained by TC-HF.

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Scope

This ETR reviews the standardisation situation in Europe, as it relates to telecommunications, focusing in particular on telecommunications facilities for people with special needs.

The ETR summarises the results of ETSI Project Team 6V and includes recommendations for further standardisation activities within the mandate of ETSI.

It contains information about the present standardisation situation in European countries, and describes the method used to evaluate the large amount of relevant material gathered during the study. The ETR draws on the material collected in order to formulate recommendations for further standardisation activity, in particular by considering reports about relevant European countries, by gathering the experience of researchers working in pan-European initiatives for people with special needs and from material outlining the expressed needs of disabled and elderly users of telecommunications.

2 References

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[18] "The telecommunications needs of Disabled and Elderly People - an exploratory study", March 1989, Report by Anthea Tinker of the Age Concern Institute of Gerontology, Kings College London for OFTEL.

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[22] CCITT Recommendation E.164: "Numbering plan for the ISDN era".

[23] CCITT Recommendation E.161: "Arrangement of figures, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network".

[24] CCITT Recommendation V.22: "1200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

3 Abbreviations

For the purposes of this ETR, the following abbreviations apply:

BABT	British Approvals Board for Telecommunications
BSI	British Standards Institute
CCITT	Consultative Committee on International Telegraphy and Telephony
COST	European Co-operation in the field of Scientific and Technical Research
DIN	German Standards Institute - Deutsche Industrie Normen Ausschuss
DTMF	Dual Tone Multi Frequency
EC	European Community
EFTA	European Free Trade Association
ERS	Emergency Response Service
ETR	ETSI Technical Report
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
FSK	Frequency Shift Keying
HASICOM	Hearing and Sight Communication
HDTV	High Definition Television
HF	Human Factors
IN	Intelligent Network
ISDN	Integrated Services Digital Network
ISO	Organisation for International Standardisation
MMI	Man-Machine Interface
OFTEL	Office of Telecommunications (UK)
PABX	Private Automatic Branch eXchange
PC	Personal Computer
PSTN	Public Switched Telephone Network
RACE	Research and Development in Advanced Communications Technologies in Europe
RNID	Royal National Institute for the Deaf (UK)
SAS	Social Alarm System
STC	Sub-Technical Committee (ETSI)
TDD	Telecommunications Device for Deaf user
WS	Work Station

4 European standardisation situation

4.1 Introduction

The main objective for the project was to seek to identify relevant standards applying in Europe, and to understand the scope of the telecommunications facilities available in these countries. To this end the project was mandated to spend a reasonable proportion of its effort on this topic, and then to draw conclusions from what was learnt.

It was decided to find countries whose telecommunications provisions appropriately represented the situation in the regions of Europe. These distinct regions were identified as Scandinavia, Northern Europe, Southern Europe, Central Europe, EFTA and Eastern Europe. In addition, some effort was made to consider the situation in the former Eastern Block Countries.

In this Clause, therefore, the overall telecommunications situation of these countries has been summarised, and any particular provision for people with special needs has been outlined.

4.2 Standardisation situation in EC countries

4.2.1 Denmark

4.2.1.1 General remarks

The annual budget in Denmark for all types of technical aids is estimated to be in the order of 150 MECU to 200 MECU, i.e. approximately 30 ECU to 40 ECU per inhabitant per year. The political trend is clearly to provide, free of charge, technical aids to people with special needs to the widest extent in order to improve their possibility of functioning better in their everyday life, but also, however, to reduce other types of social resources. The cost percentage in the field of telecommunication is not clear. Only in fields of big market volumes do some codes of practice and specified standards exist, e.g., options to the telephone terminals, social alarm systems, etc....

There are four telephone companies in Denmark, two covering each of the two major islands, Sealand and Fynen, one covering the middle and north of Jutland, and one covering the south of Jutland.

Earlier, these companies had the full monopoly of both telephone terminals and the network. In December 1989, however, the terminal market was liberated and, in June 1990, the network market was also liberated. However, terminal equipment to be connected to the Public Switched Telephone Network (PSTN) under these four companies have to comply with the requirements from the authority: Telecom Inspectorate, Denmark (TI).

4.2.1.2 Telephony

The telecom companies in Denmark have a tradition of also being able to supply special versions of the normal telephones with different features for the different impairments. For example,

Visually impaired people:

- enlarged keyboard pads;
- autodialer for fixed programmed numbers.

Blind people have a problem because two keypad standards (CCITT and ISO) are used.

Hearing impaired people:

- additional acoustic or visual indication of the phone ringing;
- adjustable acoustic amplifier and magnetic coil;
- text telephone, as described in subclause 8.4.

Reduced co-ordination:

- enlarged keyswitch for loudspeaker;
- special framework reducing the risk for pressing more than one key simultaneously.

Speech impaired people:

- amplifier on the microphone.

4.2.1.3 Other networks available

Apart from telex and Datex (circuit switched data network), a public packet switched network (Paxnet) is also available in over 90 % of the country. Modem and connection can be offered within a few days, from which connection can be made to value added services, e.g., social alarm transmission can be established to a 24 hour manned watchcentre.

4.2.1.4 Videotelephony

This facility is not normally available for people with special needs today. However, a network called "MegaNet" may be established via multilines on the PSTN with a capacity of 2 Mbit/s. Between all the larger cities in Denmark, optical fibre lines also exist offering a capacity of 140 Mbit/s.

4.2.1.5 Text-telephones

In Denmark there are three different standards for text-telephones. The Danish text-telephone system uses the Dual Tone Multiple Frequency system (DTMF system) for signalling. In Europe, only the Netherlands and Denmark are using this system and a change to Frequency Shift Keying (FSK) is under consideration.

The telecommunications companies are running a relay service for establishing calls between text telephone users and ordinary subscribers. This works in two ways: for non-speaking and non-hearing users the operator is the link between the two parties, but if the text-telephone user is able to speak but not hear, or able to hear but not speak, it is possible for sound to be transmitted directly between the two communicating parties, with the operator translating from text to speech or vice versa.

There is also an automatic conversion system, enabling text-telephones with different signalling systems to communicate.

The telecommunication companies pay for the terminals, and whether a person is entitled or not to have the text-telephone is decided by a committee with members from the relevant handicap organisations and others. There is no compensation for the costs of the extra time needed because of the slower communication.

There are approximately 2 000 users of text-telephones in Denmark.

At present, there is no telephone system with Braille output for the deaf-blind in Denmark, but a project is being set up to introduce such telephones. When this project has been finished, and a system has been chosen, the public social sector or the telecommunications companies will provide the telephones. It is estimated that there will be, approximately, 50 users of such a system.

Another problem under consideration is access for blind people to the telephone directory. The telecommunications companies are running an operator-manned directory information service for all subscribers, but the charges for using it are relatively high. With the new digital telephone exchanges it is possible to adjust charge rates individually, which means that a blind subscriber could be allowed to use the directory information service at a lower rate than others.

4.2.1.6 ISDN facilities

ISDN field tests are going on between the major Danish cities and are also being performed in co-operation with Swedish Telecom. The plan is to connect it to the common European ISDN network. At the same time the network will also become available to the public.

4.2.1.7 Information retrieval services

Today, information retrieval services are not normally directly available to people with special needs via the telephone network. Television text is quite common offering some 600 pages of many different types of information. To get access to databases, etc., people with special needs will need a PC including a modem to the PSTN.

A system like the French MINITEL is not available in Denmark.

4.2.1.8 Other services in the field of telecommunication

Social Alarm Systems (SAS)

SAS are primarily intended for impaired or elderly persons living on their own, who are at risk of finding themselves in a situation that requires assistance - emergency as well as service.

In Denmark, the SAS is defined as a 2-way communication system normally controlled by the watch-centre. The communication is opened by a call either by an autodialler or by transmission via the packet switched data network (Paxnet) in Denmark.

As mentioned earlier, no European standard exists, but in Denmark a standard has recently been approved as a basis for granting labelling permission from the Danish Institute for Technical Aids.

The standard is:

Draft Type Testing of Social Alarm Systems,
CLC/TC79/WG4(DK1).REV C 900529 FH,
By Flemming Hjorne, Project no. 332320 - 29 May 1990.

This draft will be submitted to the other Nordic countries for approval as a NORDTEST method. The standard specifies:

- a well-defined average transmission range of the radio transmitter;
- the environmental stability and immunity (temperature, humidity, EMC, etc.);
- requirements to function and construction, e.g., back-up capacity, etc.

Public paging system (DK/OPS)

Most of Denmark is covered by this radio paging system. From any telephone it is possible to communicate a message of a maximum of 20 digits to a specific numbered radio receiver.

Environmental control

For remote control of a number of different functions within the premises like e.g., lights, opening of front door, hook-off the handset on the telephone, etc.. The following draft was prepared in the Nordic countries:

> **Proposal for the Quality Requirements for Environmental Control Devices in the Nordic Countries,**
> 15 September, 1989
> prepared by:
> Dansk Hjaelpemiddel Institut/DK
> Handikappinstitutet/S
> Rådet for tekniske tiltak for funsjonshemmede/N
> Valtion teknillinen tutkimuskeskus/SF.

4.2.2 France

4.2.2.1 General

In 1990, a report on the situation in France with respect to people with special needs and telecommunications was published which showed that the French population was found to include:

- 10 % of physically handicapped;
- 19 % of elderly people;
- 45 % people who have particular difficulties using new technologies.

It also showed that disabled people want to be independent, whereas elderly people are more willing to be helped. A particular focus of the report was on access to different telecommunications services.

4.2.2.2 Communication problems

Using bank cards: 59 % of the population were reported to have them but only 20% were using them. Those who do not use them expressed two principal concerns:

- there are no existing standard procedures;
- no information is given during the financial transaction.

Recommendations include:

- a vocal guide should help people with visual impairments and will, of course, also help non-visually impaired people when lighting conditions are poor (e.g. very strong sunshine on the screen);
- manual directions need to be given and should be easy to follow;
- bank, or telephone cards should be marked in some way to indicate the direction in which they should be inserted.

Using the telephone: recommendations include:

- amplifiers and supplementary earpieces should be provided for hearing impaired people;
- keyboards should have large and well-separated keys for visual and motor impaired people;
- cordless equipment should be provided for mobility impaired people.

Profoundly deaf people are able to use Dialog MINITEL (50% of profoundly deaf people are using it at present).

The keyboard - the use of function keys is necessary.

European calls - should follow CCITT Recommendations:

- 0 used for national calls;
- 00 used for international calls.

Television pictures - mobility impaired people can use decoders; hearing impaired people can use subtitles.

The national centre for the study of telecommunications in France has initiated a study on the use of the Videophones by deaf people. The study has the additional aim of helping mentally impaired users during the course of making calls. Another study is being carried out which is concerned with the use of personal computers by disabled people. The aims were:

- to find alternative methods of presenting screen information for visually impaired users, including sound or Braille;
- to replace auditory information by alphanumeric characters;
- to provide alternative man-machine-interfaces to enable different disabled users to gain access to the new telecommunication services (electronic mail, facsimile, etc...).

4.2.2.3 New applications

It was noticed that the heterogeneity of the different systems is a big problem for disabled people, who need to use different interfaces in order be able to communicate, learn, move, control the environment, etc.. Applications which should be considered include:

- vocal and Videotex servers;
- Intelligent Networks;
- intelligent houses.

With respect to the latter application, the harmonisation concerning the input/output interfaces and the environmental controls need to be studied.

4.2.2.4 Man-Machine-Interfaces (MMI)

An examination of lists of different disabilities and the existing input/output interfaces shows that many problems are encountered when using terminals or interactive services in order to communicate:

- difficulties accessing keyboards, memory cards, WIMPS, etc.;
- difficulties accessing sound signals and vocal instructions;
- difficulties accessing MMIs with texts and graphics.

Studies need to be run to validate the suggested recommendations, especially with respect to the human engineering interfaces, e.g.:

- key and character size;
- sound amplification levels;
- layout of keys on the keyboard.

The commission for visually impaired people has put forward the following recommendations. Their priority is to establish specifications which will permit the visually impaired to have easy access to the different services and terminals.

Standardisation of:

- keyboards;
- interfaces;
- synthetic speech protocols;
- telephone and bank cards;
- acoustic guides.

Recommendations for:

- braille or large print in telephone boxes;
- Videotex standards to improve accessibility for visually impaired people;
- development of synthetic speech terminals.

4.2.3 Germany

4.2.3.1 Introduction

The following subclauses under 4.2.3 deal with the standardisation situation of the telecommunication network services that are the responsibility of the Deutsche Bundespost TELEKOM. An attempt is made to fairly present the multitude of offered services and show a variety of communication possibilities available for handicapped people.

Integrated Services Digital Network (ISDN) is covered in particular, along with an overview of the current state and future developments of the ISDN standards on a European and national level. Also, current ISDN services and user-related ISDN service characteristics are introduced.

4.2.3.2 Telephone network and "Intelligent Networks"

With about 28 million analogue subscriber lines and 6 200 local and long-distance switches, the TELEKOM provides of an extremely, high-performance telecommunication infrastructure. In the former East German Republic (GDR) only a total of 7 % of the households have a telephone line, 65 % of which have been installed as two-party line systems. This compares with a total coverage of close to 98 % in the Federal Republic of Germany. Because of the obsolete and therefore maintenance-intensive electro-mechanical dialling system, the average bit-error rate within the GDR telephone network is 10-2. This high bit-error rate allows only limited facsimile and data transmissions.

Based on the CCITT signalling system No. 7, the technical guidelines 1TR7 have been adapted by TELEKOM as the signalling system between switches, because of their excellent flexibility when

integrating new services. See Deutsche Bundespost, Fernmeldetechnisches Zentralamt: Technische Richtlinie 1TR7 [1], CCITT Recommendations Q.700 - Q.716, Specification of Signalling System No. 7 [2], CCITT Recommendations Q.721 - Q.766, Specification of Signalling System [3], CCITT Recommendations Q.771 - Q.795, Specification of Signalling System No. 7 [4] and Bocker, P. : ISDN Das diensteintegrierende digitale Nachrichtennet [5]. Furthermore, it is intended to construct a so-called Intelligent Network (IN) based on signalling system No. 7. Therefore, services like databases and data collection systems may be integrated into the public network. Some IN-services are listed below:

- charge-free call (Green Number Service);
- network automatic call distribution;
- televoting;
- alternate billing service;
- private virtual network;
- Emergency Response Service (ERS).

With the introduction of Intelligent Networks, new services such as Emergency Response Services (ERS) will become available. This service features a uniform telephone number that directly connects the service user to the nearest emergency station. The number of the caller (Automatic Number Identification) is transmitted to the emergency station, so that identification and eventually access to additional information, like sickness data, prescribed medications, etc., is possible.

4.2.3.3 Terminal equipment in the analogue telephone network

With liberalisation in July 1989, TELEKOM gave up their monopoly position on terminal equipment. This caused a wide spectrum of telephones and additional equipment to be offered. On the other hand, new performance characteristics and comfort functions for conventional telephones were developed as well. That is why, for example, a telephone was marketed that allows an acoustic user interaction. Also, the possibility of bimodal dial-up (touch-tone and pulse) opens new opportunities for handicapped people, with features like universal suffix-dialling of an existing connection, within the analogue telephone network.

In order to combat vandalism and criminal manipulation of public coin telephones, TELEKOM has decided to introduce card telephones. Although acceptance research has been conducted on card and machine operation, problems that handicapped and other disadvantaged groups of people have, who are using the card telephones, cannot be overlooked.

4.2.3.4 ISDN service and service characteristics within the area of TELEKOM

What follows is a collection of the ISDN services offered by the DBP since 1989:

- telephone (3,1kHz bandwidth):
  - ISDN service characteristics;
  - conventional (analogue).

- Data transfer:
  - 64kbit/s circuit-switched;
  - Terminal Adaptor TA (a/b);
  - Terminal Adaptor TA X.21;
  - Terminal Adaptor TA X.25 (packet-switched for access to DATEX-P).

- Teletex:
  - 64kit/s;
  - Terminal Adaptor TA (Ttx);

- Facsimile:
  - ISDN-terminal equipment with Group 4, class 1;
  - terminal equipment with Group 4 and Group 3;
  - Terminal Adapter TA (a/b) with terminal equipment Group 3.

- Videotext:
  - 64kbit/s;
  - Terminal Adapter TA (a/b) or TA (Btx).

The inclusion of telephones with a bandwidth of 7 kHz were included from 1990 and it is now planned to include the picture telephone into the ISDN service concept.

ISDN-PC-terminal equipment

The connection of the Personal Computer (PC) and the Work Station (WS) into ISDN allows a completely new type of communication that, because of the ergonomic arrangements possibilities for PC and WS, could open new perspectives for handicapped people. A variety of ISDN-PC-slotcards is available to allow the physical interface between to S0-bus and the PC/AT-bus. Attractive offers from TELEKOM are supposed to enhance the sales of approved ISDN slotcards.

Due to the possibility of local processing and storage of data, text, graphics and voice, an ISDN capable PC or WS has an enormous application-potential for novel communications for handicapped people. An intelligent user-control and/or an integrated speaker-dependent or -independent voice recognition system, for example, could ease the operation procedures for certain handicapped groups. To further extend multi-service terminal equipment, voice-mail applications may be implemented, so that language output may be repeated as many times as desired.

For the local processing and storing of a non-voice communications type (text, data, pictures and graphics) a PC or a WS is required. The inclusion of non-voice information types allows further help for handicapped people.

4.2.4 Great Britain

4.2.4.1 Introduction

In 1981, The Telecommunications Act separated British Telecom from the Postal Services and opened the way to the liberalisation of the supply of equipment and information services. This resulted in a duopoly with telecommunication services provided by two companies, British Telecom (BT) and Mercury. Both of these companies have a statutory obligation to supply equipment and a service for disabled users.

The Office of Telecommunications (Oftel) was created as a regulatory body.

In 1990, a further government review proposed the ending of the duopoly and to allow other new companies to apply for licences to run local and international services.

4.2.4.2 British Standards

A comprehensive set of British Standards covers the general requirements for much of the equipment available in Great Britain.

In addition, a number of Oftel standards and requirements exist for certain types of apparatus.

- Oftel standard OTR001 requires that all PBX equipment with a capacity of greater than 6 trunk lines, have a suitable adaptation for use by visually handicapped telephonists. (This standard is shortly to be incorporated into BS6450, as part 4.)
- Oftel standard OTR002: 1988 specifies that all private payphones are fitted with inductive couplers.

Important OFTEL recommendations have also been published, including:

- "A guide to the requirements for text communication equipment for use by hearing impaired people and others" (Oftel Reference WGH1(87)35).
- "Code of Practice for the magnetic coupling of telephones to hearing aids". This document refers to BS6317, Simple Extension Telephones, CCITT Recommendation P.37, Magnetic field strength for hearing aids, BS6083, Standards for Hearing Aids.

- "Standard for Simple Telephones with additional receive amplification". This document refers to BS6317, Simple Extension Telephones.

4.2.4.3 The telephone network

Telephone Equipment

A wide range of telephone equipment is available from many suppliers. All such equipment shall have British Approvals Board for Telecommunications (BABT) approval.

A selection of equipment is available from BT and third parties for disabled users. For hearing-impaired people there are: amplifiers, inductive couplers (fixed and portable), high volume tone ringers and flashing-light ringing indicators, loudspeaking telephones, pagers fitted with a vibrating alerting device.

For visually impaired people there are:

- enlarged number telephones;
- enlarged dial surrounds;
- tactile accessories.

For people with a weak voice, a telephone is available with outgoing amplification.

For people with speech problems, a keyboard-controlled voice synthesizer product is available.

For special cases, equipment is available enabling telephones to be operated by severely disabled people with the minimum of movement.

For general application, there is a range of accessories to help support, extend or duplicate telephones.

Several types of Social Alarm Systems are available. A British Standard Code of Practice exists for this type of equipment (BS 6804). The services are mainly run by local councils or social service departments. Over 300 such schemes are now running.

Payphones

Public payphones are provided by both BT and Mercury. There are a number of options for payment. Coin payment is still the most common. Pre-paid phonecards of a fixed number of units are issued by both companies.

There is a statutory requirement under the terms of the licence granted to BT and Mercury, that they install inductive couplers on all public payphones (as detailed in the telecommunications act). Under the Branch Systems General Licence, this requirement also applies to phones on private premises to which the public may have access and to emergency phones in lifts.

4.2.4.4 Videotext

The main Videotext service available is BT's "Prestel". This offers dial-up modem access to a whole range of public and private information sources. For disabled people, there are several information sources within the Prestel service.

4.2.4.5 Text telephony

The Royal National Institute for the Deaf (RNID) has been running an experimental text telephony/relay service. A 24-hour nationwide service was due to be launched at the end of 1992, funded by BT.

Callers wishing to contact a hearing-impaired person can ring in to the RNID's Relay Centre and an operator transcribes the caller's conversation into text which is transmitted via a modem to the recipient's receiver. The receiver can either be a special portable terminal or a computer with a modem. The

recipient can then reply by the reverse sequence. A "talk through" facility is provided. There is a live interactive service which has proven very successful.

4.2.4.6 Tactile braille telephony

A project run by the National Deaf-Blind League called HASICOM (Hearing and Sight Communication), provides equipment and training for Deaf-Blind people to communicate via the PSTN. Two types of equipment are supplied. For blind users, a braille terminal fitted with a modem is used and for partially sighted users a PC computer with large text capability and a modem is used. Users can either communicate via a mailbox on Telecom Gold, or directly. In principle, the PC or Braille terminal gives them access to any other computer/modem service.

Currently there are 45 people using the service. The modems used are CCITT Recommendation V.22 [24] compatible (1 200 baud).

4.2.5 Greece

4.2.5.1 General remarks

There is a state monopoly on telecommunications which is exercised through OTE, an independent organisation controlled by the government. The present situation is, however, about to change with the introduction of digital technology underway and with present government plans to deregulate and privatise part of the future telecommunication services.

4.2.5.2 Proposed services for people with special needs

Very recently, activities have been initiated with OTE for the introduction of some pilot projects towards the establishment of such services. Discussions, in principle, presently involve the following services:

- text-telephones for deaf people;
- digital newspaper for blind people;
- alarm systems;
- telephones for deaf/blind people.

4.2.6 Ireland

4.2.6.1 General remarks

It is only in recent times, since 1984, that Irish Postal and Telecommunications activities have existed as separate entities. The telecommunications sector is defined as a "semi-state body", meaning that it is owned by the state but operates according to commercial criteria, in a market where Telecom Eireann has a monopoly as a single and exclusive provider of the PSTN but with increasing liberalisation leading to competition in value added services related to the core network.

Private voice/data networks are widely used by large private/public companies for internal communication/data flow which can only be supplied by Telecom Eireann. For reasons of national security, independent microwave communications systems are operated by the power supply authority, national defence and civic guards. A nation-wide cellular/mobile phone network is also supplied by Telecom Eireann which is the sole licensee at present. The country's largest cable television network is also supplied by Telecom Eireann which competes with a number of other suppliers. The carrying of international traffic as far as the country's national boundaries is the sole prerogative of Telecom Eireann, but competition is being felt from privately owned international network provider's routing of international traffic out of Ireland on leased circuits to hubbing centres for international transmission via cable or satellite.

4.2.6.2 Telephone service for the disabled

Telecom Eireann, in conjunction with the National Association for the Deaf, National Rehabilitation Board, Central Remedial Clinic and other associations working for the needs of handicapped people, have examined the main problem areas restricting access to the public telephone network:

- provision of a suitable basic handset for hard of hearing users;
- provision of a Telecommunications Device for Deaf users (TDD);
- provision of silent call indicators;
- reduced call charges for hard of hearing/deaf users;
- provision of central relay service for TDD users;
- to provide public payphones suitable for hard of hearing users;
- to ensure ease of physical access and use of public payphones for physically disabled users;
- to provide physical indicator on key-pad - (protrusion on central digit "5");
- enlarged key-pad to aid poor manual dexterity;
- use of braille number identification in public payphones;
- enable access free-of-charge to Directory Enquiries by blind people.

A "charter of rights" entitling disabled telephone customers to equal access to the network, where practicable, has been drawn up by Telecom Eireann in conjunction with organisations representing disabled people.

4.3 Standardisation situation in EFTA countries

4.3.1 Austria

No standards directly relating to the telecommunication requirements of the target group could be identified, a lot of background information and general guidelines were found and entered into the database. Most of this material deals with the design of a barrier-free and accessible environment for mobility impaired people. The Austrian PTT has issued a lot of documents about barrier- free buildings and wheelchair accessible telephone booths.

The needs of sensory impaired users are very seldom addressed. Few documents deal with hearing amplification and inductive coupling of hearing aids. The only assistance offered for blind and visually impaired telephone users is a specified raised dot placed in the centre of the "5" key on all push button telephones and a tactile notch on payphone-cards to indicate the correct direction for inserting the card.

The investigation at the Austrian Standards Institute produced a handful of national standards relating to disability, but none explicitly dealing with telecommunication. Austria has produced a standard which specifies the assignment of the 8-dot braille characters to the 8-bit code. This standard could be very helpful for designing future telecommunication equipment with braille output.

4.3.2 Sweden

4.3.2.1 General remarks

In Sweden, postal and telecommunication activities have always been separated. Furthermore, government regulation of the telecommunication sector is by tradition limited. No statutory monopoly exists for the installation and operation of telecommunication networks. Therefore, besides the public state-owned telecommunication network for which Televerket (Swedish Telecom) is responsible, Sweden has extensive telecommunication networks to satisfy the internal needs of railways, power supply and national defence. In addition, private companies operate networks for cellular radio and cable television in competition with Televerket; competition in providing network services is also increasing for international traffic.

Sweden has no specific regulation for value-added services. However, all business activities, including those in the telecommunications field, are subjected to general Swedish legislation on competition. The market for terminals intended for connection to the public telecommunication network was gradually liberalized during the 1980s and in 1989 the whole terminal market, including Private Automatic Branch

Exchanges (PABXs) and pay-phones, was fully opened to competition. This means that the customers of Swedish Telecom can buy their terminal equipment from any supplier. However, the equipment has to comply with a set of technical conditions for the permission to be connected to the public telecommunication network operated by Swedish Telecom.

4.3.2.2 Telematics and people with special needs

In Sweden there are no telecommunications standards which address the needs of people with special needs. During 1990 the Telematics and Disability Project has been running the following projects:

1) Document-reading through facsimile for visually impaired people.
2) Still picture telephones for mentally handicapped people.
3) ISDN/videophony.
4) Videocommunication for deaf people.
5) Sign-language newspaper for deaf people.

The Swedish government has explained that Televerket has a special social and regional responsibility. A "standard" telephone is part of these service-provider obligations. The "standard" telephone is a product built to higher standards of quality than that which is required for approval. It is constructed to suit 95% of the population. Thus it has:

- a big keyboard and pads;
- tactile indication on pad "5";
- autodialler (programmable);
- adjustable ringer (both level and tone);
- induction loop for hearing aid bearers;
- adjustable volume (both acoustical and inductive).

However, the "standard" telephone is not a part of the telephone subscription. It is bought like any product and is, therefore, the property of the purchaser.

4.3.2.3 Text-telephone services

In Sweden it has been estimated that there is a need for 5 500 to 6 500 text-telephones in order to assist deaf, hard of hearing and speech impaired people in their daily living. The service started in 1980, and, presently approximately 6 000 text-telephones are in use in the homes of the handicapped. In Sweden both DTMF and V.21 are accepted procedures. A relay-service has also been included.

4.3.3 Switzerland

The situation is very similar to the one prevailing in Austria. No standards were identified. As there are several manufacturers for telecommunication equipment for handicapped users located in Switzerland, there seems to be a reasonable awareness for special needs and a good knowledge of products.

As in Austria, the major part of the identified document deals with questions of accessibility for mobility impaired persons. There are some good suggestions to assist visually impaired persons, e.g. a standard describing the necessary height of characters for different reading distances.

4.4 Standardisation situation in Eastern European countries

The situation may be summarised as follows:

1) No international or national standard is available in Eastern Europe which covers the field of telecommunications and issues for people with special needs.

2) Very little additional material is available which might be useful for future standardisation activities related to people with special needs in the future:

- in Czechoslovakia, TV news can be transmitted in sign language for deaf persons. A periodic TV programme for deaf people is also available;
- in the former East Germany, some institutions were developing facilities for people with special needs, e.g. speech synthesis at traffic lights for blind people "Specifications for Traffic Lights for Blind and Visually Impaired People" [6], "Remote Controlled Speech Output at Traffic Lights for Blind People" [7] or guidelines for access of people with special needs to public buildings, "Constructional Measures for Handicapped Persons in Public Transport Environments" [8].
- in Poland, research activities include computer-based telephones for deaf-mute persons. The system is comparable to the French Minitel system, "Telephone Set for Deaf-Mute Persons" [9], "Microcomputer in Telephony or Deaf-Mute Persons" [10];
- in the ex-USSR, no telecommunications applications for people with special needs exist. Some boarding schools for the disabled are interested in using appropriate telecommunications facilities. The ex-USSR indicates that there are more than 10 000 blind people registered as being in vocational activities;
- additional activities in Eastern Europe were presented at the DAGA-conference in April,1991 in Bochum.

The main reasons for this situation are that:

- in many countries telecommunications themselves are rather poor;

- it is assumed that the standardisation situation for telecommunications issues is as poor as that of the telecommunications situation itself;

- the term "people with special needs" has, in most cases, not been applied to telecommunications or has not been introduced at all. This situation may change in the near future.

On the other hand, many of the organisations from whom information was obtained have expressed the view that standardisation is urgently required. They also expressed great interests in being involved in cooperation with organisations like for example, the European Co-operation in the field of Scientific and Technical Research (COST).

At the moment, no other material is available from Eastern European countries and the probability is low that important information will be found. On the other hand, there is great interest in being involved in future activities on telecommunications issues for people with special needs.

5 Evaluation methodology and statistical results

5.1 General description

This subclause describes the method. Subclauses 5.1.1 and 5.1.2 contain a general description of the evaluation model and the classification procedure.

5.1.1 Evaluation mode

The evaluation methodology is based on a model which was developed from similar models used in different European initiatives for telecommunications facilities for people with special needs. The core of the model is a description of a user, a description of the interaction steps involved in the use of a telecommunications service and a list of different services. The topics of interest are the "user function", the "telecommunications interaction" and the "telecommunication service" (see figure 1). These three lists are arranged in a three dimensional matrix cube, so that information gathered during the study could be classified according to the topics covered within the three areas of interest.

The parameter user function describes the various functions which are necessary to use a specific telecommunications facility. In the case of an impairment of one or more user functions, a user may have problems with a specific telecommunication interaction or a telecommunication service (e.g. the use of a telephone by a motor impaired person).

In using a telecommunication facility, several telecommunication interactions have to be performed. If, for example, disabled people want to use a public telephone, they need to know where the telephone is located and how they can get access to it. They need to know where they can get the telephone number of the people they want to contact, how to use the telephone terminal, where coins or cards have to be inserted, how to dial, etc...

Influenced by the COST 219 book [11], where the impacts of a specific impairment to the telecommunications interactions are described, it was found that many pairs of a specific user function/telecommunication interaction are similar to a specific class of telecommunication services, e.g. conversational services. Thus, the third axis of the model, named as telecommunication service, is divided into four service classes, i.e. conversational services, messaging services, retrieval services and distribution services. This also follows the foundational services work found within the Research and Development in Advanced Communications Technologies in Europe (RACE) programme.

The names which have been chosen for each category of the model have been selected to highlight the fact that this study focuses on functional aspects. The advantage of a functional description of the field of telecommunications facilities for people with special needs is that it can be used either in the present (analogue) or in a future (digital) telecommunications environment.

5.1.2 Document classification methodology

The essential idea was that at the end of the study each cell of the model could be related to a number of documents which address the issue that it covers. To fulfil this task, a number of steps had to be performed which are described below.

1) Each relevant document was classified against a number of criteria. The criteria were established in order to make correspondence between the model and the document. Besides the information identifying a specific document, the most important classification criteria are:

   - type of document (e.g. standard, proceeding, book, journal);
   - user function and corresponding matrix code (as described above);
   - telecommunication interaction and corresponding matrix code (as described above);
   - service and corresponding matrix code (as described above);
   - document status (e.g. international standard - appropriate to people with special needs standards or background material). From this parameter, the importance of the document for further activities can be derived;
   - coverage (e.g. design, evaluation, usability).

2) The classification codes were stored for later evaluation. To allow quick searching, an electronically held database was created and maintained.

3) The evaluation of the database led to a statement within each cell of the model describing the standardisation situation identified by a letter code. From that statement, further or future standardisation activities for specific areas could be prioritised.

5.2 Statistics

In the following figures, the results of the classification of the documents collected are displayed. The statistical review is divided into two parts. The first shows the distribution of the documents against the following criteria:

- type of document (book report, etc.);
- document status (international standard, background material, etc.),
- coverage of documents (design, evaluation, etc.).

The second part shows the distribution of the documents according to the three dimensions of the classification model:

- user function;
- telecommunications interaction;
- service classes.

Figure 1 displays the distribution of various document types.

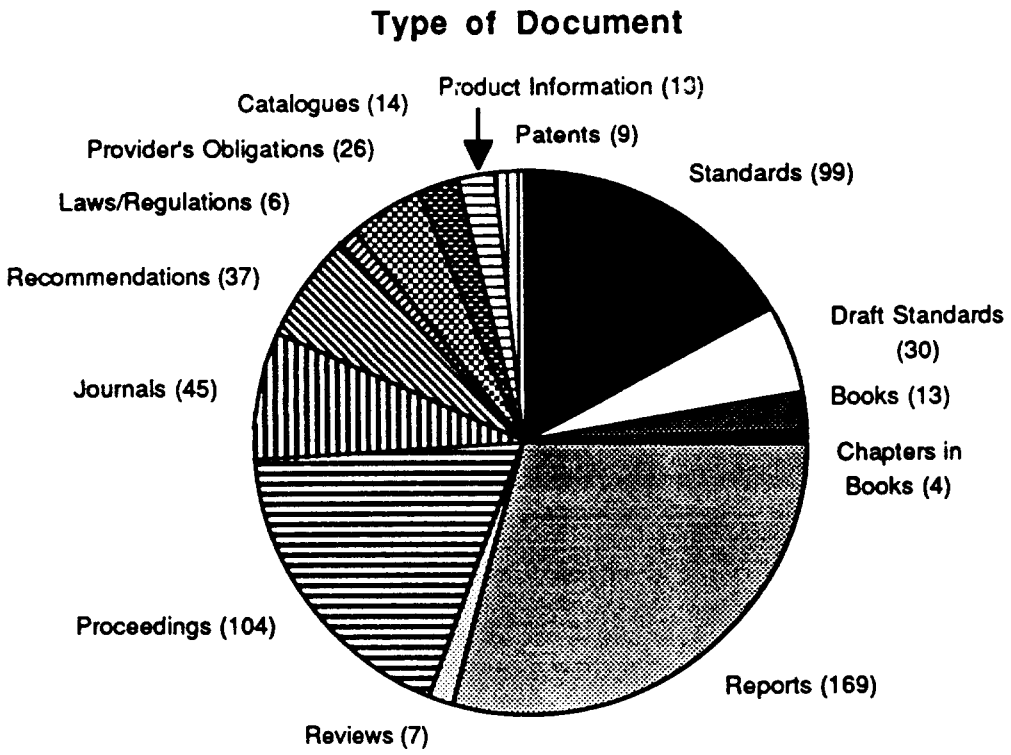

Figure 1: Type of document

As shown about 22% of the documents are standards and draft standards. Another 11% contain recommendations or provider's obligations. Nearly 66% of the material are of other types, e.g. reports (about 30%), proceedings (about 18%) or journals (about 8%).

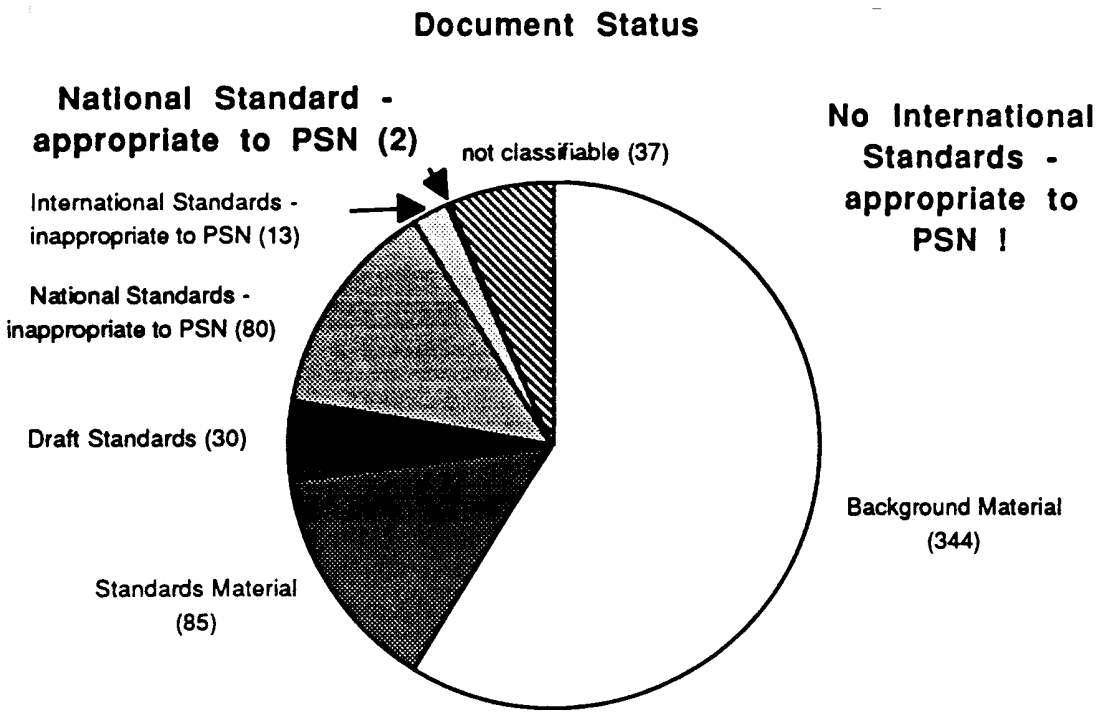

Figure 2: Document status

Figure 2 displays the standardisation situation very clearly, and the following points become immediately apparent:

a) no international standard and only two national standards appropriate to people with special needs were identified;

b) 80 national and 13 international standards (about 16% of all documents) exist, which are relevant, but do not cover both telecommunications facilities and issues for people with special needs. Therefore, they have been classified as standards which are inappropriate to people with special needs.

EXAMPLE: National standards exist at the DIN institute specifying requirements for office workplaces with visual display terminals. These standards do not cover any issue for people with special needs directly, but conflict with requirements for terminals for people with special needs. Thus, they have impact on the usability by people with visually impairments for example.

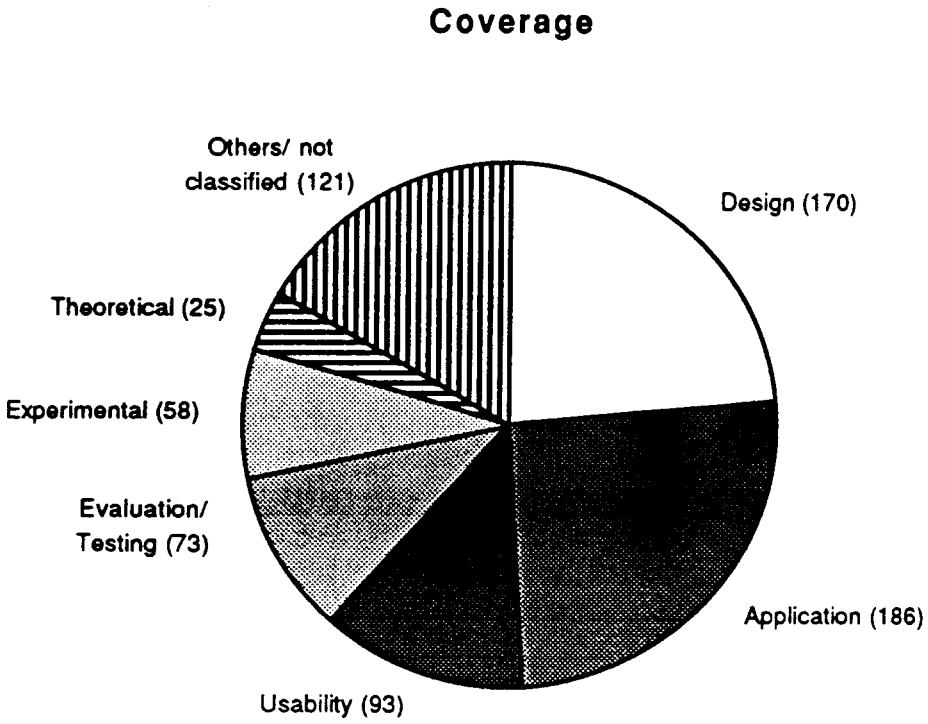

Figure 3: Coverage of documents

Figure 3 illustrates the statistics concerning the coverage of the documents. It indicates whether a document is dealing with design or application or usability issues or contains more theoretical or political information.

6 Examination and analysis of additional material

Following the statistical exercise performed on the material in the database, an attempt was made to analyse the implications of what had been revealed. What became immediately apparent was that although there was a large amount of valuable information in the database, recommendations for focusing standardisation activity was not going to be possible, as there was not enough standards material to build upon. What could be seen clearly was that standards are urgently needed, but the priorities could not be discerned.

For this reason, a number of alternative pools of information were considered that would enable to recommend standardisation priorities. The investigation followed a carefully considered sequence, the basis of which is as follows:

- evolution of telecommunications technology. As changes in the technology enable new services and equipment to be made available, it is clear that standards need to be implemented to ensure that this technology is not utilised in such a way as to prove to be a barrier to people with special needs. The trends of technological developments should be determined and monitored so that appropriate action can be anticipated;

- recommendations of experts working on behalf of the people with special needs. As technology changes, so it needs to be applied. Recommendations for future research and development activities that have been made by experts working in the field have been considered;

- requirements of the users. Experts and engineers have a tendency to focus on issues that present them with a particularly rewarding challenge. These areas may not, however, represent the areas of most urgent interest to the users themselves. With the growing obligations on service and network providers to ensure that all users are able to gain access to communications, they are becoming increasingly aware of the expressed needs of users and the size of the populations demanding

facilities. In some instances, these issues will find earlier inclusion in standardisation activities as they are very close to expressed market demand.

The recommendations that are proposed in this ETR therefore reflect the synthesis of all these various opinions as outlined in this Clause.

6.1 Analysis of the survey

This subclause comments on some of these data and gives the results from a more detailed review carried out on a selection of the documents in the database.

The classification process for documents entered in the database included assignment of a document status category, from 0 to 7, describing the type of material in the document, ranging from "unclassifiable" (0) to "international standard appropriate to people with special needs" (7). A further review examined again, in detail, all the references in the database (24 May 1991) under document status categories 6 (National Standards - appropriate to people with special needs). The purpose of the detailed review was to establish the degree of appropriateness with regard to telecommunications aspects, impairment, current state technology and human factors aspects of design parameters.

Categories 6 and 7 were chosen for detailed review because they were those where it was expected to find some detailed recommendations already accepted by standardisation organisations, on either a national or international basis, as appropriate and capable of being applied to telecommunications requirements for people with different functional impairments.

The search of all 586 entries resulted in 35 titles related to standardisation, of which only two were in category 6 and none in category 7, which are directly referencing people with special needs.

In addition, it was anticipated that the following would be found:

- existing international standards suitable for immediate adoption as ETSI standards or recommendations;

- high quality national standards, or parts thereof, suitable for adoption internationally; and

- standards in these categories in need of revision or more extensive additions to make them suitable for adoption internationally.

This search would enable priorities and targets to be set for work on additional material for relevant areas where standards were either lacking or inadequate.

In particular, the aim was to be guided by the COST 219 [11] work, which set up categories of impairments and the work of TC-HF which made tentative recommendations for technical solutions in ETR 029 [17].

6.1.1 Standards appropriate to special needs

As discussed above, there are no international standards and only two national standards available, which are really relevant for further standardisation activities.

The international standard "type testing of social alarm systems" may serve as a basis for further work on standards for social alarm services. The international standards for "proposals for new symbols for IEC 417 for the quality requirements for environmental control devices in the nordic countries may be relevant for standardisation activities.

From 25 national standards which were reviewed, three standards from the British Standards Institute (BSI) are specified which deal with hearing aids with inductive loop coupling. Another six national standards from Germany (DIN-standards), Austria (ÖNORM-standards) and Switzerland (SN-standards)

deal with specifications for public buildings. These standards may be relevant for the access to public telecommunication terminals.

The standardisation situation for Social Alarm Systems alone may be classified as "sufficient". In this service class, no conflicting standardisation situation can be derived.

The main emphasis of the standards occur only in two telecommunication areas:

- ergonomic requirements of office environment (display work stations, display units, keyboards, illumination, symbols, etc.). Here, a couple of standards from the German Standards Institute (DIN) are available;

- standards on telecommunication services. About 25 standards have been specified from the Swedish Standards Institute. They deal mainly with technical specifications for ISDN issues. The ISDN field, mainly network issues on layers 1 to 3 of the OSI reference model, is also covered by ETSI standards.

6.1.2 Areas with contradictory standards

The situation that standards are "contradictory" may occur for two reasons:

- a standard or a group of standards is contradictory to the needs of disabled or elderly people. The main topic occurs on standards for work display units;

- standards are appropriate to people with special needs and cover the same issue, but are contradictory to each other. National standards, or groups of standards in one country, are normally consistent and are not contradictory. Thus, the situation that an area is covered by contradictory standards may only occur when several national standards cover the same issue. It should be mentioned here that areas with contradictory standards can only be recognized when the relevant standards are cross-checked against each other.

6.2 Examination of telecommunications evolution and trends

As digital telecommunications networks become established in Europe, new services and the hardware required to support them will evolve. In addition, new facilities to make existing services accessible to users with special needs will also become available.

There are, therefore, three levels of priorities based upon the predicted trends:

- standardisation required for existing services and equipment;

- standardisation required for new standard services and equipment;

- standardisation of special services or equipment for people with special needs, or adaptations to be added to standard services and equipment.

In order to be able to set these priorities, it is important to reference the current predictions as to the evolution of telecommunications over the next 5 years. This would avoid spending efforts on looking at an issue which is unlikely to be a problem for some time in favour of considering an issue which needs urgent attention.

The most obvious source of such material in Europe is the central office of the European Community's RACE programme. This programme is intended to stimulate the various actors in the European Telecommunications arena to ensure that the infrastructure evolves at least as fast as that in the USA and Japan. In addition, it is promoting research in the areas of multimedia techniques and services to ensure that the uptake of the functionality of the evolving networks is utilised as soon as possible.

The RACE central office has undertaken a number of surveys over the last few years to help it to target its efforts. The one that is of particular interest is "Perspectives for Advanced Communications in Europe" [12]. This document considers the trend of the evolution of the broadband telecommunications networks from the current analogue systems, not just from the point of view of the networks themselves, but also with regard to the foreseen services and the equipment needed to make these services available.

In addition to this information, however, a number of other sources have been referenced where they are able to bring additional information about a particular area.

Before the foreseen evolution is discussed, it would be helpful to consider what will drive this evolution, and how it will occur. There are a number of components that shall all be available before an evolutionary step can be taken. These are:

- technology to provide the advance in the network infrastructure;

- services that can utilise the new capabilities offered by the network;

- hardware that can support the services;

- functionality in the network, service and hardware the end users think they need;

- all the elements available to the end users at a price they consider they can afford, and at a price that gives the providers the return they consider they need.

In addition, for Europe-wide evolution to take place, there shall be the necessary political will to ensure that the integration of the various national systems takes place, and the appropriate standards agreements to ensure that the various components can be integrated.

The interesting fact is that although much of the literature talks of this process being driven by the market, the experience of ISDN to date seems to show that, in reality, end users (individual or corporate decision maker) do not realise or know what they want, or cannot understand what it is that is being offered, or even do not want what they see. Without a clearly defined demand, therefore, the various network operators, service providers and equipment vendors are introducing facilities, services and products based upon what they perceive to be the market. This is a very uncertain process, and may, in fact, ignore obvious but non-financially lucrative markets in favour of trying to appeal to markets where there is perceived to be a potentially large profit. This is justified by claiming that the investment costs are very high (which is true) and that these markets will yield the necessary return (which may not be true).

For this reason, the forecasts should be treated with some caution. In view of this, it would perhaps be most sensible to consider the trends in technological potential and then try to qualify this by predicting which of these technological possibilities will actually be of interest to different sectors of the population.

6.2.1 Strategic and network evolution

The first step in the evolution of the telecommunications system will be the digitalisation of the networks. The current EC network operators have targets which they are working towards and these are given in table 1.

Table 1: Degree of digitalisation of the telephone network by 1990

Country	Subscriber Main Lines (Millions)	Degree of Digitalisation (%)		
		Transmission	Switching local	Local distance
Belgium	4,0	50	29	75
Denmark	3,0	85	23	40
France	27,0	70	70	75
Germany	28,6	50	3	22
Greece	4,5	15	15	25
Ireland	1,2	70	65	85
Italy	21,7	45	25	36
Luxembourg	0,2	35	8	10
Netherlands	6,3	95	35	15
Portugal	19,5	70	20	30
Spain	12,2	47	5	45
UK	20,0	100	42	90

The details of such a table may be debated, but the trend is clear: all member states intend a significant move towards a digital network backbone, with a more gradual move towards local digital networks.

The next phase of this evolution will be to increase the throughput of these early networks from the basic ISDN 64 kbit and 16 kbit elements up through 2 Mbit to 140 Mbits and beyond. (The movement from basic ISDN up to 1,5 Mbit/s is already beginning in the USA, and purchasers of the multiplexers are already requiring them to be upgradable to 45 Mbit/s).

The stated milestones in "R & D in Advanced Communications technologies in Europe" [14] of the ongoing RACE activity will give us an idea of how this will evolve, as they have been formulated by representatives of all the major actors in telecommunications, including the network operators. This should, therefore, reflect their thinking as to where the technology is going over the next few years.

1992/93
Early introduction of applications (mostly business, professional) and carrying out Advanced Communications Experiments testing new services based on existing networks and prototype versions of IBC equipment (e.g. early ATM, MAN, Customer Premise Networks);

Procurement/investment decisions for future pan-European IBC Networks (with major decision steps: optical fibres in the loops and in the trans-European trunks) and full IBC services. This requires the completion of the related major standards during this period.

1994
Completion of the interconnection of all capitals of the community and with neighbouring countries, based on complementing existing and/or planned optical trunk networks supporting voice, data and image traffic, either apart or as integrated services.

1995
Initial IBC network implementation and completion of customer access for business in centres of economic and manufacturing activities throughout the Community, at least 50 000 corporate customers. Field trials to test a representative range of IBC services, including residential customers, with 2-way video and digital HDTV using commercial IBC equipment.

1996
Offer of commercial basic broadband services, based on 2,34 and 155 Mbit/s links, including fast inter-LAN data transmission, desktop video-conferencing and video-processing and CAD/CAM, and integration/interoperation with other networks either existing or planned, e.g. mobile communication and satellite networks.

1997
Offer of business customer access in towns of more than half a million inhabitants and start of widespread fibre-to-the-home implementation, carrying a full range of services to the general user. Depending on local conditions, IBC islands will link up progressively with the long-distance optical networks offering increasingly universal access to services.

2005 to 2010
50 % penetration of IBC access envisaged for 2005 to 2010

Again, the details of this timetable, and how realistic it is in practice, could be debated, but it is clearly an ambitious statement made by the people who are in a position to make it happen.

Whilst the detailed implications of this statement will have to be considered carefully, one aspect is very clear. If this goal is achieved, there will be immense and far reaching changes in the way that telecommunications impacts on all areas of life, in the domestic as well as the business and commercial environments. The foundation for these changes, and to a large extent the changes themselves, will happen in a very short period of time.

In order to influence any changes in favour of users with special needs, a programme of study and standardisation activity needs to be organised immediately.

These predictions have been made in the RACE publication "Perspectives for Advanced Communications in Europe" [15], and the general trends are outlined below.

6.2.2 Service evolution

The concept of services has been divided into three principle sectors for the purpose of the RACE analysis. These are:

- business market;
- residential market;
- mobile market.

6.2.2.1 Business services market

This area is of interest as many users with special needs will be expecting to gain employment in the future as a result of integration and vocational training initiatives in the member states and from the CEC. If this integration is to be realised, the services and equipment that these people will encounter when they seek employment need to be accessible.

In addition, this is foreseen to be the initial major market for future services, a fact which should be remembered when priorities are set.

The particular requirements for the business markets are for services that:

- enable information to be transferred quickly, securely and without degradation;
- save time;
- are cheaper/more efficient than conventional ways of achieving the same objective (e.g. videoconference).

If these criteria can be demonstrated, then business users are prepared to pay for these services.

6.2.2.2 Domestic service market

Although there is a perception that the driving motivation for future services will come from the business sector, the range of facilities and services that future telecommunications will be able to support are very broad. With this in mind, it is easy to see that there will be some services of immense interest to the domestic user that will provide significant profitable markets for the operators and service providers. The experience of the electronics companies shows that whilst the profit margins may be small, the volume of sales in the home entertainments sector is very high, and innovation at the right price and performance will succeed (e.g. compact disc).

The dominant factor in the penetration of evolving telecommunications in the home will be the cost and the perceived lifetime of the equipment. Many examples of domestic equipment have only achieved major market penetration when they are considered cheap enough for their benefits to outweigh the existing alternatives and when the technology is sufficiently stable as to make investment in the necessary hardware worthwhile.

6.2.2.3 Mobile service market

This market represents the major technological and conceptual advance in telecommunications that has happened in the last few years. As the technology has become available, in terms of bandwidth and cellular networks, the uptake of the mobile services has been explosive, as illustrated in table 2 below:

Table 2: Cellular subscribers worldwide

Area	Subscribers June, 1988	Subscribers February, 1989
Asia	183 000	450 000
Japan		230 000
Europe	839 000	400 000
USA	1 331 000	200 000
Others	34 000	45 000
Total	2 387 000	4 095 000

Focusing on Europe, the variation in implementation is quite marked, as illustrated in table 3 as follows:

Table 3: Cellular radio subscribers in Europe (June 1989)

Country	Subscribers	Population (Millions)	Penetration per 1 000
UK	650 000	56,60	11,48
Sweden	295 500	8,40	35,18
Norway	161 230	4,20	38,39
France	135 870	55,50	2,45
Finland	131 600	4,80	27,42
Germany	123 980	62,00	2,00
Denmark	112 830	5,20	21,70
Switzerland	51 540	6,00	8,59
Italy	46 850	57,20	0,82
Austria	44 250	7,60	5,82
Netherlands	43 400	14,50	2,99
Belgium	21 200	9,90	2,14
Spain	20 700	38,20	0,54
Ireland	7 570	3,50	2,16
Iceland	7 280	0,24	30,33
Portugal	1 400	10,50	0,13
Faroes	780	0,05	16,25
Cyprus	690	0,56	1,25
Luxembourg	400	0,37	1,08

It is interesting to observe that the growth has been so rapid that the providers and operators have consistently under estimated this market. This, therefore, is clearly an area of importance for the European telecommunications market. Although it may be too late to influence the current generation of mobile systems, standardisation bodies need to be in a position to respond as new developments occur.

6.2.2.4 Specific service trends - service by service

Having considered the general trends in the business and domestic sectors, it would be valuable to focus more explicitly on the different services and consider how the principal service groups are predicted to evolve. The main trends in this sector are:

Service class **Service** **Trend**

Conversational services

Videotelephone

Current: poor coverage at present - cost too high and erratic availability of networks to support the service. Two way conversation implementation of videophone is still largely an area of research. Videoconferencing is growing fairly rapidly. Some uptake, generally on private networks for video surveillance.

Future: videophone penetration rate of 21% by 1993 or 63 000 companies, provided cost and quality is acceptable. (i.e. < 2 times telephone charges). Videoconferencing will be used by about 48 000 companies by 1996. A much requested set of services by business users (predicted to be growing at a rate of >30% per year), and one that has captured the imagination of domestic users.

Audio telephony

Current: most widely used telecommunication service. Service is being enhanced with, e.g., itemised billing, call transfer, teleconferencing, etc..

Future: is likely to remain the main revenue earner for telecommunications providers until at least 2005.

Text telephony

Current: some text-telephone services are becoming available. To date, the principal problem has been the compatibility between the transmitting and receiving equipment and the ability to assume compatibility. Some services, particularly for deaf/hard of hearing, have been available for a number of years.

Future: as transduction from other media becomes available, this service could become the foundational service for the deaf/hard of hearing.

Multimedia telephony

Current: this is a very new service, beginning to appear in pilot form in interactive group working. The model, however, is used in group interactive training situations which have some implementations over WANs as well as LANs.

Future: this, provided it is a flexible but integrated package, represents one of the most interesting services for the business community in the future. Much work will be needed before the concept really crystallises into different levels of complexity and application.

The Home Bus concept being developed in Japan takes this service to its logical conclusion, where all the elements of multimedia telecommunications will be accessible to and from the bus and connected to the ISDN. These concepts are at the prototype and early standardisation stage in Europe.

Social Alarms

Current: this type of service is a special type of telephony that illustrates an important application of the telecommunications facilities. Applications cover alarm services for health or emergency situations, including such circumstances as motor vehicle breakdown alarms or when someone is stuck in a lift. The concept of such a service is well proven and applications are spreading.

Future: audio processing services will become available as media transduction develops. Is likely to remain the main revenue earner for telecommunications providers for the foreseeable future.

Messaging services

Video mail (including facsimile)

Current: facsimile is rapidly becoming an indispensable element of business working, and has demonstrated the phenomenal growth potential for a correctly targeted and implemented service.

Future: this service is likely to continue to be developed, but principly as a component of a multiple media mail service.

Voice mail

Current: in practice the use of answering machines is a widely available example of this type of service. (Although recognised as an invaluable facility, it seems to be almost universally disliked by users). Implementations beyond this have yet to appear.

Future: this service is benefitting from a large amount of activity at the present time because of interest in, for example, radio paging.

Text mail

Current: this service is becoming increasingly important as the favoured alternative to voice mail. It is interesting to consider that this service is invariably used as a method of transferring text data rather than for passing messages, illustrating the growing interconnection of computers on the telecommunications networks.

Future: this area is likely to become one of the most important services offered in the future.

Multimedia mail (including data transmission)

Current: this is a fundamental service requirement of business users as a means of inter-computer communication. Current utilisation is generally confined to text data, primarily due to the low capacity of the networks to support image transfer or even block speech transfer.

Future: major area of potential growth for such applications as remote CAD/CAM where the designs are made remotely and downloaded for future use. This area is predicted to become the biggest revenue generator for the network operators by 2005, assuming that the network and technology platforms allow it. Progress in this area is likely to be rapid, as Europe is far behind the US, and will be seeking to catch up.

Remote alarms

Current: this service is beginning to become a significant element of health care provisions, particular as large health care institutions close and the potential, or past, inmates move back out into the community to live "independent lives". This can also be generalised to cover other emergency alerting applications, including automatic fire and burgler alarms.

Future: this service is considered by many people with special needs to be one of the most important developments in recent years. In general its development is hampered by the perceived ease of abuse and subsequent clogging of the lines.

Retrieval services

Videotext

Current: this service has existed in principle for over 15 years, but is a good example of the critical mass needed to make the market, or the penetration needed to bring the costs down. In the UK, although growing slowly, it has not yet achieved a truly commercially successful market penetration, apart from a few notable exceptions, including the utilisation for travel ticket booking. Some other notable examples are private value added services, some on private networks or leased lines. (e.g. a Videotext information service for deaf and hard of hearing, and a district-wide library catalogue service). The success of the minitel system in France is well documented, although it is worth remembering that there is a general feeling that it is a potentially expensive service if it is used as much as people would like.

The other widely available application of the Videotext concept is that of "Teletext", the Videotext overlay to TV broadcasts. Although it does not appear to have been a major success in its own right, when people have it available they seem to appreciate it.
Future: the technological characteristics of the Videotext concept and presentation, although largely superceded in the computer domain, is very well understood and proven. It may well become a major service in the short term, given the demand for home shopping services as expressed by domestic users. One attractive aspect is that the terminal required is simple and relatively cheap.

Data retrieval

Current: this is a well established value added service available from a wide variety of vendors offering from one to over 200 databases on a single host. Although used generally by businesses, and to a lesser extent the academic and research community, some domestic users see the value of quick access to information (see Videotext). This is a good example of where the costs of the service are far outweighed by the savings made by having the right information. Untrained operators, however, find that it is very easy for the costs of calls to be very high.
Future: in the short term, as transmission rates of the networks improve, it is foreseen that this market will triple over the next four years. In the longer term, some of the information conveyed as text may benefit from the inclusion of images, but the demand for this type of service should continue to grow.

Sound retrieval

Current: this is largely an underdeveloped service, although some crude commercial examples are available, e.g. the British Telecom "Speaking Clock". The technological basis for this service has not been developed sufficiently for the quality to be good enough.
Future: is expected to supercede broadcast audio services rapidly in importance.

Video retrieval

Current: an underdeveloped service at the moment, as the technology has not been available to allow it be widely implemented, although some image based databases are available from the major database hosts (e.g. Dialog c). The practice of accessing stores of video material is well established, however, in the concept of the hire of video tapes of concerts, films and educational material. Still, video archives of medical and industrial images are currently held on film or microfiche awaiting electronic storage media to fall in price/increase in capacity.
Future: there is a clearly expressed demand for this service from domestic users, both for image based shopping services (catalogues, holiday brochures, house details, etc..), and for video selection from a catalogue (i.e., an on-line video library).

Multimedia retrieval

Current: virtually non-existent today apart from a few pilot applications.
Future: this is claimed to be a significant service in the future, but this will depend on a number of key factors, including the cost and availability of suitable equipment, the cost of the data and time on-line, and the issue of copyright.

Distribution services

Television

Current: currently broadcast via VHF/UHF electromagnetic radiation or analog distribution via coaxial cable. Generally applied to domestic entertainment, but also frequently used for education.

Future: will need change of perception for this to be considered as a "telecommunications service", particularly if it is to be integrated with other services. Future services are expected to concentrate on programme material on demand with a proportionate reduction of pre-programmed material being broadcast, (see video retrieval).

All video services will be influenced by the advent of HDTV, which is beginning to be available in Japan, and will begin to be implemented in Europe in the near future.

Audio broadcast

Current: the most obvious widely available audio broadcast service is the AM/FM wireless service. In addition, some private network operators offer AM/FM modulated material on analogue cable networks alongside the video distribution services. Some crude examples of telecommunications based audio distribution are spoken sports commentaries and the "Dial-a-Disc" services of British Telecom.

Future: depending on the penetration of appropriate cables, etc., many more subscribers will turn to audio retrieval rather than programmed material. There will, however, continue to be demand for broadcast services for current event reporting and comment on a variety of subjects.

Document broadcast

Current: a few examples exist today (e.g. news and sports services for journalists), but it is still largely underdeveloped to date.

Future: this is largely an unknown area and requires further research.

6.2.3 Equipment evolution

The evolution of equipment will obviously depend on the evolution of the network capabilities and is, as yet, unpredictable. It is, however, clear that the possibilities are enormous, particularly with concepts such as the Home Bus.

It is often argued that terminal equipment is an area of telecommunications that is generally outside the scope of standardisation bodies. This is potentially a very dangerous attitude as the equipment may be the fundamental barrier that could prevent someone gaining access to the telecommunications facilities.

6.2.4 Evolution of society

The previous subclauses have outlined the possibilities for the future in the light of the evolution of technology. Before conclusions are drawn, it would be worth listing a few predictions as to what society might look like in the future. This will avoid the temptation to get carried away by technology, and serve as a reminder that the evolution should be driven by the needs of the users and the technological developments working hand-in-hand.

This paragraph will not be extensive; a few pertinent predictions are made below:

- information and data will continue to increase exponentially. Good decisions based on appropriate data, creativity and freedom of choice will depend on the data being available. The expectation is that this information will be available with the minimum of effort;

- the general level of education in the population will continue to rise;

- population centres will tend to concentrate in district towns rather than huge cities;

- the mentality and culture of the population will become more international;

- the individual members of society will take more responsibility for their own choices and decisions;

- work will depend more on information technology tools, particularly as CAD/CAM techniques continue to penetrate the manufacturing sector;

- increasing numbers of people will transfer a proportion of their workload to working at home rather than travelling to a communal work site;

- increasing numbers of people will be introduced to technology at an early age as a natural element of their lives, rather than having to come to terms with it later in life;

- decision making at an international level will increasingly influence local life;

- the average age of the population is predicted to rise, and with it an increase in the number of relatively wealthy retired people seeking occupation and entertainment supported by information technology.

These statements illustrate the complex web of issues that will influence the validity of the predictions and the forecasts. They are included to give a reminder that telecommunications is not an end in itself, but rather a tool that will change the way that society is able to achieve its goals and to progress.

6.3 Examination of recommendations of experts on telecommunications needs of people with special needs

Individuals and groups in Europe have, over the last few years, been alerted to user's needs, both to act in response to current deficiencies, and to anticipate problems as the field evolves. The relevant projects are described in detail in ETR 029 [17]. In some cases clear recommendations have been made, and these need to be collated and synthesised.

6.3.1 Recommendations of COST 219

Over the past few years, COST 219 has considered the telecommunications needs of people with special needs in detail. The outcome of this has been a catalytic action for other projects resulting from recommendations for work according to needs as perceived by COST 219.

In addition, however, COST have made some recommendations for areas where standards are required if people with special needs are going to get access to the telecommunications facilities. Following discussions at the 2nd European Conference on Policy related to Disability and Telematics in Paris, 19-21 June 1990, a list of recommendations for technical development and for standardisation activities was prepared, and the pertinent ones are quoted verbatim from the proceedings of the conference [16].

"Recommendations

1. Technical development

1.1 User requirements should be collected together with the RACE IPSNI and TUDOR projects. Plea for recognition of needs for people with disabilities with regard to telecommunications.

1.2 Disabled people should take part in the development work of new technical aids and systems for disabled people. Guidelines also to own COST 219 working Groups on how to involve people with disabilities in the work.

1.3 Public terminals should have more than one input as well as output mode, like speech, tactile, visual, etc. (compare ETSI work in Clause 4). For example, additional video output can improve the understandability from 44% to 90% (hard of hearing users).

1.4 The user interface should not be too complex.

1.5 The social acceptance of new equipment could be astonishingly low. A study on why new technical aids are not accepted should be performed. Equipment should be attractive and appealing and there should always be a choice. Methodologies should be developed in order to increase usage and social acceptance.

1.6 Problems arise because of the "Do-it-yourself" trend in society. The do-it-yourself gadgets should not be made only for the large majority of people or designed so that only they can use them.

1.7 Problems with environmental design; better acoustics and less background noise is required.

1.8 It should be remembered that most disabled people have more than one disability. Terminals and services should, therefore, be modular as well as adaptive.

1.9 Electromagnetic coupling in some computers interferes with magnetic coupling.

3. Standardisation

3.1 Co-operation with ETSI directly as well as via IPSNI, TUDOR in order to support standardisation work on projects such as:

- text-telephone systems & conversation services;
- NICAM channel use for newspapers to blind people as well as others;
- Radio Data System channel for alarm services for deaf as well as for other users;
- alarm and safety systems and terminals should take use by disabled people into account from the very beginning;
- amplification in telephones;
- coils in every public telephone;
- communication to hearing aids should be standardised especially in public places;
- ridges for identification of foil keys, standardised lay-out, better quality displays, remote activation solutions for identification, telephone card displays, etc;
- sockets for e.g. RS 232 connections & interface protocol for adding complementary keyboards or displays;
- possibilities of magnifying displayed symbols, touch screen difficult for some user groups;
- more than one input (output) mode should be supplied by public terminals, e.g. keyboard & voice input, visual & speech output.

3.2 A systematic approach is needed in standardisation, as well as in legislation in this field), i.e. what ?, why ?, when ?

3.3 The American Disability Act should be studied.

3.4 New standards, laws and regulations that take disabled people into account.

6.3.2 Recommendations of appropriate RACE projects

There are three RACE projects considering aspects of the telecommunications and people with special needs:

R1054 - APPSN - Application Pilot for People with Special Needs;
R1066 - IPSNI - Integration of People with Special Needs in IBC.

These two projects are ongoing and are investigating specific aspects of the use of IBC equipment by elderly and disabled people. Some recommendations for the realisation of accessible equipment and services are available and could provide valuable data for standards. These will be found in the publications from these projects.

R1088 - TUDOR - Usability Issues for People with Special Needs

This project has considered the people with special needs population as a market to be provided for by IBC designers, and as members of the conventional markets for IBC products. In other words, how big are the populations of people with special needs that will require specific attention for special solutions, what is the probability that a user of a piece of IBC equipment or an IBC service will be for people with special needs, and will disabled and elderly people actual consider using this equipment? A number of works have been published [17] and [18] with the clear overall conclusion that:

- there is a significant number of people with special needs within the population of Europe (see subclause 6.4.4);

- these users (including elderly people) are becoming more open to the influence of technology on their lives, and, therefore, are looking forward to the advent of advanced telecommunications services;

- the availability of some telecommunications services has the potential of changing the lives of some people with special needs more significantly than almost any other sector of the user population. This includes such aspects as the possibility, for the first time, of integrated communication between deaf and non-deaf users or users with no speech and speaking users and of employment for users who are able to work from home;

- designers cannot assume that the users will not be people with special needs, and will therefore have to consider how accessible their equipment or services are and what can be done to make them more accessible. Standardised hardware and software interfaces "ports" could be one solution, allowing specialist providers to hook an adaptation onto this.

This indicates that whilst some sectors of the population are anticipating the advent of broadband telecommunication with mild interest, if not ambivalence or apathy, some people with special needs are eagerly waiting for its potential to be realised. This seems to indicate the need for standards to be in place at an early stage that will allow the potential to be achieved.

6.3.3 Existing priorities of ETSI - technical report and study items

Since 1990, work has been done within ETSI, particularly based on the considerations of COST 219. ETR 029 [17] contains an outline of recommendations for the design of telecommunications equipment, some of which may result in recommendations for standards. This outline is reproduced below.

List of Recommendations for equipment design from ETR 029 [17]

1 Access to terminals

1.1 Identification of public telephones

R1.1 Identification of location of public telephones for the blind and partially sighted (cf. subclauses 2.1 and 2.1.2; also ISO/TC 173/SC4).

R1.2 Identification of the modus and facilities of the public telephone (cf. subclause 2.1).

1.2 Identification of payment facilities

R2.1 Tactile identification information of coin inserting slot (cf. subclauses 2.1 and 2.1.3; also ISO/TC 173/SC4).

R2.2 Tactile identification information on accepted coin denominations (cf. subclauses 2.1 and 2.1.3; also ISO/TC 173/SC4).

R2.3 Tactile identifiable information for the card slot (cf. subclauses 2.1 and 2.1.3; also ISO/TC 173/SC4).

1.3 Design of public telephone booths

R3.1 Full accessibility for people in wheelchairs (cf. subclauses 2.6 and 2.6.2; cf. the American "Barrier-free" code and the Danish "roll-in/roll-out" system).

R3.2 Full accessibility for nonwheelchair-bound, mobility impaired people (cf. subclauses 2.6, 2.6.2, 2.7 and 2.7.2).

R3.3 All booth fittings must be accessible to seated people (cf. subclauses 2.6, 2.6.2, 2.6.3, 2.7, 2.7.2, 2.7.3, 2.7.4, 2.8, 2.8.1 and 2.8.2).

1.4 Accessibility and operability of interactive terminal elements

R4.1 Interactive parts of the telephone shall be placed in such a way that they can all be operated from seated and standing positions (cf. subclauses 2.6, 2.6.1, 2.6.2, 2.6.3, 2.6.4, 2.7, 2.7.1, 2.7.2, 2.7.3, 2.8, 2.8.1 and 2.8.2).

R4.2 Interactive parts of the telephone shall be placed in such a way that they can all be accessed by people who cannot use their arms and hands (cf. subclauses 2.7.1, 2.7.2, 2.7.3 and 2.7.4).

2 Terminal ergonomics: keys and displays

2.1 Implementation of keys

R5.1 Standardised layout of dialling keys (cf. subclauses 2.1, 2.1.6, 2.9; also cf. CCITT Recommendation. E.161 [23] "Dialling keys").

R5.2 Standardised layout of alpha-numeric keys other than 12-key dialling keypad (cf. subclauses 2.1, 2.1.6, 2.5 and 2.9; also cf. relevant ISO standards).

R5.3 Standardised layout of all other operating keys (cf. subclauses 2.1, 2.1.6, 2.5 and 2.9).

R5.4 Ergonomic standards for size, spacing, grouping and positioning of keys (cf. subclauses 2.1, 2.1.6, 2.1.7, 2.7 and 2.7.2).

R5.5 Identification of standardised tactile indicators on keys (cf. subclauses 2.1, 2.1.6, 2.1.7 and 2.9).

R5.6 Identification of standardised visual indicators on keys, including size, fonts, colours, symbols, etc. (cf. subclauses 2.1, 2.1.9, 2.2, 2.4, 2.5 and 2.9).

2.2 Implementation of displays

R6.1 Visual displays shall be accessible for people with colour perception impairments (cf. subclauses 2.1 and 2.1.9).

R6.2 Appropriate use of hues and contrasts for people with low vision and impairment of colour vision (cf. subclauses 2.1 and 2.1.9).

3 Operational procedures & alternative representation of relevant procedure information

3.1 Operational procedures

R7 Network considerations, such as time-outs, should not prevent slow users from setting-up and completing calls (cf. subclauses 2.5, 2.7 and 2.9).

R8 Mobility impaired people should be able to answer telephone calls remotely with a message (cf. subclauses 2.6, 2.6.1, 2.7 and 2.9).

R9 All people with special needs should be able to use and follow basic telecommunication procedures in a consistent manner (cf. subclauses 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8 and 2.9).

3.2 Alternative displays

R10 User instructions should be supported by non-verbal pictograms, icons and symbols (cf. subclauses 2.2, 2.3, 2.4, 2.4.1, 2.5 and 2.9).

R11 Acoustic and visual signals shall always be used in parallel to indicate call progression and status (cf. subclauses 2.1, 2.1.3, 2.1.8, 2.2, 2.2.1, 2.2.2, 2.4, 2.5, 2.5.4 and 2.9).

R12 People who use technical aids should be able to use these with telecommunication terminals (cf. subclauses 2.2, 2.2.3, 2.3, 2.3.1, 2.5, 2.5.3, 2.7 and 2.7.2; cf universal socket and plug for electronic interfacing and physical design).

6.3.4 Additional recommendations

Two organisations from Germany have offered areas where standards are urgently needed. The proposals which are suggested are highlighted in the following paragraphs.

Bayrischer Blindenbund e. V.

a) Some telephones with foil keypads are available on the market. These keypads are not applicable for blind or severely visually impaired users. Keypads should be designed to accommodate blind people. Keyboards with function keys should not only be marked by colours, but also with markings to allow blind people to distinguish them from numeric keys.

b) **Public telephones** with LC displays should have an additional voice output facility for instructions and user guidance tasks. For private telephones with LC displays an additional voice output facility should be available. Furthermore, add on facilities for blind users should be preferred instead of designing special telephones for blind users.

c) Deutsche Bundespost TELEKOM has planned to introduce a charge counter with speech output. This add-on device should be offered as a "charge counter with special facilities", not as a "special product for the blind".

d) Many blind users are familiar with "Bildschirmtext" (interactive Videotex) and use a PC with braille or synthetic speech output. It is recommended to display all text information transmitted by BTX as ASCII characters, not by graphic representation. Graphics cannot be transformed to braille or synthetic speech and cannot be understood by blind users.

e) PCs should also be equipped to receive facsimile messages (not only to send them). This would be very useful for blind persons with PC's and Braille or synthetic speech output. Furthermore, the information on facsimile displays should be transmitted via acoustic output.

Deutscher Schwerhörigenbund e. V.

1) **A European standard for Text-telephones** should be introduced. A transmitting rate of maximum of 9 600 bits/s (memory-to-memory transmission) is recommended. The standard is urgently needed for combination of devices with mixed text-telephones/interactive Videotex/facsimile modes. These terminals can be used everywhere in Europe. These terminals also support conversation between hard of hearing and non-disabled persons.

2) **A European-wide standardisation of FM radio channels for people with hearing impairments** should be introduced. Proposals for 3 FM narrowband radio channels all over Europe. The frequencies:

   - 36,72 MHz;
   - 36,64 MHz;
   - 36,76 MHz.

   should be reserved. These frequencies are already used in Germany and Czechoslovakia for these purposes.

6.4 Summary of some of the expressed needs for telecommunications facilities by people with special needs

As work has continued to ensure that telecommunications is able to meet the needs of people with special needs, it has been discovered that the perceived needs of these users may differ quite substantially from their expressed needs, "The telecommunications needs of Disabled and Elderly People - an exploratory study" [19], "Age and Design" [20]. These differences highlight alternative priorities with regard to what these users want from telecommunications. It is interesting and particularly important that we understand the nature and the source of these priorities, as some are clearly due to a perception of what telecommunications has to offer, whilst others depend on the users' appreciation of their likelihood of

getting access to what is on offer. It is also very important to have a feel for the size of the potential user population and a forecast as to its growth. The following subclauses are not an exhaustive resume of the issues but rather a synthesis of the main conclusions and recommendations.

6.4.1 Current expressed concerns

A conception that telecommunications = POTS (Plain Old Telephone Service). If any other services do exist, they are not really for domestic users.

The general positions that seem to span the people with special needs user population are:

- there seems to be an expressed need for company and the ability to get help in an emergency, but it is not universally accepted that the telephone is the answer to that need. If it is the only available solution, it is considered to be essential;

- an expressed satisfaction as to the functionality that the telephone offers, and a lack of comprehension as to how they would use any other services;

- a general unwillingness or suspicion about having to learn to use a "complicated new thing", whose value may not be recognised. It seems, however, that this more true of the general population than of the people with special needs, who seem to be more conscious of the benefits that technology could bring them;

- an unwillingness to become dependent on the telephone for social interaction rather than on human contact;

- a proportion of users was unaware of the possibilities of having the telephone adapted to make it more usable;

- perhaps most significantly, a real sense of caution about any involvement with telecommunications because of the cost. Many users will not use the telephone even when they have it, and cannot afford to have it adapted. In addition, many users are ignorant as to how the costs are incurred and the concessions and benefits available to them;

- the only clearly expressed need for a new service was for an alarm service that would bring assistance to them in an emergency, particularly where the problem was health related.

The lack of expressed requirement on the part of the people with special needs is a cause for concern, but may be attributed to an almost universal ignorance as to what is available, and a legitimate concern about the cost. The complete impossibility of many users to pay for the service or adaptation (be it only the installation charge) means that many (potential) users simply do not make the effort to find out what is available to them.

6.4.2 Trends in the expectations of the user population

Although the general comments made above seem to accurately characterise the current population of people with special needs, there are a number of characteristic trends that have been observed.

- There is an increasing expectation of the people with special needs population as to the opportunities that technology holds for them and the expectation that they should be able to get access to the innovations.

- There is an almost universal increase in the exposure of people with special needs to technology together with the experience to cope with the rapid changes that characterise this field. This observation in particular covers the younger section of the group, but is not restricted to them.

- Despite the previous two comments, there is also a keenly developed sense of realism, that it is unlikely that they will ever benefit fully from the opportunities available unless alternative arrangements are made to meet the cost of gaining access to the equipment and the services.

6.4.3 Detailed requirements

Whilst it has been difficult to gather specific expressed requirements, some concrete issues have been highlighted and are listed below.Telephone related topics in expressed priority:

- cordless telephone;
- big buttons;
- audible signals;
- enlarged numbers;
- lifeline;
- hands free;
- flashing lights;
- wall mounting;
- holder.

The only non-telephone specific issue that users have focused on as being a real requirement with realistic chances of being made available are those relating to remote and telephonic alarms.

6.4.4 Size and composition of user populations

It is the general experience of those working in the field, that accurate statistics are difficult to obtain. Attempts by national agencies and international bodies have consistently found that they have encountered problems defining the terms describing the concepts and issues, and an understandable unwillingness on the part of the people with special needs to be classified.

Having said this, some data are available to get a working picture, as illustrated in the tables 4 and 5, see also, "Demography and Market Sector Analysis of People with Special Needs in Thirteen European Countries" A Report on Telecommunication Usability Issues" [21].

Table 4: Disabled population of European member states

Type of Impairment	% of Population	Number (Millions)
Physical		
Lower Limb	5,8	18,7
Upper Limb	1,9	6,1
Visual	2,0	6,5
Hearing	2,7	8,7
Mental	2,3	7,4
Verbal Communications	1,1	3,6
Total European Population = 322 356 000 Disabled Population = 11,3% - 15,1%		

Another important set of data covers the trends in population of the elderly.

Table 5: Population aged 65 and over, 1980 to 2050, in the European Community

Year	1980	1990	2000	2010	2020	2030	2040	2050
Millions	3,6	3,8	4,1	4,5	4,9	5,5	5,8	5,2
% of Population	13,1	13,6	14,7	16,0	18,1	20,8	22,4	21,6

This information becomes all the more pertinent when it is remembered that there is an expectation that the purchasing power of this population will increase relative to the disposable income that is the current norm.

7 Conclusions and recommendations

7.1 Introduction

This Clause summarises the main issues from investigations on telecommunications facilities for people with special needs on a national level, taken from the database survey and from Clause 6 where other relevant sources and contacts are analyzed.

In subclause 7.2, the main conclusions are outlined and commented upon. Subclause 7.3 contains recommendations on procedural and policy issues, including a proposal for a generic standard for the design of telecommunications facilities for people with special needs.

Subclause 7.4 gives a priority list of further standardisation activities which should be performed in the near future. Subclause 7.5 deals with topics which should be observed for ongoing review in order to be prepared to participate in standardisation activities.

7.2 Conclusions

No suitable international standard is available that fits both telecommunications facilities and the needs of disabled or elderly people. When the project was started it was hoped to find some standards appropriate to the investigation topic. However, the fact that no standard is available was not expected.

On the other hand, some international standards are available which either are related to people with special needs issues but are not dealing with telecommunications facilities, or have impact on telecommunications but are not appropriate to people with special needs. Some of these standards are causing conflicts when they are applied to telecommunications facilities which may be used by disabled or elderly people.

Some national standards are available, which are related to telecommunications and people with special needs issues. **It is recommended that ETSs should be prepared from these standards.**

Extensive background material is available, which contains useful information for further, or future, standardisation activities. The material which was collected during the lifetime of the project was entered in the database and classified according to the evaluation model.

Important topics for standardisation have been identified, but no priorities have been found in order to set up a workplan for further standardisation activities. Therefore, a proposal for further standardisation activities has been prepared. Furthermore, a proposal for a generic standard was made.

Some relevant material conflicts with the needs of disabled or elderly people and contradicts other material. Several national standards dealing with ergonomic specifications, office computer workstations and computer work places are contradictory, and conflict with the needs of people with disabilities, e.g. visually handicapped users. It is recommended that there should be co-operation between the national or international standardisation bodies (e.g. ISM) in order to overwrite these conflicting national standards with international ones.

7.3 Recommendations on procedural and policy issues

7.3.1 People with special needs - the creation and development of standards

7.3.1.1 The need for standards

It may now be said that no suitable standards have been published which will help remove the barriers to access telecommunications facilities by people with special needs.

7.3.1.2 Proposed generic standard

It is proposed that a single standard is prepared and issued in a number of parts. The first part would contain an introductory preamble introducing the topic, stressing its importance and explaining the significance of user performance to ensure the same degree of access and utilisation of telecommunications facilities as the rest of the user population. This part should also give instructions on methodology to be used in establishing end-user performance and the evaluation of compliance with the standard.

7.3.1.3 Scope for proposed generic standard

This standard is intended to provide information for designers of telecommunications services and equipment to ensure their usability by people with special needs. The standard is issued in a number of parts, each part dealing with a different specific impairment. The standard should not define technological solutions that will limit future development generally, but will point out requirements for usability and the difficulties met by people with the impairment specified.

7.3.2 Requirements for legislative action

Standards issued by many regulatory or specification organisations are often of two kinds. Guidelines and codes of practice are often adopted on a voluntary basis by manufacturers, who rely on the market appeal of certain features and conformance with established practice. On the other hand, many standards do contain mandatory items, which nevertheless do not necessarily carry the force of law.

Legislation in many countries now recognises the rights of consumers and what were often thought of as "common law rights" concerning aspects of fitness for use and basic personal safety. People with special needs are perceived as a minority group, often with needs that are expensive to satisfy in some way or another. However, people with special needs, especially if we include elderly people, are fast becoming a substantial minority, increasingly vociferous and as demanding of attention from facilities suppliers as the rest of the population. The high profile being established for people with special needs now justifies some legislative power for the enforcement of basic requirements. This may be especially true as telecommunications services suppliers operate for private profit.

It is recommended that steps are taken further to investigate the legislative position within Europe in the matter of telecommunications facilities for people with special needs and if existing laws are lacking or weak, lobby for enabling legislation to ensure equal opportunity of access for such people. As a model, the Americans with Disabilities Act, passed into law in the USA in 1990, would serve to ensure that suppliers comply with any standards that may be developed.

It is believed that the political climate, at least within CEC, is such as to encourage this belief and direct discussions and lobbying should commence at the same time as development of standards, as outlined in this report.

7.3.3 Public awareness availability of special services and equipment for people with special needs

The special requirements that are needed by various user groups to overcome the limitations of disabled persons in gaining access to present day telecommunications and other related services, will be vastly improved through greater public awareness of these needs.

The specialist organisations that are involved with the user groups, all produce guidelines appertaining to their own specific requirements, but also each individual will have some slightly different need. Whilst it is not economically viable to meet every need, a better compromise could be achieved by greater awareness of the problems involved, it should also be recognised that in many cases the full use of a facility is often curtailed by economic factors.

With ever increasing numbers of people with special needs, together with the advancement of scientific developments, the expectations of people with special needs will create greater demands to take into account these expectations. This will have, perhaps, a greater impact on the work flow than in the home, although this is difficult to forecast accurately.

Public awareness of the needs of people with special needs can be addressed in a number of ways: by broadcasting on radio and television at peak viewing/listening time, by advertising in public places and on public transport. Also in the local and national press, a further complementary role would also emanate from statutory bodies, welfare organisations, self help and specialised user groups.

Manufacturers of all related equipment should include in the advertising literature that their product is suitable, or may be readily adapted to enable it to be used by people with special needs. More can be done to increase the awareness of the requirements of people with special needs by a greater understanding on the part of designers, architects and town planners with regard to the construction and siting of public telephone call boxes. So as not to create additional hazards for visually impaired users, a textured paved area around the site will provide additional warning. Regarding siting, consideration should be given to taking account of surrounding noise levels and electrical and magnetic emissions that could seriously affect those with hearing impairments. Thought should also be given to providing a greater ease of access for wheel-chairs users and elderly people.

7.3.4 Involvement of users in development and approval of standards

It has become clear in this study that there may be a discrepancy between the perception of user needs on the part of those working on behalf of people with special needs, and the needs expressed by the people with special needs themselves. This should be taken as a warning that people with special needs should be involved in any decisions made concerning their needs.

In order to find a practical method for achieving this, contact should be made with a small number of organisations in Europe that could efficiently handle such a process. These organisations could include user groups, major charities of groups of users, or populations of people with special needs such as sheltered accommodation or workshops.

7.3.5 Consideration of billing issues for people with special needs

The clear message from discussions with users is that the uptake of telecommunications is extremely price/convenience sensitive, and that many people with special needs are very worried about the possibility of finding themselves having to pay excessive bills. This is potentially worrying, as effort will be expended in standardising aspects of telecommunications that may never be used by the target users.

Practical answers could include:

- standardisation of an "on-line call cost" function being added to as many services as possible so that users get an immediate feedback as to the cost of calls;
- standardisation of hardware and software interfaces so that adaptation is simple and, therefore, cheap.

7.3.6 Consideration of time-on-line issues for people with special needs

Some people with special needs have disabilities that slow down the communication process considerably, e.g. written communication by text-telephone is more than twenty times slower than conducting the same conversation by speech. Other disabilities give rise to other problems that result in longer on-line times when communicating via the tele-net.

Some means need to be found for compensating people who require substantially longer on-line time to conduct their communication. In Norway, e.g., people who use text-telephones and are registered as deaf or needing a text-telephone for other reasons, have a free quota of 300 tariff impulse intervals (local) every quarter (three months), to compensate them for the increased costs of communicating by text-telephone.

This is not a standards or technical recommendations issue, since it is the domain of social security or health authorities in each country to come to necessary agreements with the organisations of the disabled and handicapped, or to have the appropriate national laws passed to ensure the rights of disabled people.

This ETR can only point out the need for such compensation to people with special needs who are slow users of telecommunications as a means of giving them telecommunications on nearly equal terms with non-impaired users.

7.4 Priority list for standardisation activities

Having considered a large number of statements by a wide spectrum of sources, priorities and recommendations for urgent standardisation topics are contained in the following list. This list is in priority order, and is weighted in favour of the comments by the disabled people themselves, so the first two topics are equal highest priority. There is no elaboration of the list as it is important that the first step in standardising any of these topics is a thorough investigation of the aspects that need to be standardised.

1 Telephony

- 1.1 unique dialling codes
- 1.2 tones and signals
- 1.3 keyboard layout issues
- 1.4 inductive coupling for hearing aids
- 1.5 sockets for additional facilities
- 1.6 portability
- 1.7 amplification
- 1.8 memory facilities
- 1.9 adaptation
- 1.10 user instructions
- 1.11 social alarms

2 Public access to telephones

- 2.1 Access to the terminals
- 2.2 Procedural access
- 2.3 Payment: card & coins

3 Text-telephones - harmonisation

4 Videotelephony

5 Facsimile - procedures and operation

7.5 Further topics for ongoing review

Having isolated the topics that require urgent standardisation, it was realised that it was important to consider the aspects of telecommunications that were currently areas of basic research, or pre-competitive prototyping, but which would have a potentially profound impact on people with special needs.

The recommendation is that progress in these topics should be reviewed on a regular basis and, at the earliest appropriate time, they should become subjects of standards.

The list is not in priority order:

a) Multimedia terminals;
b) Mobile telecommunication;
c) Broadcast services;
d) Audiofacsimile;
e) Video retrieval;
f) Voice mail;
g) Alternative function control (e.g. voice).

Annex A (informative): Collection, categorisation and use of material used

A.1 Data collection

The initial task of the project team was to collect as much relevant material as possible which describes the standardisation situation of telecommunications facilities for people with special needs. Relevant material was divided into three categories:

a) international standards and recommendations (ISO, CCITT, CEN, CENELEC, etc), national standards and recommendations (DIN, BSI, ANSI, etc), laws, specifications and codes of practice of service providers and manufacturers were gathered, directly related to telecommunications facilities for people with special needs;

b) material containing definitions, ideas, technical descriptions or other information concerning telecommunications facilities for people with special needs. This material, however, is diverse and difficult to classify;

c) background information and good recommendations from government agencies in health and social services, institutions, associations or schools for people with special needs. Laws, recommendations, etc., promoting independent living for people with special needs were included.

A.2 Classification model

As described in Clause A.1, the evaluation data was arranged as a three-dimensional model in the form of a cube (see figure A.2). The axes of the cube characterise "user function", "telecommunication interaction", and "service". Each "slice" of the cube represents one service and is subdivided into a classification matrix (see figure A.1). The rows of the matrix (user functions) indicate various kinds of impairment (see table A.1). The columns (telecommunication interactions) describe the access to a telecommunication service and the man-machine communication elements (see table A.2). The third axis of the cube is subdivided into a number of service classes and services (see table A.3) representing all telecommunication services which are currently available, or will be in the near future. Each of the cells within the matrix can be viewed as coordinates of a certain user function and a telecommunication interaction. The standardisation situation is indicated within each cell by a letter code (see figure A.1).

Each layer provides an overview of the standardisation situation for each telecommunication service (see figure A.2).

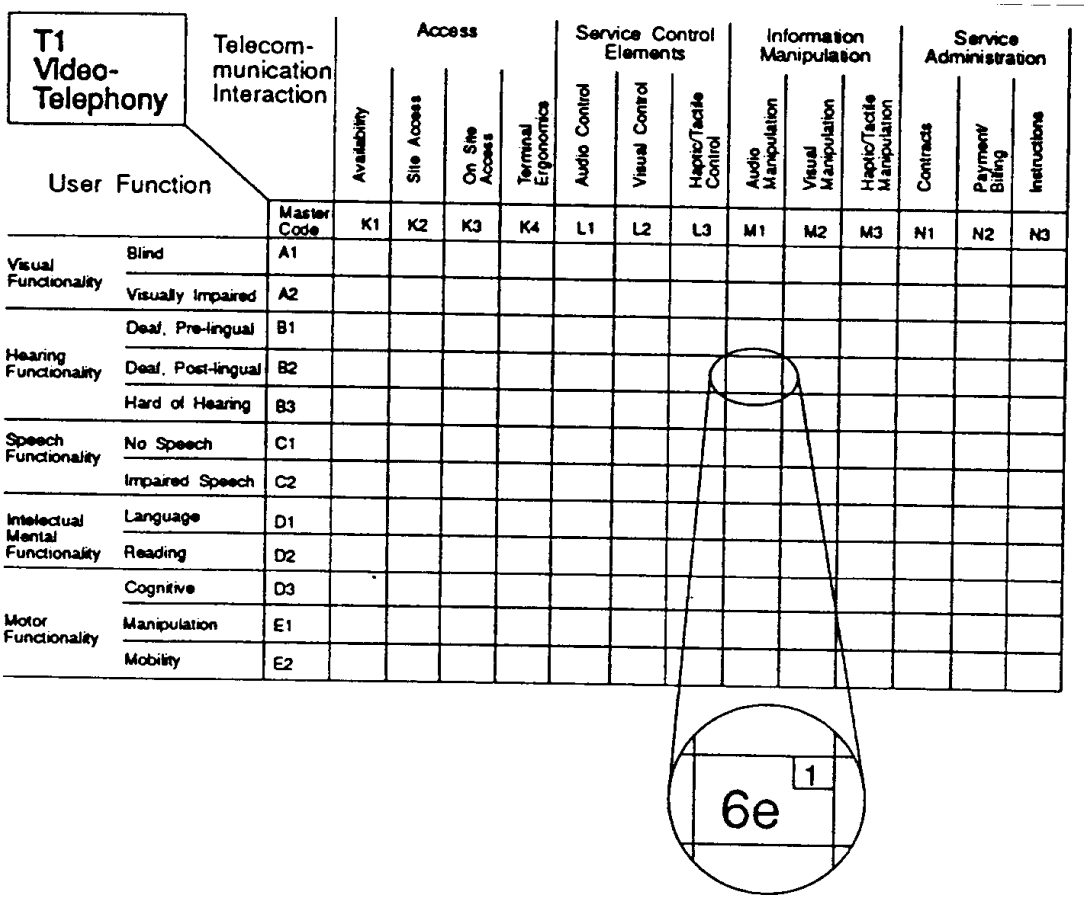

Figure A.1: Classification matrix with cell highlighted for evaluation

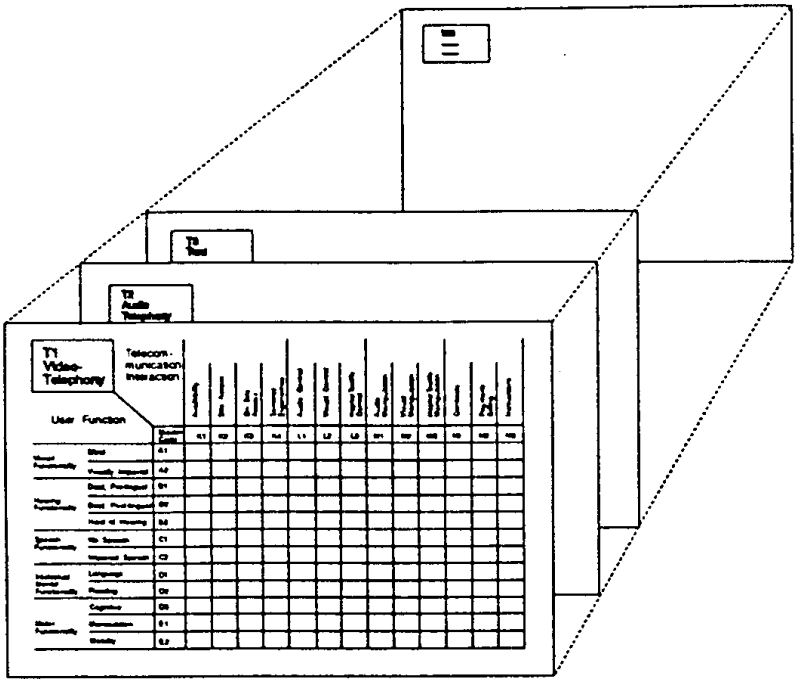

Figure A.2: Classification Model (principle)

Table A.1 lists the functionality that the user requires in order to interact successfully with the telecommunications system, and the principal functional consequences of impairment. The list makes no judgement as to the cause of the impairment, but only points out the consequences. Causes may include medical, ageing, lack of experience, incorrectly targeted education or social deprivation.

Table A.1: First axis of the model - user function

A	**Visual functionality** Ability to use visual function, and the types of impairment that affect this ability.
A1	Blind
A2	Visually impaired
B	**Hearing functionality** Ability to use hearing function, and the types of impairment that affect this ability.
B1	Deaf, pre-lingual
B2	Deaf, post-lingual
B3	Hard of hearing
C	**Speech functionality** Ability to use speech function, and the types of impairment that affect this ability.
C1	No speech
C2	Impaired speech
D	**Intellectual/Mental functionality** Ability to use intellectual/mental function, and the types of impairment that affect this ability. It is notable that a significant proportion of the apparent difficulties experienced in this area are not due to lack of intellectual power, but rather due to inappropriate education or training that becomes apparent in a new situation.
D1	Language (including writing) (NOTE)
D2	Reading
D3	Cognitive (including processing and memory) (NOTE)
E	**Motor functionality** Ability to use motor function, and the types of impairment that affect this ability.
E1	Manipulatory impairments
E2	Mobility impairments
NOTE:	Items in parenthesis are for explanation and are not entered in the database.

Table A.2: Second axis of the model - telecommunications interaction issues

K	**Access** Issues that may influence the accessibility of the telecommunications as a whole for the user.
K1	Availability (of telecommunications, including reliability) (NOTE)
K2	Site access (to terminal) (NOTE)
K3	On site access (of terminal) (NOTE)
K4	Terminal ergonomics
L	**Service control elements** Issues that govern the accessibility of the dialogue that govern the service control procedures.
L1	Audio control
L2	Visual control
L3	Haptic/tactile control
M	**Information manipulation** Issues that govern the accessibility of the information being conveyed by the service.
M1	Audio manipulation
M2	Visual manipulation
M3	Haptic/tactile manipulation
N	**Service administration** Issues that govern the availability and administration of services; between the user and the service provider.
N1	Contracts
N2	Payment/billing
N3	Instructions
NOTE:	Items in parenthesis are for explanation and are not entered in the database.

Table A.3: Third axis of the model - service classes

T	**Conversational services** Two or multi-point interactive exchange of information by mutual agreement at a point in time.
T1	Videotelephony (Point-to-Point and Multi-Point) (NOTE)
T2	Audio telephony (Point-to-Point and Multi-Point) (NOTE)
T3	Text telephony (Point-to-Point and Multi-Point) (NOTE)
T4	Multimedia telephony (Point-to-Point and Multi-Point) (NOTE)
T5	Social alarms
U	**Messaging services** Message left in store at a point in time for later retrieval by intended recipient.
U1	Video mail (including facsimile) (NOTE)
U2	Voice mail
U3	Text mail
U4	Multimedia mail
U5	Remote alarms
V	**Retrieval services** Information is accessed from a pool at a time chosen by the person initiating the access.
V1	Videotext
V2	Data retrieval
V3	Audio retrieval
V4	Video retrieval
V5	Multimedia retrieval
W	**Distribution services** Information broadcast to a set of recipients at a time determined by the broadcaster. It is the recipients' responsibility to be ready to receive the information.
W1	Television
W2	Audio broadcast
W3	Document broadcast
NOTE:	Items in parenthesis are for explanation and are not entered in the database.

A.3 Database and classification aspects

Each document is classified by comparison with the criteria required for each of the 19 fields of the database. Where key words are required, the appropriate entry is selected from the relevant list. An example is given in table A.4 below.

Table A.4: Sample record from the data base

No Field	Example	Instructions for Reviewer
1 Record number	0005	Automatic field
2 Date of record	07-02-91	Automatic field
3 Author/destination	OFTEL	
4 Original title	Standard for Simple Telephones with Additional Receive Amplification	Full original language title
5 Translated english title		English title - not required where original language is English
6 Document identifier		Unique document identifier, e.g. ISBN, series no.
7 Published date	1989, 06	Year, Month (if available), e.g. 1990, 12
8 Source	OFTEL	Place/Organisation from where copies may be obtained
9 Type of document	Standard	Select keyword from table 5a
10 User function	Hard of Hearing	Select keywork(s) from table A.1 (NOTE 1)
11 User function matrix code	B3	Select code(s) from table A.1 (NOTE 2)
12 Telecommunication interaction	Audio Information	Select keyword(s) from table 2 (NOTE 2)
13 Telecommunication interaction matrix code	M1	Select code(s) from table 2 (NOTE 2)
14 Service	Audio Telephony	Select keyword(s) from table 3 (NOTE 2)
15 Service matrix code	T2	Select code(s) from table 3, (NOTE 2)
16 Document status	6: National Standard Evaluation	Select keyword(s) from table 5b, (NOTE)
17 Coverage		Select keyword(s) from table 5c, (NOTE 2)
18 Reviewers name		Surname, initials
19 Comments		Free text

NOTE 1: For fields 10 - 17, where multiple entries are required, separate with comma followed by space (,).
NOTE 2: Items in parenthesis are for explanation and are not entered in the database.

Table A.5: List of database keywords and classification codes

Table A.5a: Document type (database field 9)

Document Type
Standard
Draft Standard
Book
Chapter (in book) (NOTE)
Report
Bibliography
Review (thematic) (NOTE)
Proceedings
Journal
Recommendation
Law/Regulation
Obligation (of service provider) (NOTE)
Catalogue (directory, list) (NOTE)
Product Information
Patent
NOTE: Items in parenthesis are for explanation and are not entered in the database.

Table A.5b: Document status (database field 16)

Number	Document status
0	unclassifiable document
1	background material
2	standards material
3	draft standard
4	national standard - inappropriate to people with special needs
5	international standard - inappropriate to people with special needs
6	national standard - appropriate to people with special needs
7	international standard - appropriate to people with special needs

Table A.5c: Coverage (database field 17)

Coverage
Design
Usability
Evaluation
Application
Experimental
Theoretical

Table A.6: List of matrix cell classification codes

Table A.6a: Standards status

Code number	Matrix cell status
0	not an issue
1	background material
2	standards material
3	draft standard
4	national standard - inappropriate to people with special needs
5	international standard - inappropriate to people with special needs
6	national standard - appropriate to people with special needs
7	international standard - appropriate to people with special needs

Table A.6b: Standardisation activities

Code letter	Recommendation
a)	Topic urgently requiring standardisation
b)	Topic requiring further or future standardisation activities
c)	Topic currently covered by contradictory standards
d)	Topic where no standardisation is necessary
e)	Topic where existing standards are satisfactory

A.4 Evaluation matrix

After classification of all documents, the standardisation situation can be mapped onto the three-dimensional model. This not only describes the standardisation situation, but it also contains relevant existing material for future standardisation activities. After classification, every cell of the classification matrix contains a code number (1 to 7) giving the standardisation status according to the highest score of the document status and a code letter (a to e) giving a measure of the work required in this area see (table A.6). Furthermore, the number of documents relating to the standardisation status appears in the upper right corner of each cell.

When this procedure is applied, only those documents are displayed which refer to the highest document status score. For some purposes it might be necessary to have all documents numbered which refer to the cell. Therefore, the standardisation status of each cell can be displayed in a lattice (cf. figure A.3, right), where the columns are labelled with code numbers 1 to 7 (i.e. the standardisation status of a document) and the rows with the code letters a to e (i.e. the standardisation activity which should be performed). In the lattice fields, the number of documents relevant to a cell clock the number in the cell, giving a measure of the specific standardisation situation/standardisation activity.

The example document which is written in table A.4 is used to show how this procedure is intended to be applied. The document is a national standard dealing with additional receive amplification for simple telephones. Therefore, it refers to cell B3, M1 on audio telephony. The standard is appropriate to people with special needs (document status number 6, cf. table A.6a). It was evaluated that the cell's topic is well covered by the standard (standardisation activity code e, cf. table A.6b).

Figure A.3 illustrates how the matrix may be filled out. As indicated in the example cell, only one document which refers to this cell was found.

Specific areas were identified where the standardisation situation is sufficient, insufficient, contradictory or not relevant to people with special needs. These results were used as a basis for drawing conclusions as

to the standardisation activities required. It is intended that the matrix will become more "lively" when all material which contains information for standardisation activities are classified and filled into the matrix.

The matrix sheets were set up at a very late stage of the project. So, only those documents with the document status number 6 (i.e. national standards which are appropriate to people with special needs), and some documents with document status numbers 4 and 5 (international and national standards which are inappropriate to people with special needs) appear in the sheets.

As an example of a mapped record, there are a couple of standards which deal with computer work places in an office environment. These standards will appear in those cells where user function issues for visually or motor impaired users appear in combination with telecommunication interaction issues "information manipulation" or "service control elements". Services are only affected where visual display units or keyboards are used.

A.5 Distribution of documents according to the model

The bar diagrams in figures A.3 to A.5 illustrate the distribution of documents in the three dimensions of the evaluation model. Figure A.5 shows the number of documents which are related to the user function categories (A, B, C, D, E), figure A.4 those related to telecommunications interactions (K, L, M, N), and figure A.5 is related to different service classes and services (T, U, V, W).

Within each category, several bars appear which display the number of documents. The first (black) bar within each category shows the total number of documents. The next (white) bar displays the number of those documents which deal with the category in general, but do not have any impact on specific issues. Then a number of bars follow which count the number of documents which contain information directly related to a specific subcategory.

The correspondence between the bars and the classification categories is given in the legend beside each diagram and is shown below. The details are extracted from the description of the evaluation methodology.

EXAMPLE: In category A (visual functionality) in figure A.3, 310 documents were found which deal with this issue. From these documents, 45 have an impact for blind people (category A1), and 27 on visually impaired people (category A2). All other documents (238) do not have specific implications for blind or visually impaired people.

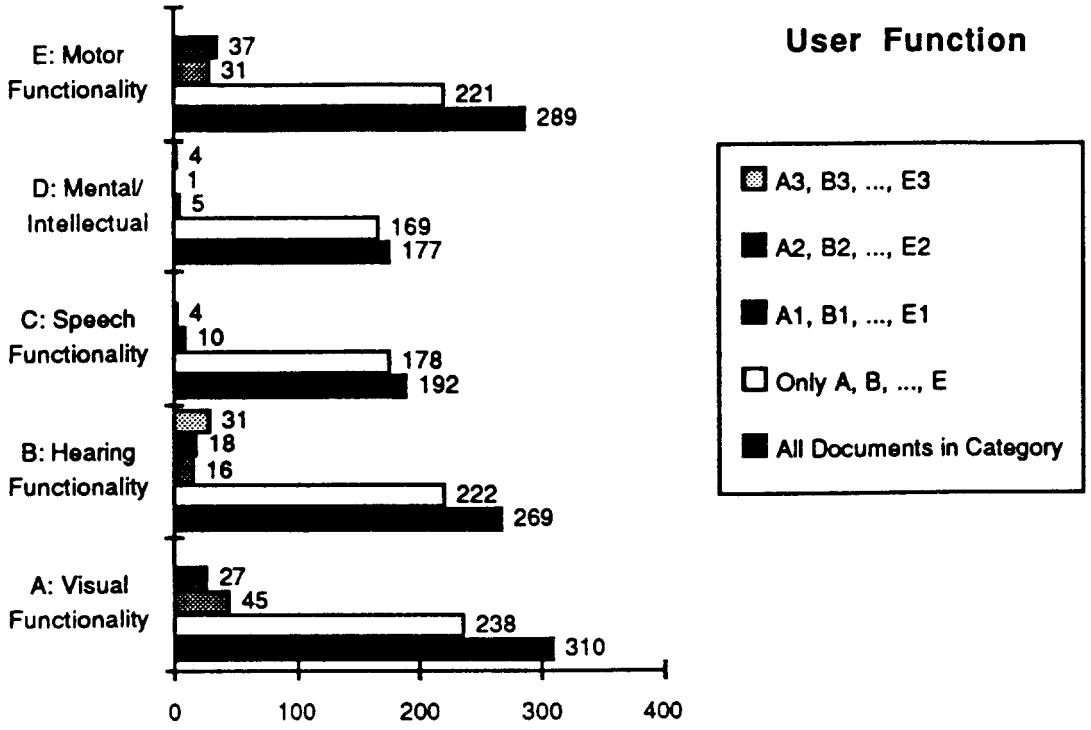

Figure A.3: User functionality

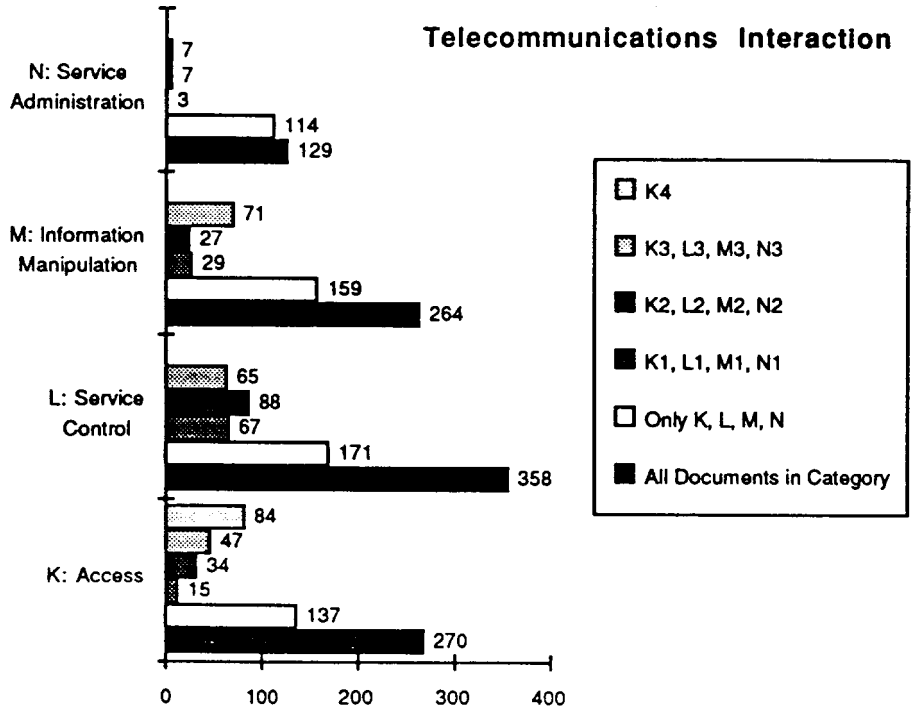

Figure A.4: Telecommunications interaction

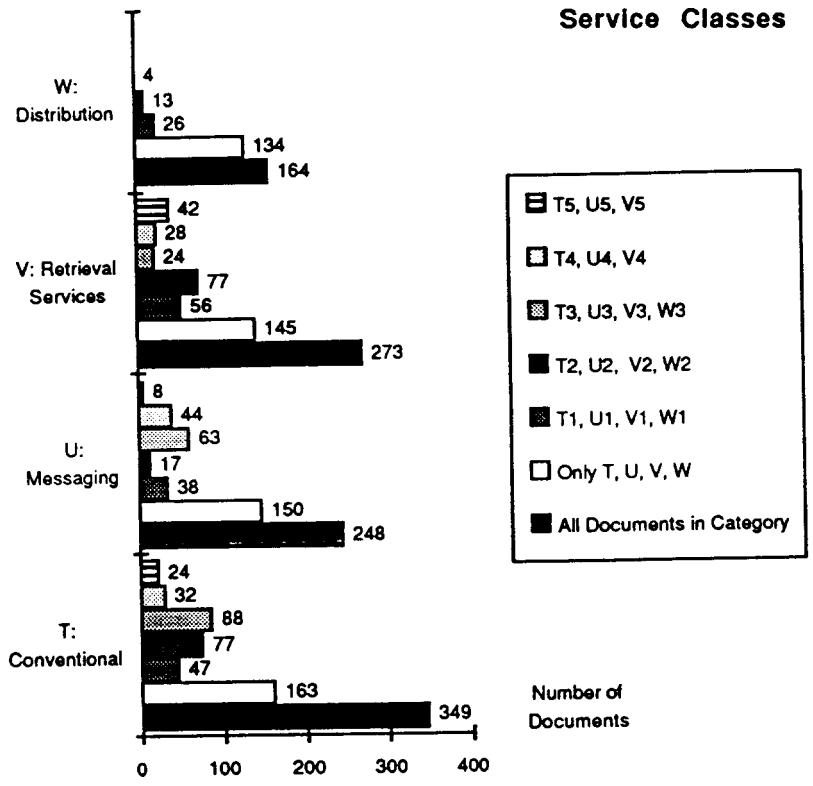

Figure A.5: Service classes

History

Document history	
September 1993	First Edition
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