

Chapter 6

Communication Devices





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Introduction

For the purpose of this report, the term 'communications devices' is defined as comprising telephones in both public and private locations with the latter including corded and cordless terminals for both fixed and mobile networks. The recommendations apply in most cases equally to analogue and digital (e.g. ISDN) fixed network phones. Videotelephony is addressed where appropriate.



Home environment

Cordless and corded telephones, analogue and digital (ISDN), voice-only (telephone), text only (text telephone), and voice, text and image (videophone) in private homes and at work.



Public environment

Public telephones, textphones, videophones and total conversation terminals.



Mobile environment

Mobile phones for voice, text and voice, text and image communications (GSM, UMTS, CDMA, AMPS...)

Voice over IP (internet telephony) is covered in the context of Total Conversation (see below).

For text telephony, different (national) standards exist; with the V.18 protocol, ITU-T defined an international standard for fixed networks, although one for mobile networks is not yet implemented. Many users need text as a medium in conversation, because of a disability in hearing or speech or of other reasons. By including text conversation facilities in communication device designs and telecom services, they can be designed for all, and satisfy both disabled users and others. Text conversation may be provided in new environments, like mobile networks and the Internet. Then, it is natural to establish interworking functions for communication with text telephones in the telephone network, in the same way as is done for voice telephony. Many of the recommendations listed below also apply for these forms of telecommunications.

Compared to some of the other technologies addressed in this report, telecommunications services and devices are mature and well established. For this reason, a large number of agreed-upon and empirically confirmed design guidelines and examples of good design practice exist. Following these is good for all users, with or without special needs, and ignoring them potentially jeopardises the usability of the products for impaired people.

While telephony is more than a century old, recent trends towards adding more and more features ('featurism') leads to a new level of



complexity of the user interfaces of telephones. While some of these features can simply be ignored by those who do not need them, others may become a necessity for some users (such as adding a new terminal to a DECT-station or using a missed-calls list and network-based answering machines). This leads to the requirement for user interfaces to manage the feature complexity in such a way as to make the most important features easily accessible by all.

The complexity of using telecommunications services and devices is further increased by the advent of a liberated telecommunications market offering a plethora of services from a large number of providers making service selection and the charging structures (e.g. call by call and preselect) very difficult to understand for the non-expert.

Another crucial issue with modern telecommunications is mobility, such as in the case of mobile phones and cordless fixed-network phones. Mobility affords a trend towards miniaturisation which in particular affects the input/output characteristics of a telephone: keyboards become so small that they are difficult to be used even by people without impairments; displays are small and often present low resolution characters. The very small devices have to indicate additional functionality such as battery status and signal strength.

While manufacturers feel forced to follow the trend towards miniaturisation for reasons of competitiveness, a design that supports Assistive Technology with defined technical interfaces for enhanced input/output has the potential of remedying this problem to a certain degree.

Finally, the issue is not just one of making sure people with special needs are not excluded from using telecommunications terminals and services, but also to ensure that telecommunications can have additional value for people with functional restrictions or other impairments by helping to organise social relationships at home or at work and by supporting care services thus empowering people with special needs to participate as active members of society.



Standards

Relevant ETSI recommendations

The Technical Committee Human Factors (TC HF) of the European Telecommunications Standards Institute (ETSI) was founded in 1989 with the mission of addressing Human Factors aspects of telecommunications technology benefiting from standardisation. In doing this, TC HF has consistently adopted a user-centred approach of Design for All.

Between 1989 and 1997, an entire Subtechnical Committee (STC HF 2) was dedicated to addressing the specific requirements of People with Special Needs. As of 1997, i.e. after the closure of the Subtechnical Committees of TC HF, all work items of TC HF including those on people with special needs are dealt with in the plenary committee.

Relevant work completed as of 02/2000

The following list provides an overview of deliverables item completed so far by ETSI TC HF:

Previous standards

ETR 068 "European standardisation situation of telecommunications facilities for people with special needs."

User requirements

ETR 334 "The implications of ageing for the design of telephone terminals."

General design guidelines

ETR 029 "Access to telecommunications for people with special needs; Recommendations for improving telecommunications terminals and services for people with impairments."

TR 101 767 "Symbols to identify telecommunications facilities for deaf and hard of hearing people; Development and evaluations."

ETR 333 ed.1 and ed.2 "Text Telephony; Basic user requirements and recommendations."

Hardware design issues

ETR 165 "Recommendations for a tactile identifier on machine readable cards for telecommunications terminals."

ETS 300 767 "Telephone prepayment cards; Tactile identifier."

ETR 345 "Characteristics of telephone keypads and keyboards; Requirements of elderly and disabled people."

ES 201 381 "Telecommunications keypads and keyboards; Tactile identifiers."

Design Evaluation

ETR 166 "Evaluation of telephones for people with special needs; An evaluation method."

Current relevant work items as of 02/2000

The following work items related to people with special needs are currently in preparation:

User requirements

DEG/HF-00003 "Guidelines for user-oriented addressing in future telecommunications systems".

DTR/HF-00005 "Symbols to identify telecommunications facilities for deaf and hard of hearing people".

DTR/HF-00014 "Guidelines for telecommunication relay services for text telephones."

DTR/HF-00018 "Requirements for Assistive Technology devices in ICT".



Hardware design issues

EN 301 462 “Symbols to identify telecommunications facilities for deaf and hard of hearing people”.

DTR/HF-02022 “Mobile videotelephony for use by people with special needs”.

DTR/HF-02021 “Sign language video communication; Quality evaluation method and requirement specification”.

Design Evaluation

DEG/HF-00006 “Usability evaluation for the design of telecommunication systems, services and terminals”.

Relevant ITU-T Recommendations

Work on human factors issues in general and on issues related to people with special needs in particular is addressed in ITU-T Study Group 2, Questions 16 and 17 (previously the word was carried out in Study Group 1). And in Study Group 16, Multimedia Systems and Services, where Question 9, titled “Accessibility to Multimedia for people with disabilities, work in co-operation with expert groups in the study group to define services and protocols of importance for accessibility.

ITU-T E.135 (10/93) – Human Factors aspects of public telecommunications terminals for people with disabilities.

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

ITU-T E.161 (05/95) – Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network.

Relevant work completed as of 02/2000

General design guidelines

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

ITU-T F.902 (02/95) – Interactive services design guidelines.

ITU-T F.910 (02/95) – Procedures for designing, evaluating and selecting symbols, pictograms and icons.

H Series Supplement 1: Application Profile Sign language and lip-reading real time conversation usage of low bit rate video communication (requirements).

Hardware design issues

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

Design Evaluation

ITU-T F.901 (03/93) – Usability evaluation of telecommunications services.

Recommendations created in ITU for Total Conversation

(For further information see the informal web area of ITU-T Q9/16 :www.omnitor.se/english/standards.)

T.140 Text conversation protocol for multimedia application, With Amendment 1(character set, editing, display and transmission of text for real time text conversation).

H.323 Annex G Text Conversation and Text SET (text in IP multimedia and IP telephony).

T.134 Text Chat Application Entity (for the T.120 data conferencing environment).



V.18 Operational and interworking requirements for DCEs operating in the text telephone mode (Automatic interworking with all old textphones and allowing voice and text simultaneously).

Recommendations modified for Total Conversation:

H.224 A Real Time Control protocol for simplex applications using the H.221 LSD/HSD/MLP channels (with addition for text conversation in H.320 video telephones).

H.324 Multimedia terminal for circuit switched networks.

V.8 Procedures for starting sessions of data transmission over the public switched telephone network (for selection of text telephone call type in PSTN).

V.8 bis Procedures for the identification and selection of common modes of operation between data circuit-termination equipments (For selecting voice and text simultaneous).

H.245 Multimedia control protocol (for selecting the text channel in multimedia protocols).

V.250 and V.254 DCE control. (General modem commands with additions for text telephony).

Current relevant work items as of 02/2000

Hardware design issues

ITU-T E.138 – Human Factors aspects of public telecommunications terminals relevant to their use by older people.

Total Conversation

F.700 Framework for Multimedia Service description.

F.MCVS Multimedia Conversation Service description.

H.248 Gateway control protocol Annex F fax, text conversation and call discrimination packages.



Output from projects

The COST 219 programme is the most comprehensive study in the telecommunications sector of user requirements for people with different degrees of disabilities. The authors are, of course, aware of many more projects conducted within and outside the framework of European programmes, e.g. INCLUDE (see the Handbook on Inclusive Design of Telematics Applications). To review them all would go beyond the scope of this document. Fortunately, the findings of most of them are in line with those of COST 219 and its subsequent work (see below). The main findings are summarised in the table below providing an overview of difficulties in various aspects of the use of telecommunications terminals and services arising from different types of impairments.

Some of the issues raised by the COST 219 reports have been addressed since the work was conducted (e.g. international standards on telecommunications payment cards and tactile markers on telecommunications keyboards) while others remain to be solved.

It has been proposed (Forschungsinstitut Technologie-Behindertenhilfe der Evangelischen Stiftung Volmastein, Study conducted for Directorate-General XIII of the European Commission) to update the COST 219 Table above by including a set of columns describing the problems of access to services that have come into operation since the original COST 219 work:

- telecommunications market
- identify and choose provider
- Select and contract
- Initialise and install
- Set individual options
- Call by call
- Equipment maintenance

Concerning images, videophones and multimedia, three more columns are being proposed:

- Images
- Video
- Enforced multimedia

With respect of the demographic shift, two sets of combinations of functional restrictions are proposed as rows:

- Low level loss of multiple functions (LLLoMF) representing a huge part of the older population. For this category, 82% of the actions in the table lead to problems, with an average overall problem degree of the class 'difficult' (1).
- High level loss of multiple functions (HLLoMF), closely related to the age group 80+ who have extremely high prevalence of disability. For this group, 97% of the actions lead to problems, with an average problem degree of 2.6 which means almost impossible. This indicates, that this group is very close to being excluded from many telecommunications services.

An activity aimed at capturing the multimedia requirements not initially covered by COST 219 is the Total Conversation initiative by ITU and IETF. This issue is one of the main topics of ITU-T SG16 Q9 and refers to the concept for conversation in video, text and voice (see ITU-T F.MVCS). IP-based Total Conversation and the interworking between IP-based and switched Total Conversation is addressed by ITU, ETSI TIPHON and IETF (MEGACO). This activity should also be seen in the light of European Parliament Resolution B4-0985/98 requiring compatibility among text and video communications systems.

The following tables follow the framework of this extended approach of the COST 219 results by addressing novel telecommunications technologies wherever possible.



Communication Devices

Area of Impairment	Use of telecommunication			Physical access							Directory			Establishing contact					Alerting signals				Communication									Storing			Correction	
	Private	Public	Payment	Handling	Reading	Switch on	Lift receiver	Hold receiver	Dialling tone	Read numbers	Dial number	Line signals	Acoustic	Visual	Tactile	Hearing	Speech	Lip reading	Lip movements	Receive sign language	Use sign language	Visual reading	Visual writing	Handling printed matter	Tactile reading	Tactile writing	Typing	Writing	Vocal	Visual						
Visual	Blind	1	2	3	4	1	1	1	1	3	1	1	3	13	14			3	17	18	19	20	21	22	23	24	25	26	27	28	29					
	Partially sighted	1	1	1	1	2	1			1			1					3		2		2	1				1	1		1						
	Reduced vision					1												1		1		1									1					
Hearing	Deaf - without speech								3			3	3			3	2													3	3					
	Deaf - with speech								3			3	3			3	1													3	3					
	Hard of hearing								2			2	2			2														2	2					
Speech	No speech															3		3												3	3					
	Reduced intelligibility															2		2												2	2					
	Low volume															1														1	1					
Reading	Dyslexia																													2	2					
Language comprehension	& intellectually impaired			1							1	1	1			2	2													3	3					
	Not intell. impaired					3										2	1													2	2					
Use of legs and feet	Wheelchair dependency	1	2	2	1																															
	Need help or aid	1	1	1	1																															
Use of arms and hands	Cannot use arms	1	2	3	3						2					3														3	3					
	Can use one arm			1	1											1														3	3					
Strength	Cannot move fingers		1	2	2						2					2														3	3					
	Cannot lift or push		1	1	2						2					2														2	2					
Coordination of movement	Lack of coordination		1	1	1						1					1														1	1					
	Reduced coordination	1	2	2	2						1					2														2	2					
Body size	Reduced coordination																																			
	Height	1	1	2	2						1																			1	1					

Figure 6-1

3 impossible

2 very difficult

1 difficult

usually no problem



User Requirement

Locating and Physical Access



Home Environment

- The terminal must not be required to be installed in such a way as to prevent some users from accessing it (e.g. it must be possible to attach an extension cord to a corded phone that is long enough so that the phone can be reached by a person in a wheelchair).
- Locating a terminal (e.g. a DECT handset) can be facilitated with a paging button on the station.



Public Environment

- The Public telecommunications terminal must be placed in an area that everybody can reach. The user may need additional space (for a wheelchair, for a companion, for valuables and possessions) for interacting with a public telecommunications terminal.
- The Public telecommunications terminal has to be easily recognised and located by everybody.



Mobile Environment

- Locating a mobile terminal can be facilitated by using a paging feature or by placing a call to the terminal.

Requirements

Standardisation



Physical

- Terminals (in particular public) should be accessible to all individuals (i.e. also to those with mobility impairments).
- Free and unimpeded access requires that the terminal be located and designed in such a way as to be operable by wheelchair, walker or cane user (e.g. level floor surface). There should be sufficient room around the terminal for wheelchair access, clear floor ground space of at least 760 mm deep by 1220 mm wide

In preparation:

- Draft Rec. ITU-T E.138.



Auditory

- It must be possible to present acoustic signals (in particular ringing signals) in a way for them to be noticeable against background noise also by mildly auditory impaired people.

In preparation:

- Draft Rec. ITU-T E.138.



Requirements

Standardisation



Visual

- Standardised signs with accompanied text (in national language) indicating the nature of the public terminal should be displayed in sufficient size and placed in close context with a terminal. The sign should be in high contrast (e.g. white or yellow characters on a dark background) and illuminated.
 - Lighting of at least 50 lux to be provided at floor level and at least 200 lux in the interactive area of the terminal.
- In preparation:
- Draft Rec. ITU-T E.138.
 - Required:
 - Standardised symbols for different kinds of telecommunications terminals and services.



Cognitive

- Unique information symbol language for location signs minimising confusability.
- Required:
- Standardised symbols for different kinds of telecommunications terminals and services.



Dexterity

- Same as physical.



Combination

- Specialist directory enquiry and service help facilities.
 - No phone should bar outgoing calls completely: Emergency call must always be possible.
- Required:
- Recommendation for specialist directory enquiry and service help facilities for people with special needs.
 - Standard for accessibility of emergency calls (as in GSM).



Physical Handling of Telecommunications device



Home Environment

- The device should not impose undue restrictions on the position of the user during extended use (e.g. use extendable receiver cords or portable videophone displays).



Public Environment

- All interaction elements (e.g. receiver, keypad, coin and card slots) should also be reachable from a wheelchair.
- Allow for protection from ambient noise.

Requirements

Standardisation



Physical

- Weight, size, and balance should be such as to allow for one-handed and single-handed (e.g. only left hand) operation and installation (e.g. insertion of SIM-card).
- When using fixed camera angles, tall pedestrian users and short wheelchair users must also be captured.

Existing standards:

- ETR 345 on telephone keypads and keyboards.

In preparation:

- Draft Rec. ITU-T E.138.

Required:

- Standardised interface to external input device (e.g. larger keyboard).
- Standard for camera characteristics in public videophones.



Auditory

- All audio events (signalling, receiver and loudspeaker) should be presented in scaleable volume.
- Induction coupling should be provided wherever possible.

In preparation:

- Draft Rec. ITU-T E.138 (for Variable amplification in all (public) phones and adjustable volume of ringer).

Required:

- Standardised interface to external amplification system.
- Induction coupling in (all) (public) (fixed network and cellular) phones.



Requirements

Standardisation



Visual

- Provide visually clear access to functionality (e.g. on / off).
- All the interaction elements (e.g. keys) should be easily detectable and recognisable.
- The interaction elements should be logically distributed in terms of the interaction process. Display resolution and illumination should be adequate.
- Tactile markers for orientation on the keypad should be used.

Existing standards:

- ETS 300 767 on tactile markers.
- In preparation:
- Draft Rec. ITU-T E.138.

Required:

- Standardised symbols e.g. for on-off.
- Standardised interface to external display system (e.g. TV, large display).



Cognitive

- People must easily recognise the type of terminal.
- All the interaction points (slots, buttons, screen buttons...) must be easily detected and recognised.
- Redundant coding should be used for different set-up elements (e.g. unique shape of connectors for mains and telephone network).

Existing standards:

- ITU-T E.161 on telephone keypad layout.

Required:

- Symbols for mains, receiver...



Dexterity

- Orientation and operation should be possible with tactile sensors only.
- One-handed and single-handed operation (e.g. connecting to power supply for battery charging, use of card readers).

Existing standards:

- ETS 300 767 on tactile markers.

Required:

- Recommendation on how to make equipment usable for one-handed and single-handed users.



Combination

- The interaction elements should offer the possibility of multimodal feedback (acoustic, tactile and visible).

Required:

- Standards on interaction elements (shape, colours, feedback, dimensions) for physical and screen controls and indications.



User Interface (UI)



Home Environment

- The user interface should be adjustable to individual needs (individualisation, user profiles).



Public Environment

- Special requirements for public manuals apply.



Mobile Environment

- The user interface should be adjustable to individual needs (individualisation, user profiles).
- The user interface must be consistent independently from environmental influences (e.g. type of mobile communications network).

Requirements

Standardisation



Physical

- Tall pedestrian users and short wheelchair users can have parallax problems in using softkeys and precision problems with tactile screen system.

Required:

- Standard for adjustable display angles (tilted displays).



Auditory

- Optional provision of redundant visual and acoustic feedback.
- Redundant visual and tactile alert for deaf users.
- Scaleable volume (for interlocutor voice and feedback indication) also during conversation phase.
- Network facilities to provide text information in parallel with voiced information.

Required:

- Recommendation on feedback typology: how to activate the different outputs (speech, visual...), message typologies, tactile feedback.
- Standards on hearing aid coupling (inductive loops, possibility to plug in hearing aids).
- Interface for ISDN User to user signalling.



Requirements

Standardisation



Visual

- The entire user interface must be “readable” by a visually impaired person.
- Use standard layouts for keypads, legible key labels (size and contrast).
- Display text: contrast, colour, typeface and size. Established guidelines for instructions for public phones [ETSI ETR 167] apply.
- Output of display in Braille or voice.

Existing standards:

- ETSI ETR 167 on user instructions for public phones.
- ETS 300 767 on tactile markers.
- ITU-T E.135 (10/93) – Human Factors aspects of public telecommunications terminals for people with disabilities.
- ITU-T x on standard key layout.

In preparation:

- Draft Rec. ITU-T E.138.

Required:

- Recommendation on “blind” activation and navigation.
- Recommendation on the user interface attending to typefaces, legibility, sizes, colours and graphical representations.
- Recommendation for converting display information into voice output.



Cognitive

- Use established graphical symbols for common functions.
- Use consistent and distinguishable user interface layouts for different applications. Internal consistency of the entire user interface.
- Provide continuous feedback during operation.

Required:

- Standards on user interface symbols.
- Standards on feedback typology (as auditory).



Dexterity

- For manual dexterity the dimensions of the operation buttons are a priority. In mobile phones, the requirement of sufficiently large keys may only be achieved by employing assistive technology.

Required:

- Standardised interface to external input device (e.g. larger keyboard).



Combination

- Internal consistency of the entire user interface.
- Provision of alternative input modes and interface for assistive technology devices (adaptation equipment).

Required:

- Standard on interface for adaptation equipment.



Operation (User Dialogue)

Requirements

Standardisation



Auditory

- Use redundant (auditory and visual) dialogue prompting.
- Multi-modal information about cost structure and billing.

Required:

- Recommendation for multi-modal dialogue prompting.
- Recommendation for multi-modal presentation of information on cost structure and billing.



Visual

- Use redundant (auditory and visual) dialogue prompting.
- Multi-modal information about cost structure and billing.

Required:

- Recommendation for multi-modal dialogue prompting.
- Recommendation for multi-modal presentation of information on cost structure and billing.



Cognitive

- Correspondence between logic of the user task and screen design / menu or button ordering.
- Consistent standard functionality (e.g. deleting an entry from a phone book and deleting and entry of a redial list).
- Many elderly or cognitively impaired people need more time to read and understand the different screens of the telephone. Therefore sufficiently long timeouts (critical for elderly users) for input (prompts) and output (e.g. feedback).
- Offer (preferably) multi-modal help.
- Offer optionally reduced dialogue complexity (separate steps).
- Prompts should be recognisable, clear and unambiguous.
- Offer easy-to-understand information on cost structure and billing.

Required:

- Standard for minimum timeout in dialogue input prompts.
- Recommendation for multi-modal help.



Requirements

Standardisation



Dexterity

- Adjustable time-dependent input events (e.g. double click).
- Sequencing of shift or function key input.

Required:

- Recommendation on the implementation of shift or function keys (in terms of offering alternatives for the one-handed user).



Combination

Physical

- None identified



Adaptation to User Profile



Home Environment

- Profiles of settings for different users (profile selection).



Public Environment

- Possibilities of adapting public terminal are limited, but e.g. to be able to short dial n numbers stored on the phone card.
- Adaptation in terms of these characteristics can be: language, size of the messages and labels, time between different displays, speaker volume, operation typology.



Mobile Environment

- Preferences for user (individualisation) and according to the environment.

Requirements

Standardisation



Physical

- Adaptation of the user interface or operation process to specific physical requirements of the user, e.g. voice input instead of keypad input.

Required:

- Recommendation on adaptability of phone user interfaces to people with different needs.



Auditory

- Use redundant (auditory and visual) dialogue elements and optional visual feedback of every interaction.
- Technical interface for audio amplification and hearing aid coupling.

Required:

- Recommendation for additional auditory signals in dialogues.
- Standard for assistive technology (see above).



Visual

- Use redundant (auditory and visual) dialogue elements and optional auditory feedback of every interaction (e.g. auditory signal of menu wrap).
- Profiling of character size on the display.
- Technical interface for external enlarged display.

Required:

- Standard for assistive technology (see above).



Requirements

Standardisation



Cognitive

- Novice, expert and extended help modes. Simplified user interface for the most important functions.

Required:

- Recommendation on characteristics of novice and expert menus and help systems.



Dexterity

- Interface for extended input device (e.g. larger keys).
- Require confirmation dialogues for potentially problematic actions.

Required:

- Recommendation for prompting in potentially damaging dialogues.
- Standards for assistive technology (see above).



Combination

- E.g. for deaf *and* blind people solely rely on e.g. Braille.

Required:

- Standards for assistive technology (see above).



Security of Operation



Public Environment

- The public terminal should minimise the risk of interception of private information.



Mobile Environment

- Risk of unauthorised use, eavesdropping.

Requirements

Standardisation



Auditory

- To reduce the danger of eavesdropping, headsets can be used instead of speakers.

Required:

- Standardised interface for earphones.



Visual

- Multimodal prompts also for set-up phase (e.g. prompt for PIN entry).
- Replace PIN by biometric identification (e.g. fingerprints).

Required:

- Standardised interface for biometric identification.



Cognitive Physical

- None identified



Dexterity

- Replace PIN by biometric identification (e.g. fingerprints).

Required:

- Standardised interface for biometric identification.



Combination

- Privacy, integrity of information, authenticity of information or originator, non-repudiation of sender and access control, maximum reliability of transmission and timely availability of services.

Required:

- Technical (non-human factors) standards on these aspects.



Conclusions

Input for standards currently being prepared

Draft Rec. ITU-T E.138 (various issues across the report).

Required standards (listed in order of priorities)

Standard on interfaces for adaptation equipment:

Recommendation on adaptability of phone user interfaces to people with different needs. (ETSI SMG 9/ ITU-T).

Standardised interface to external input device (e.g. larger keyboard). (ETSI AT / STQ).

Standardised interface to external display system (e.g. TV, large display). (ETSI AT / STQ).

Standardised interface to earphones and external sound amplification system. (ETSI AT / STQ).

Induction coupling in (all) (public) (fixed network and cellular) phones. (ETSI / ITU-T).

Standards on hearing aid coupling (inductive loops, possibility to plug in hearing aids). (ETSI AT / STQ).

Standards for the wireless connection of audio to hearing aids (e.g. ANSI C63.19). (ISO/IEC).

Recommendation for multi-modal user interfaces:

Recommendation for multi-modal dialogue prompting and feedback. (ETSI TC HF).

Recommendation for multi-modal presentation of information (e.g. on cost structure and billing). (ETSI TC HF).

Recommendation for multi-modal help. (ETSI TC HF).

Recommendation on “blind” activation and navigation. (ETSI TC HF).

Review user interface recommendation on the user interface attending to typefaces, legibility, sizes, colours and graphical representations. (ISO / ETSI TC HF).

Recommendation for converting display information into voice output. (ISO).

Recommendation for additional auditory signals in dialogues, building on ETSI ETR 101041. (ETSI TC HF / ITU-T).

Recommendation on feedback typology: how to activate the different outputs (speech, visual...), message typologies, tactile feedback. (ETSI TC HF / ITU-T).

Recommendation on how to make equipment usable for one-handed and single-handed users. (ISO).

Recommendation on the implementation of shift or function keys (in terms of offering alternatives for the one-handed user). (ETSI TC HF / ITU-T).

Recommendations on lowering cognitive demands:

Standard for minimum timeout in dialogue input prompts. (ETSI TC HF).

Recommendation on characteristics of novice and expert menus and help systems. (ISO).

Review previous standards (ETSI ETR 116) and develop standards on interaction elements (shape, colours, feedback, dimensions...) for physical and screen controls and indications. (ETSI TC HF).

**Safety and Security:**

Standard for accessibility of emergency calls (as in GSM). (ETSI / ITU-T).

Recommendation for prompting in potentially damaging dialogues. (ITU-T).

Standardised interface for biometric identification. (CEN TC 224 WG 6 / CEN ISSS WS E-SIGN / ETSI SEC).

Technical (non-human factors) standards on security aspects. (CEN TC 224 WG 6 / CEN ISSS E-SIGN).

Standards for text telephony:

European communication protocol for text telephones (European or global standard).

Complete standard for national text telephone relay service. (ETSI / ITU-T / National standardisation bodies).

Interface for ISDN User to user signalling.

Standardised symbols:

Symbols for different kinds of telecommunications terminals and services; symbols for user interface elements; symbols for on-off, mains, receiver, etc. (ISO/IEC 35 / ITU-T / ETSI TC HF to provide input).

Other Recommendations:

Review recommendation for specialist directory enquiry and service help facilities for people with special needs. ETSI TC HF / ITU-T.

Standard for camera characteristics in public videophones. ETSI TC HF / ITU-T.

Standard for adjustable display angles (tilted displays). ETSI TC HF / ITU-T.