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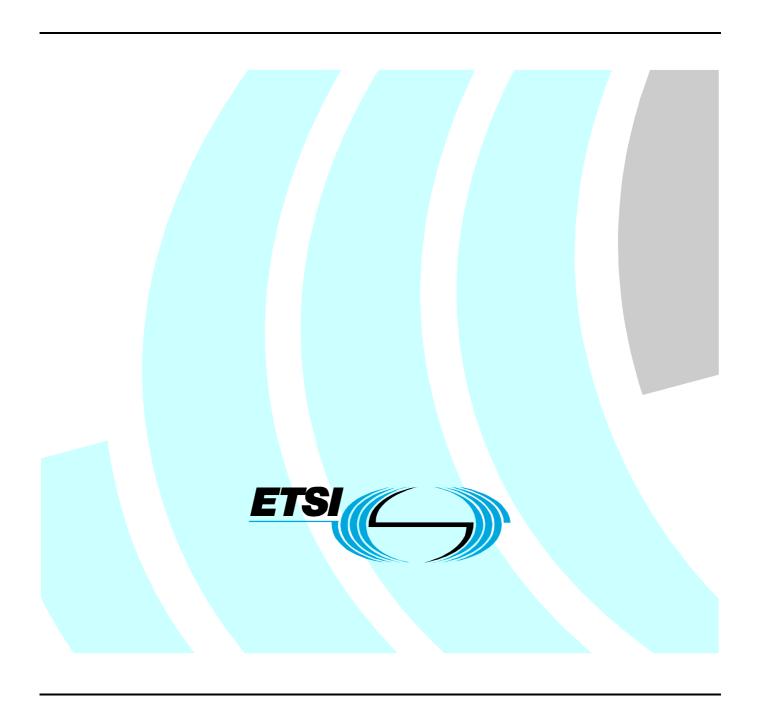
ETSI Guide

Human Factors (HF);
User Interfaces;
Guidelines for generic user interface elements
for mobile terminals and services

ETSI

Reference

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Foreword

This ETSI Guide (EG) has been produced by ETSI Technical Committee Human Factors (HF), and is now submitted for the ETSI standards Membership Approval Procedure.

The present document is based upon individual expertise, consultation and consensus, aiming at a rapid uptake and the widest possible support for future product implementations.

Intended users of the present document are user experience and interaction design professionals, developers of mobile terminals, services and applications, mobile network and system providers, terminal approvers and standard writers and developers.

Introduction

Information and Communication Technologies (ICT) play a key role in the daily activities of many people. The mobile telephone is a highly successful device that also corresponds to a deep human communication urge. Available and coming applications and services promise a world where ICT resources improve further the quality of life.

The global number of mobile subscriptions continues to rapidly grow, estimated to reach 2 billion in 2008. It already overtook the number of wire-line subscribers globally in 2003, growing six times faster than fixed-line services. In addition to those presently subscribed, over 500 thousand new mobile telecommunications users sign up each day. Users also talk more on their mobile terminals and increase their use of data services (over 1 billion SMS messages are sent every day). GSM is the globally most widespread technology in 2004, it accounts for more than 1 billion subscribers served by more than 600 operators in more than 200 countries. The penetration growth is particularly strong in Central and Eastern Europe, China and India, also driven by tariff reductions. In 2004, world penetration is estimated to 20 % (with a total of some1.3 billion subscriptions in mid-2004).

The capabilities offered by mobile solutions evolve, from only being able to make a call and use voice-mail to downloadable personalization achieved through ring signals, software programs such as games and the introduction of multimedia information services such as mapping and directions, traffic information, text messaging and e-mail access, quasi-cordless functionality or video call services.

Connectivity and interoperability between telephony networks, personal computing, the Internet, and ever-smarter mobile terminals and services offer enormous potential for improving life. However, there is concern about whether these new products, services and their content will be fully accessible to all people, including children, aging and disabled users. An effective *e*-society relies on the fact that *all* citizens are granted access. Users who cannot get over the hurdle of the first installation of their terminals and services will perpetually be excluded from the *e*-society. Ensuring access to mobile communication for all is a common goal of vendors, operators, service providers, users associations, as well as politicians, often talking about the creation of the *e*-inclusive information society, see [65] to [67].

It is important to consider the use of market-driven solutions that utilize technologies with forward-looking interoperability. Such an approach can provide users with increased satisfaction in the use of superior modes of communication terminals and ICT equipment. A similar approach has recently been announced in the networked consumer electronics area in order to establish a platform of interoperability for digital media [71].

The present document is based on the conclusions and recommendations provided by TR 102 125 [1] and has been conducted in collaboration with the telecommunication industry, aiming at consensus building. It was presented to the international community at various international mobile communication conferences, workshops, symposia, major trade fares and other events, thereby increasing the understanding for the benefits of such an approach, preparing the ground for implementations.

The work is aligned with and sponsored by the European Commission's initiative *eEurope*, a programme for inclusive deployment of new, important, consumer-oriented technologies, opening up global access to communications and other new technologies, for all, see http://europa.eu.int/information_society/eeurope.

The eEurope 2005 Action plan -following on from the eEurope 2002 initiative -aims to provide a favourable environment for the creation and uptake of new services and new jobs, to boost productivity, to modernize public services and to give everyone the opportunity to participate in the global information society. Thereby, the most competitive and dynamic economy in the world, exploiting the opportunities of the new economy and technologies, can be created. However, this will only happen if people have confidence in the commercial and public services offered to them electronically.

1   Scope

The present document aims at simplifying end-user access to information and communication services from mobile telecommunication terminals. It does not restrict the ability of market players to further improve and develop their terminals and services, nor does it limit their options to trademark user interface elements or profile the user experience of brand-specific user interface implementations as a competitive edge.

The present document is applicable to public and private (licensed and unlicensed) mobile telecommunication networks, terminals, services and applications.

The present document addresses key issues from the end user's perspective, providing guidance on proposed generic user interface elements for basic and advanced mobile terminals, services and certain aspects of application handling. The aim is to provide simplified access to basic and selected advanced functions of mobile communication. User requirements and available results of standardization work have been considered and integrated in the present document, providing implementation-oriented guidance. Wherever possible, a Design-for-All approach has been adopted, taking special needs of children, elderly users and users with physical or sensory disabilities into account.

2   References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

[1]   ETSI TR 102 125: "Human Factors (HF); Potential harmonized UI elements for mobile terminals and services".

[2]   ETSI ETS 300 907: "Digital cellular telecommunications system (Phase 2+) (GSM); Man-Machine Interface (MMI) of the Mobile Station (MS) (GSM 02.30 version 5.7.1 Release 1996)".

[3]   ETSI TR 102 068: "Human Factors (HF); Requirements for assistive technology terminals in ICT".

[4]   ETSI ES 202 076: "Human Factors (HF); User Interfaces; Generic spoken command vocabulary for ICT devices and services".

[5]   ETSI EG 202 067: "Universal Communications Identifier (UCI); System framework".

[6]   ETSI ES 202 130: "Human Factors (HF); User Interfaces; Character repertoires, ordering rules and assignments to the 12-key telephone keypad".

[7]   ETSI EG 202 116: "Human Factors (HF); Guidelines for ICT products and services; "Design for All"".

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[9]   ETSI SR 002 180: "Requirements for communication of citizens with authorities/organizations in case of distress (emergency call handling)".

[10]   ETSI ETR 297: "Human Factors (HF); Human Factors in Video telephony".

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[12]   ETSI EG 202 249: "Universal Communications Identifier (UCI); Guidelines on the usability of UCI based systems".

[13]   ETSI EG 202 191: "Human Factors (HF); Multimodal interaction, communication and navigation guidelines".

[14]   ETSI ETR 070: "Human Factors (HF); The Multiple Index Approach (MIA) for the evaluation of pictograms".

[15]   ETSI EG 201 379: "Human Factors (HF); Framework for the development, evaluation and selection of graphical symbols".

[16]   ETSI ETR 113: "Human Factors (HF); Results of an evaluation study of pictograms for point-to-point videotelephony".

[17]   ETSI TR 101 767: "Human Factors (HF); Symbols to identify telecommunications facilities for deaf and hard of hearing people; Development and evaluation".

[18]   ETSI ES 201 381: "Human Factors (HF); Telecommunications keypads and keyboards; Tactile identifiers".

[19]   ETSI ETR 095: "Human Factors (HF); Guide for usability evaluations of telecommunications systems and services".

[20]   ETSI ETR 116: "Human Factors (HF); Human factors guidelines for ISDN Terminal equipment design".

[21]   ETSI ETS 300 178: "Integrated Services Digital Network (ISDN); Advice of Charge: charging information at call set-up time (AOC-S) supplementary service; Service description".

[22]   ETSI ETS 300 179: "Integrated Services Digital Network (ISDN); Advice of Charge: charging information during the call (AOC-D) supplementary service; Service description".

[23]   ETSI ETS 300 180: "Integrated Services Digital Network (ISDN); Advice of Charge: charging information at the end of the call (AOC-E) supplementary service; Service description".

[24]   ETSI ETS 300 375: "Human Factors (HF); Pictograms for point-to-point videotelephony".

[25]   ETSI ETR 329: "Human Factors (HF); Guidelines for procedures and announcements in Stored Voice Services (SVS) and Universal Personal Telecommunication (UPT) ".

[26]   ETSI TS 122 101: "Universal Mobile Telecommunications System (UMTS); Service aspects; Service principles (3GPP TS 22.101 version 5.13.0 Release 5)".

[27]   ETSI ES 201 275: "Human Factors (HF); User control procedures in basic call, point-to-point connections, for Integrated Services Digital Network (ISDN) videotelephony".

[28]   ETSI ETR 187: "Human Factors (HF); Recommendation of characteristics of telephone services tones when locally generated in telephony terminals".

[29]   ETSI TR 101 041-1: "Human Factors (HF); European harmonization of network generated tones; Part 1: A review and recommendations".

[30]   ETSI TR 101 041-2: "Human Factors (HF); European harmonization of network generated tones; Part 2: Listing and analysis of European, World and Standardized tones".

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[33]   ITU-T Recommendation E.123: "Notation for national and international telephone numbers, e-mail addresses and Web addresses".

[34]   ITU-T Recommendation F.910: "Procedures for designing, evaluating and selecting symbols, pictograms and icons".

[35] ITU-T Recommendation P.76: "Determination of loudness ratings; fundamental principles".

[36] ITU-T Recommendations P.10: "Vocabulary of terms on telephone transmission quality and telephone sets".

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[38] ITU-T Recommendation P.78: "Subjective testing method for determination of loudness ratings in accordance with Recommendation P.76".

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[43] ITU-T Recommendation P.800: "Methods for subjective determination of transmission quality".

[44] ITU-T Recommendation P.911: "Subjective audiovisual quality assessment methods for multimedia applications".

[45] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

[46] ITU-T Recommendation E.161: "Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network".

[47] ITU-T Recommendation E.121: "Pictograms, symbols and icons to assist users of the telephone service".

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[61]   ISO/IEC 11581: "Information technology - User system interfaces and symbols - Icon symbols and functions".

[62]   ISO 7000: "Graphical symbols for use on equipment - Index and synopsis".

[63]   IEC 60417: "Graphical symbols for use on equipment".

[64]   ISO/IEC 11581-5: "Information technology - User system interfaces and symbols - Icon symbols and functions - Part 5: Tool icons".

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3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the following terms and definitions apply:

consensus: general agreement, characterized by the absence of sustained opposition to substantial issues by any of the concerned interests and by a process that involves taking into account the views of all parties concerned and to reconcile any conflicting arguments

design for all: design of products to be usable by all people, to the greatest extent possible, without the need for specialized adoption

emergency call: call from a user to an emergency control centre

enhanced 112 (E.112): emergency communications service using the single European emergency call number, 112, which is enhanced with location information of the calling user

emergency call number: special short code(s) or number(s), used to contact the Public Safety Answering Point (PSAP) to provide emergency services

> NOTE: The emergency number issued by the emergency caller to request assistance from the emergency services. There exist two different types of emergency numbers in Europe:
>
> - **European emergency number, 112:** unique emergency number for pan-European and GSM emergency services and used, for example, in EU member states and other countries.
>
> - **National emergency numbers:** each country may also have a specific set of emergency numbers.

emergency service: legally recognized service that provides immediate and rapid assistance in situations where there is a direct risk to life or limb, individual or public health or safety, to private or public property, or the environment but not necessarily limited to these situations

end user: See **user**.

function: the abstract concept of a particular piece of functionality in a device or service

generic: generalized set or general purpose set, often in the sense of basic or ordinary

ICT devices and services: devices or services for processing information and/or supporting communication, which has an interface to communicate with a user

impairment: any reduction or loss of psychological, physiological or anatomical function or structure of a user (environmental included)

mobility: See **personal (user) mobility, service mobility** and **terminal mobility**.

personal (user) mobility: ability for the user to access personal services and data independent of the device and access network used

pre-emptive mode: interface state where a user must complete one task before proceeding to the next; in a pre-emptive mode other software functions are inaccessible (e.g. file save dialog boxes)

public safety answering point: physical location where emergency telephone calls are received and then routed to the proper emergency services

service mobility: ability of services to be accessible and deliverable independently of network, terminal or geographical location attributes

spoken command: verbal or other auditory dialogue format which enables the user to input commands to control a device, service or application

terminal: physical device which interfaces with a telecommunications network, and hence to a service provider, to enable access to a telecommunications service

NOTE: A terminal also provides an interface to the user to enable the interchange of control actions and information between the user and the terminal, network or service provider.

terminal mobility: ability of a terminal, while in motion, to access telecommunication services from different locations, and the capability of the commercial wireless networks to identify and locate that terminal

usability: effectiveness, efficiency and satisfaction with which specified users can achieve specified goals (tasks) in a specified context and particular environments, see ETR 095 [19] and ISO/IEC 9241-11 [59]

NOTE: In telecommunications, usability should also include the concepts of learnability and flexibility; and reference to the interaction of more than one user (the A and B parties) with each other and with the terminals and the telecommunications system, see ETR 116 [20].

user: person who uses a telecommunications terminal to gain access to and control of a telecommunications service or application

NOTE: The user may or may not be the person who has subscribed to the provision of the service or owns the terminal. Also, the user may or may not be a person with impairments.

User Interface (UI): physical and logical interface through which a user communicates with a telecommunications terminal or via a terminal to a telecommunications service (also called man-machine interface, MMI)

NOTE: The communication is bi-directional in real time and the interface includes control, display, audio, haptic or other elements, in software or hardware.

user requirements: requirements made by users, based on their needs and capabilities, on a telecommunication service and any of its supporting components, terminals and interfaces, in order to make use of this service in the easiest, safest, most efficient and most secure way

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CLI Calling Line Identification
EMS Enhanced Message Service
GPRS General Packet Radio Service
GSM Global System for Mobile telecommunication
ICT Information and Communication Technologies
ISP Internet Service Provider
ITU-T International Telecommunications Union - Telecommunication standardization sector
MMI Man-Machine Interface
MMS Multimedia Message Service
M-Services Mobile data Services
OMA Open Mobile Alliance
OTA Over-The-Air configuration
P3P Privacy Preferences Protocol
PIN Personal Identity Number
PoC Push-to-talk over Cellular
SMS Short Message Service
UCI Universal Communications Identifier
UG User Guide
UI User Interface

UMTS   Universal Mobile Telecommunication System
UPT   Universal Personal Telecommunication
WAP   Wireless Application Protocol
W-CDMA   Wideband Code Division Multiple Access
Wi-Fi   Wireless Fidelity (ISO/IEC local area network standard family 802.11, also known as WLAN)

4 The evolution of mobile communication and concepts of mobility

4.1 Major milestones in the evolution of mobile communication

In this clause, important milestones in the history and evolution of mobile communication are presented, with focus on relevant end user aspects and their impact in the perspective of historical, generic harmonization in the establishment of a mass market. By this, it is intended to introduce the recommendations of the present document in a historical perspective and increase the understanding for the work presented.

Samuel F.B. Morse developed the fully functional telegraph in 1837. A good or two later, supposedly between 1849-1857, Antonio Meucci invented a "sound telegraph", a device for transforming electricity to sound, calling the invention a "*teletrofono",* or electric telephone, and filed his first patent caveat (a notice of intention to take out a patent) in 1871. The patent caveat lapsed in 1874.

In October 1861, Phillip Reis demonstrated an "electric ear" before the Physical Society of Frankfurt, Germany. Reis coined the word "*telephony*" during that demonstration.

Only two years later, in 1876, Alexander Graham Bell made his first successful telephone experiment. Bell filed for a US patent on February 14, 1876, just two hours before Elisha Gray did the same!

Guglielmo Marconi trialled radio communication from ships in 1899, reporting from America"s Cup. Two years later, a message was from England all the way to Canada!

Mobile telephony dates back to 1910, when Lars Magnus Ericsson, founder of the Swedish Telefonaktiebolaget L.M. Ericsson and his wife Hilda used the first "car telephone", hooking two long sticks over a pair of telephone wires and connecting to an operator in the telephone exchange.

Public broadcast radio was invented in 1921. Eight years later, in 1929, the Chicago police department used radio communication between cars. In 1935, radio communication between cars was first used in Europe (by the Swedish Gothenburg police department). Soon thereafter, two-way radio and handwriting recognition were invented.

In 1946, the first single-cell, manually switched telephone radio service was introduced by AT&T in St. Louis, USA. A year later, in 1947, Claude Shannon and Robert Pierce developed the first cellular-type mobile system specifications for CDMA.

On December 3rd, 1950, Sture Lauhrén made the world's first cell phone call using a prototype system developed in Sweden by Ericsson and Televerket. In 1956, Mobile Telephony System A, MTA, was publicly launched in Stockholm and Gothenburg, with a maximum capacity of 150 subscribers. An MTA telephone set weighed 35 kg! Six years later, in 1965, Mobile Telephony System B, MTB, was launched to solve capacity problems in MTA. MTB supported six simultaneous calls and offered a capacity of 660 subscribers. As transistors were already introduced, the weight of an MTB mobile telephone was reduced to 9 kg.

In 1966, the first fax was sent through a telephone line.

In 1973, Motorola vice presidents Marty Cooper and John Mitchell made the first public demonstration of a call from a handheld wireless phone.

In 1977, the first personal computer was released, the Apple II. In 1981, the Xerox Star graphical user interface concept was presented and first used in commercial implementations in 1984 by the Apple Macintosh and the Psion organizer.

In 1981, the first commercial operation of a Nordic Mobile Telephony, NMT450, began (in September in Saudi Arabia and in October in Sweden and Denmark). In the meantime, several but incompatible systems such as AMPS, NAMPS, TDMA and CDMA were developed and launched in the United States.

In 1982, eleven countries founded Groupe Spéciale Mobile (GSM) with the goal to define a global standard for mobile telephony. Seven years later, in 1989, it was hosted by ETSI.

In 1985, the International Mobile Telecommunications 2000, IMT-2000 (the number 2000 carrying three meanings: supposed to represent the year 2000 when the ITU hoped the system would become available, data rates of 2000 kbps and frequencies in the 2000 MHz region; also known as Third Generation Mobile Communication, 3G and Universal Mobile Telecommunication System, UMTS), study began with the establishment of an Interim Working Party (IWP 8/13) and work continued in Task Group 8/1.

In 1986, NMT450 became far too popular, leading to capacity problems and NMT900 was launched. A year later, the first PDA (Apple Newton) and the first "pocket" phone (Ericsson - 750 g, talk-time 12 minutes, standby time 4 hours) were launched.

In 1988, ETSI was founded. In 1989, voice-mail for mobile subscribers was introduced and a year later, wide area paging. In 1991, Radiolinja in Finland launched the first GSM system and the first really portable, pocket-sized handsets appeared.

In 1993, Short Messaging Services (SMS) was launched, as feedback indication for voice-mail waiting. The same year, subsidized GSM handsets appeared on the market. The first Internet browser with a graphical user interface, Mosaic, was launched the same year.

In 1994, commercial operation of D-AMPS (IS-54) in the US and PDC in Japan started.

In 1996, the first Palm Pilot, Nokia Communicator and Motorola StarTac (90 g) were launched. The year after, in 1997, GSM 1 800 MHz was launched to solve GSM capacity problems. The WAP Forum was founded and the first pre-paid subscriptions launched.

In 1998, the first handset with a colour screen was introduced (Siemens S10). In December, ETSI Special Group Mobile (SMG) created 3GPP in Copenhagen, Denmark, in partnership with other associations including T1P1, ARIB TTC and TTA.

In 1999, Wireless Internet Application Protocol (WAP) services and the first commercial GPRS networks were launched (first handsets: Nokia 7110, Siemens S25 and Ericsson R520).

In 2000, the Bluetooth and General Packet Radio Service, GPRS, specifications were disclosed and the first Bluetooth-enabled handset was launched (Ericsson R520), followed by the first Java-enabled handset (Motorola Accompli 008). The next year, in 2001, the first MMS-compatible handset (Ericsson T68i) was released.

In June 2001, NTT DoCoMo launched a trial 3G service (an area-specific information service for i-mode). In October 2001, the first commercial WCDMA-based 3G mobile network was launched. In Europe, MMO2 set up a 3G "mobile lab" network on the Isle of Man, and in September 2002, Mobilkom Austria launched Europe's first national, commercially operating UMTS network.

The Wireless World Research Forum was established in 2001, initiating research focusing on mobile solutions beyond UMTS.

4.2   Concepts and notions of mobility

There are several concepts and notions of *mobility* the present document takes into consideration, introduced in the following clauses.

4.2.1   Personal (user) mobility

The user will need some means of secure identification towards the terminal, which in turn will depend on the environment hosting the accessed data and services as well as necessary configuration to enable such access. Personal mobility involves the network's capability to locate the terminal associated with the user for the purposes of addressing, routing, and charging the user for calls.

Terminal-independent access to services provides strong motivation for standardization, and hence also the present document.

4.2.2   Terminal mobility

Terminal mobility is defined in commercial wireless networks as the ability of a terminal, while in motion, to access telecommunication services from different locations, and the capability of the network to identify and locate that terminal.

4.2.3   Service and application mobility

Service and application mobility is the ability of services and applications to be accessible and deliverable independently from network, terminal, or geographical location attributes.

Service roaming between different operator networks and access technologies becomes an issue when travelling between network operator boundaries (e.g. different countries) or accessing applications and services through a variety of access technologies (e.g. GSM, GPRS, W-CDMA or Wi-Fi).

5   Rationale for generic user interface elements

Manufacturers, operators and service providers differentiate their products and services by trying to make them unique, or at least different from and better than those of their competitors. Areas in which such differentiation can be achieved include industrial and screen design, feature sets and also the user interface design. In this light, the user interface is not an obvious candidate for generic user interface elements to be adopted by manufacturers, operators and service providers.

Harmonized and generic user interface solutions have in the past found acceptance in particular in those product types that raise specific safety issues. A good example of safety-motivated user interface harmonization is the controls and indications used in cars. The user interface elements of cars (e.g. the gear, the arrangement of pedals, the symbols and colour schemes used for many of the indications) are harmonized across manufacturers to such an extent that users expect to be able to immediately drive any car (e.g. a car picked up from a rental station) without reading any instructions.

A second type of product with generic user interface elements concerns those products expected to be used by many different people. These typically are products in public places (e.g. public telephones) or in work environments.

Finally, there are established and accepted de-facto standards regarding the user interfaces of particular product types such as elements of graphical user interfaces in PCs and the design of music instruments.

User interface harmonization or the emergence of generic user interface elements is the result of either de-facto standards (as in the case of the graphical user elements) or of standardization (as in the case of the keypad arrangement on public phones). In either case, the harmonization potentially benefits end users, manufacturers and service providers. What user interface harmonization should not do is to restrict the manufacturer or service provider in expressing their brand identity or in coming up with particularly good solutions. Neither should user interface harmonization be an obstacle to novel nor innovative solutions (e.g. the emergence of new solutions for the gear change in cars, such as semi-automatic gearshifts).

In other product areas, no harmonized UI concepts have emerged, often resulting in difficulties for the users. One notorious example of a product with only limited user interface harmonization is VCRs.

In the recent past, standards bodies have issued recommendations that are expected to facilitate the uptake of new and emerging types of user interfaces. For example, ES 202 130 [6] presents the manufacturer with a clear instruction on how to assign European letters to telephony keypads and how to order lists in various languages thus saving the time and effort for finding individual solutions. In addition, that standard benefits the end user by generating consistent expectations on how characters will be handled in comparable terminals. Another example is the generic spoken command vocabulary for ICT terminals and services, ES 202 076 [4], allowing the implementation of one standardized set of voice commands across a large range of heterogeneous terminals and services.

Basic considerations of what makes a user-interface area a candidate for generic user-interface elements include:

- the proposed harmonization should not present any barrier to innovation;

- likewise, it should not present an obstacle to good product-specific user interfaces;

- only the semantics of a harmonized user-interface element should be specified in most cases, not the actual design and implementation;

- end user aspects, such as learnability, familiarity, trust, configuration, accessibility access, should be considered;

- commercial aspects (quicker uptake of new technologies, larger user base) as well as legal requirements and possible regulations should be taken into account.

6   User and operator requirements in a mobile communication environment

6.1   Reducing the usability gap

Technological advances and market pressures have made telecommunications and ICT products and systems increasingly complex, feature rich and miniaturized. Research results indicate that novice as well as advanced users is equally afraid of the high complexity of new technologies [72].

At the same time, both customer demand and the reduced cost of technology have meant that products and services which once needed user training are now available to many types of user. These users will not normally expect or want to be trained before they use these advanced products and services. Consequently, users have become less specialized.

In mobile communications, two predominant and conflicting trends can be observed: the complexity of mobile terminals and underlying technology is on the increase while the segmentation and spectrum of their users broadens. This means that more and more technologically inexperienced users should deal with terminals increasingly difficult to handle, due to the shrinking form factor and increasing number of features. This increase in product complexity with a parallel decrease in user specialization has often occurred in other technologies, and has created problems that can be described as "the usability gap" shown in figure 1.
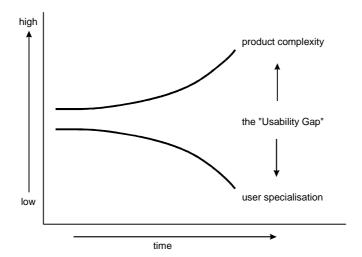

Figure 1: The usability gap

Possible ways to decrease the perceived complexity are:

- excellent user interfaces;

- context-aware intelligent user interfaces;

- simplicity of configuration;

- personalization capabilities;

- ease of operation.

User-oriented features are becoming key selling attributes and success factors of mobile solutions, more than ever before.

Technological advances and a maturing ICT industry also provide an opportunity to narrow the usability gap because products can often be designed with considerable flexibility in hardware, software and service provision. A slower introduction of new features may well enable the focus to be put on making the existing technology work. The challenge then, for Human Factors in the product design process, is to reduce the usability gap. The purpose of the present work is to contribute to the reduction of this gap.

6.2   User requirements approach

The method by which the meta user requirements described below have been assembled differs significantly from traditional user requirements processes. Figure 2 describes a cyclical process of user requirement development. Most user requirements capture processes start from the top of the circle and progress to the bottom of the figure in the direction indicated by the broken arrows. Normally a user requirements capture process will start with a context, which is typically related to a product or service that addresses some user needs (e.g. a basic telephone addresses a user need for remote real-time voice communication). User requirements capture processes normally identify a range of relevant user needs, which are then documented as a set of user requirements and then system features are developed to meet those requirements and hence, hopefully, satisfy those needs.

As the context of this present document is "mobile terminals and services", the range of possible needs that such terminals and services could address is almost infinite. Thus, a traditional user requirements process would be impossible. However, for this work, TR 102 125 [1] identified a number of potential features of mobile terminals and services that were candidates for harmonization. For this reason, the approach to user requirements taken in this present document has been to work from the system features that are described throughout the rest of the document and to try to identify the user needs that these features have been designed to satisfy. This flow is represented by the solid arrows in figure 2. The user needs that have been derived by this process have then been expressed as the user meta-requirements that are listed in clause 6.3.

Figure 2: The user requirements generation process

A final check on the suitability of the user meta-requirements can be made by:

- comparing the documented user meta-requirements with user requirements that have been derived during the design stage of real mobile terminals and services;

- forming judgements on whether the features described in the rest of this present document can be seen to relate to one of the documented user meta-requirements.

Where a feature in this present document appears to be unrelated to any of the user meta-requirements in clause 6.3, this indicates one of two possible causes:

- another user meta-requirement exists and that should have been added to clause 6.3;

- the feature satisfies no genuine user meta-requirement and it may not bring any additional value to users.

6.3 User meta-requirements

Meta-requirement 1: The user's primary interest is in interpersonal communication or information retrieval or in utilizing other non-communication functions in the terminal (all recommendations in clause 8.1.1 address this).

NOTE 1: Services, networks, terminals, or applications are secondary to the user and not what they wish to focus on. The complexities of services, networks, terminals or applications should be handled automatically according to the user's simply stated task requirements.

NOTE 2: Different users have different requirements and priorities about the means they wish to use to communicate e.g. the teenager may want "fun" communications, whereas the busy businessman will seek efficient "businesslike" means of communications.

Meta-requirement 2: Users require consistent behaviour of core functionality between terminals or services, but only if this behaviour is intuitive and efficient (most recommendations address this, especially those of clause 7).

NOTE: Making the behaviour of terminals or services consistent with unintuitive and inefficient terminals or services may offer some benefits but it will clearly make the terminal or service difficult to learn and awkward in day-to-day use.

The importance of this requirement is very context dependent and can vary between being unimportant to being essential. Some examples are:

- if a user only has a single terminal and keeps it for life, then consistency between terminals is unimportant to that person;

- if a user acquires every terminal from a single manufacturer and that manufacturer uses a consistent set of user procedures across all terminals and through all generations of terminals, then this requirement is unimportant;

- if users have one or more telephones or terminals and wish to acquire new or replacement ones from any manufacturer that they choose, then the requirement is very important as it removes the need to learn new procedures and possibly the need to simultaneously remember different conflicting procedures;

- if a user who wishes to have multiple terminals has memory deficiencies (perhaps due to ageing or to brain damage, see EG 202 116 [7]), then this requirement is very important;

- if a user is unable to observe differences in control procedures, perhaps due to an inability to detect prompting and feedback information because of vision and/or hearing loss, then this requirement is essential.

Meta-requirement 3: Users wish to be able to carry out their tasks with the minimum of complexity (e.g. recommendations R 8.1.1.e and R 8.1.3.d).

NOTE: Complexity can include too many dialogue steps but it can also include the need for extra hardware or software to be added to the basic terminal to enable standard tasks to be performed.

Meta-requirement 4: When a user interface enters a pre-emptive mode (see definitions), all users will require guidance on the choices available to them to successfully exit that mode (e.g. the "Call in progress before B-party ringing" concept in clause 8.3 is related to this requirement).

NOTE 1: On-screen "yes"/"no" softkey choices will be a pre-emptive mode that will prevent blind users from reliably exiting the mode (sometimes switching the terminal off or removing the battery is the only option available).

NOTE 2: As achieving this requirement for all users is extremely difficult, the use of pre-emptive modes in the user interface should be restricted to the absolute minimum (e.g. an "in-call" mode is inevitable in a real-time communication terminal and cannot be avoided but many pre-emptive modes in the user interface can be avoided by careful user interface design).

Meta-requirement 5: Users want to enter information only once (e.g. addressed in clause 9.11 and recommendation R 10.9.2.d).

NOTE: For this reason, synchronization between products, services and applications is a high priority.

Meta-requirement 6: Users do not want to reformat or edit data to use it with different products and services or in a different context (clauses 9.9 and 9.11 address this requirement).

> NOTE: For this reason, standardized formatting or formatting that allows standardized conversions to be made is a high priority.

Meta-requirement 7: Users wish to understand the likely cost of a communication before undertaking that communication ("advice of charge", "call charge" and "cost information" terms in clause 7.1.4 and recommendations R 8.1.1.i and R 8.3.e, all of clause 10.7 and recommendation R 10.8.1.n address this requirement).

> NOTE: Where a user is unable to determine the cost of a communication before undertaking that communication, two undesirable possibilities can occur:
>
> - the user makes the communication and is then shocked at the unexpectedly high cost of the communication;
>
> - the user is afraid that the communication will be too expensive and so decides not to make the communication.
>
> Fear that communications may be expensive (even when it is not) or anger because communications were expensive when they were not expected to be can both lead to the same result - people will be afraid of communications where the costs cannot be easily and reliably determined.

Meta-requirement 8: The layout and relative positioning of the most basic keys on a telephone (e.g. the 12-key numeric keypad keys, the "Power on/off", "Send", "End", "Yes" and "No" keys) need to be consistent across different telephones in order that blind users can locate and use these keys in order to carry out basic communications tasks, see EG 202 116 [7] and [74] (clause 9.5 addresses this issue).

> NOTE: Consistency between common keys is only relevant where telephones use 12-key keypads and have dedicated keys for the most critical keys. Where telephones lack keypads, where they employ novel keypad arrangements, or where they have no keys dedicated to the critical functions, blind users will be unable to use these terminals to directly dial telephone numbers without completely relearning the position of the critical functions. Where extensive use is made of soft keys, blind users may find the relearning process impossibly difficult.

Meta-requirement 9: Users need access to the widest range of services possible irrespective of their location, see ETS 300 907 [2] (clause 8.3 and recommendations R 8.4.f, R 9.9.6.a, R 10.3.1.c, and R 10.9.2.i address this issue).

Implication:

- Access to subscribed services when roaming. This in turn implies:
  - multi-service mobile terminals;
  - multi-service UPT (UCI);
  - all-service roaming for mobile terminals.

Meta-requirement 10: Users need a means to filter incoming communications based on a range of factors including the identity of the communication originator, the priority of the communication, the time of day, the user's current activity, etc. (clause 9.10 addresses this issue).

This requirement has a number of implications:

- a method to reliably identify the person or organization originating the communication is required;

- a universally recognized method of assigning priorities to communications is required;

- a means to filter communications based on the time of receipt or initiation of the communication is required;

- a method for specifying a user's current activities (e.g. activity-based profiles such as "Meeting").

6.4 Operator requirements

During the last decade, mobile operators have gained a limited level of exposure and influence on the user interface through the handset. One objective of the present trend for forming is to gain more control over the terminal's user interface including its update, in addition to brand and content visibility. A key goal is to provide a consistent user experience, often regarded to be of strategic importance, see [53].

Mobile operators identify the paramount importance of simple and easy user access to, and interoperability of, basic data services, see [52]. This is reflected by the operators" terminal approval requirements as well as specific requirements put on future terminals' support for functionality of Mobile Data Services (M-Services) [51]. For mobile terminals reaching the market during the second half of 2003 and 2004, the mobile operator requirements for easing access to and operation of services across different platforms include:

- greater ease of use, including more emphasis on a similar "look and feel" across different terminal types;

- terminal user interface elements such as navigation keys, icons and status indicators, presentation priorities, warning messages, multi-application user interfaces;

- a dedicated, programmable operator menu key, to facilitate service discovery and provide immediate access through a single point of entry to voice and data services;

- terminal characteristics, e.g. battery life, display type and resolution, memory;

- support for enabling technologies including OTA, Java, and WAP 2.0.

Less successful, operator-specific terminal implementation versions block certain functionality (e.g. do not allow for content to be transferred in the way preferred by the user, such as through Infrared, but require airtime-dense access to be used, such as MMS) or does not include certain blocks of software (e.g. certain games expected to be found in the terminal are left out). These kinds of functionality-harming implementations should, wherever possible, be avoided.

6.5 Linking user meta-requirements and recommendations

The recommendations made in the remainder of this present document have been carefully chosen with the aim that they address genuine requirements of both users and of operators. As such, it is possible to identify that these recommendations are linked to one or more of the user meta-requirements listed in clause 6.3 and also to the operator requirements listed in clause 6.4.

This linkage between many of the recommendations in the present document and the user meta-requirements can be seen either by references in the recommendations to specific user meta-requirements and by references to specific recommendations given as examples accompanying many of the user meta-requirement descriptions.

7 Terminology, symbols, auditory signals and user guides

7.1 Terminology

7.1.1 General

Terminology, in particular the naming of terminal and service features, is frequently a problem for users who have the intention to use a specific feature of a terminal or service but do not know its "correct" name and consequently fail to identify it when browsing feature or options menus. The reasons for a lack of familiarity of users with feature names are manifold, some of the more important ones include:

The use of specialist language: Features are usually defined by experts who employ their own terminology - often in English and making heavy use of abbreviations. E.g. the meaning of the term "roam" in the context of mobile services has to be learnt by novice users.

The use of abbreviations: The fact that "CCBS" stands for "Completion of Calls on Busy Subscriber" is known by experts only, and it is likely that even the spelt-out words do not mean too much to the end user.

The users' lack of awareness of the feature's existence: Mobile telecommunications is an extremely innovative technology and new terminal and service features are implemented with every new product generation. Users often can not keep up with the pace of new functions being made available to them and consequently lack the understanding for the offered functionality. In many cases, there is no catchy term describing a new function, which leaves the user puzzled as to what an unknown menu item represents.

The use of foreign-language terminology: As many developers of technology in Europe use English as their working language, many feature names are originally defined in English and do not get translated into the user's mother tongue. Originally English-language abbreviations like "SIM" and "PIN" are used in many languages other than English, as are terms like "display" and "keypad" which can be found in many non-English user interfaces and user guides.

Some manufacturers and service providers employ certain terms to brand their particular offering.

The sheer complexity of certain features: some features are extremely complex and cannot be easily described by simple terms (see e.g. enhanced Multi-Level Precedence and Pre-emption (eMLPP), see note).

NOTE: The enhanced Multi-Level Precedence and Pre-emption Service has two parts: precedence and pre-emption. Precedence involves assigning a priority level to a call in combination with fast call set-up. Pre-emption involves the seizing of resources, which are in use by a call of a lower precedence, by a higher level precedence call in the absence of idle resources. Pre-emption can also involve the disconnection of an on-going call of lower precedence to accept an incoming call of higher precedence.

These reasons explain the frequent clash between specialist and layman language. This clause recommends a terminology that is user oriented as opposed to specialist or technology oriented.

A further reason for proposing a harmonized terminology across manufacturers and service providers is the frequent observation that a function is labelled with different terms across different manufacturers and service providers, and sometimes different terms are used even within the terminals of a manufacturer. This makes it difficult for the end user (e.g. after having switched from one manufacturer or service provider to another) to assess the meaning of a term.

7.1.2   Existing recommendations for terminology

The only available standard for terminology of telecommunications terminal and service features is ES 202 076 [4], which specifies generic spoken commands in a number of European languages.

7.1.3   Proposed areas for recommended terminology

The terminology in this clause covers some terms related to mobile and fixed-network telecommunications terminal and service features covering DECT, GSM, GPRS, UMTS and other ICT networks and services.

Only English terms are covered, other European languages may be added in future editions of the present document. Terms are presented in British English; references to US English are made where appropriate.

The proposed terminology is restricted to those terms that an end user is likely to encounter. Specialist functionality, e.g. only used by system operators or in professional environments, is not covered.

7.1.4   Evaluating and selecting terminology

This clause presents a table of recommended terms used in mobile ICT terminals and services, to be used in user interfaces and user documentation. The terms related to terminal characteristics, services and applications, and network aspects.

Recommendation

R 7.1.a   The terms used in tables 1a to 1j should be used in all communication with the user (e.g. in menus and user guides).

The proposed terminology is presented in the tables 1a to 1j:

- Table 1a: Terminology: Terminals user interface hardware and software
  Terms related to hardware components of the terminal, e.g. keys

- Table 1b: Terminology: Configuration procedures for voice-mail
  Terms related to the set up and configuration of voice-mail services

- Table 1c: Terminology: Configuration procedures for e-mail
  Terms related to the set up and configuration of e-mail services

- Table 1d: Terminology: Configuration procedures for MMS
  Terms related to the set up and configuration of MMS services

- Table 1e: Terminology: Configuration procedures for SMS
  Terms related to the set up and configuration of SMS services

- Table 1f: Terminology: Configuration procedures for WAP/Internet
  Terms related to the set up and configuration of WAP services

- Table 1g: Terminology: Configuration procedures for data accounts
  Terms related to the set up and configuration of data services

- Table 1h: Terminology: Telephony (call preparation, making / accepting calls, in-call functions, call termination)
  Terms related to telephony (voice-service) functions including all phases from call preparation to call termination

- Table 1i: Terminology: Messaging
  Terms related to voice, text and media messaging, including terminal and network-based functionalities (e.g. network-based answering machines)

- Table 1j: Terminology: Terminal Functionality
  Terms related to terminal functionality other than telephony and messaging

Even though, in many cases, a term could logically be placed in more than one table, each term has been assigned to the one table only that seemed most appropriate.

The terminology presented in tables 1a to 1j contains the following columns:

- Concept: A term frequently used by users or specialists.

- Recommended name: The recommended term for the concept in question.

- Description/definition: Short description or definition of the concept (e.g. of the terminal feature or input/output element).

- Comment: Additional information including references to synonyms and to terms that are frequently confused with the term in question.

NOTE 1: If there is more than one popular term for one and the same concept, the preferred term is given in the "Recommended name" column (based on expert judgement). Descriptions and comments are only given in the rows listing the recommended names.

NOTE 2: In many cases, e.g. for use in menu lists presented in the terminal's display, terms have to be abbreviated. No general recommendations can be given on how to abbreviate a given term, adhering to a consistent set of abbreviation rules. It is, however, recommended to evaluate the abbreviated term in a usability test in the context of other terms used in the terminal or service.

NOTE 3: The terms listed in the tables below are presented in a neutral form (e.g. Call barring). Other morphological forms of a term will be required depending on the context in which it is employed (e.g. "Bar calls" for a command or "Calls barred" for an indication).

NOTE 4: The usage of capital letters at the beginning of terms used in the user interfaces and support documentation for products/services is a potentially complex issue and requires the application of a consistent set of rules that cover all usage of these terms. To avoid causing confusion on where capitalization should be used, all of the terms in the "Recommended Name" have been presented in lower-case only. Once capitalization rules have been applied, many of the terms will be used with an initial capital letter (e.g. as key labels or menu items) but may remain in lower-case when describing a functions in product documentation. In particular, precise rules will be needed to decide how to handle terms that are described with more than one word (e.g. should a capital letter be used only for the first word or for all words? - this is where a consistent rule is required).

NOTE 5: Tables 1a to 1j deal with recommended terms and do not in any way make recommendations about menu structures.

Table 1a: Terminology: Terminals user interface hardware and software

Concept	Recommended name	Description / Definition	Comment
# (-key)	# (-key) ("Hash-key")	Key of the 12-key keypad.	Used for entering the character "#" and for additional functionality, in North America sometimes referred to as "Pound-key" or "Square".
* (-key)	* (-key) ("Star-key")	Key of the 12-key keypad.	Used for entering the character "*" and for additional functionality.
12-key keypad	12-key keypad	Telephone keypad with keys for "0" to "9", "*" and "#".	As defined by ITU-T Recommendation E.161 [46].
camera (key)	camera (key)	Key used for activating the camera and/or taking a picture.	-
cancel (key)	clear (key)	See "clear key".	-
C (-key)	clear (key)	See "clear key".	-
clear (key)	clear (key)	Used inter alia as "clear" in text editing and for backwards navigation.	-
contacts (key)	contacts (key)	Hardkey for accessing the terminal's contacts data base (phone or address book).	In North America, the term "directory" is sometimes preferred.
dialogue (key)	selection (key)	See "selection key".	-
end (key)	end (key)	Used inter alia to terminate a call.	-
menu (key)	menu (key)	Hardkey for accessing the terminal's main menu.	ES 202 076 [4] recommends "Main Menu" as corresponding voice command.
navigation (key)	navigation (key)	Used inter alia for navigation in lists and fields.	Implemented as one unit (4-way, 5-way, 8-way, etc.) or as separate keys.
phone book (key)	contacts (key)	See "contacts (key)".	-
power (key)	power (key)	Key used to turn the terminal on or off.	In some implementations, this functionality is associated with the End key.
selection (key)	selection (key)	In user interfaces, a hardkey the function of which varies according to the current context (the current function is indicated by means of a symbol or text on the terminal's display).	-
send (key)	send (key)	Used inter alia to start dialling.	-
soft (key)	selection (key)	See "selection key".	-
volume (up/down) (key)	volume (up/down) (key)	Key(s) used to increase or decrease the volume (e.g. of the speaker).	In some implementations, this functionality is implemented as a two-way rocker key (sometimes as a side key).

Table 1b: Terminology: Configuration procedures for voice-mail

Concept	Recommended name	Description/definition	Comment
password	voice-mail password	See "voice-mail password".	-
roaming voice-mail number	roaming voice-mail number	Phone number to voice-mail box when roaming.	-
voice-mail	voice-mail number	See "voice-mail number".	-
voice-mail number	voice-mail number	The number used to call the voice-mailbox.	-
voice-mail password	voice-mail password	Password to access the voice-mail box.	-
voice-mail setup	voice-mail number	See "voice-mail number".	-
voice msg	voice-mail number	See "voice-mail number".	-
voice server number	voice-mail number	See "voice-mail number".	-

Table 1c: Terminology: Configuration procedures for e-mail

Concept	Recommended name	Description/definition	Comment
connection type	protocol	See "protocol".	-
email address	e-mail address	See "e-mail address".	-
e-mail address	e-mail address	e-mail address.	-
e-mail password	e-mail password	Password for the e-mail account. Sometimes the same as the ISP password.	-
e-mail user name	e-mail user name	User name for the e-mail account. Sometimes the same as the ISP user name.	-
incoming e-mail server	incoming e-mail server	The name or IP address of the service provider for incoming e-mail.	-
incoming mail port	incoming port	See "incoming port".	-
incoming mail server	incoming e-mail server	See "incoming e-mail server".	-
incoming port	incoming port	The number of the port for the e-mail server.	-
incoming server address	incoming e-mail server	See "incoming e-mail server".	-
ISP user name	ISP user name	The user name required when dialling up to the ISP.	-
ISP password	ISP password	The password associated with the ISP user name.	-
login user name	ISP user name	See "ISP user name".	-
login password	ISP password	See "ISP password".	-
mail address	e-mail address	See "e-mail address".	-
mailbox	e-mail user name	See "e-mail user name".	-
mailbox type	protocol	See "protocol".	-
my e-mail address	e-mail address	See "e-mail address".	-
outgoing e-mail server	outgoing e-mail server	The name or IP address of the SMTP server for sending e-mails.	-
outgoing mail port	outgoing port	See "outgoing port".	-
outgoing mail server	outgoing e-mail server	See "outgoing e-mail server".	-
outgoing port	outgoing port	The number of the port for the SMTP server.	-
outgoing server address	outgoing e-mail server	See "outgoing e-mail server".	-
password	e-mail password	See "e-mail password".	-
port	incoming port, or outgoing port, as appropriate.	See "incoming port", or "outgoing port, as appropriate".	-
protocol	protocol	E-mail protocol.	-

Concept	Recommended name	Description/definition	Comment
server	incoming e-mail server, or outgoing e-mail server, as appropriate	See "incoming e-mail server" or "outgoing e-mail server", as appropriate.	-
user name	e-mail address	See "e-mail address".	-
username	e-mail address	See "e-mail address".	-

Table 1d: Terminology: Configuration procedures for MMS

Concept	Recommended name	Description/definition	Comment
message server	message server	Message server address.	-

Table 1e: Terminology: Configuration procedures for SMS

Concept	Recommended name	Description/definition	Comment
service centre(s)	service centre	Phone number to service centre.	-
e-mail gateway(s)	e-mail gateway	Phone number to e-mail gateway.	-

Table 1f: Terminology: Configuration procedures for WAP/Internet

Concept	Recommended name	Description/definition	Comment
gateway	IP address	See "IP address".	-
HTTP Proxy server	IP address	See "IP address".	-
IP address	IP address	The IP address for the WAP gateway or HTTP proxy server.	-
login ID	user name	See "user name".	-
password	Gateway password	Password for the WAP gateway.	
user id	user name	See "user name".	-
user ID	user name	See "user name".	-
user name	user name	User ID for the WAP gateway.	-
WAP IP	IP address	See "IP address".	-

Table 1g: Terminology: Configuration procedures for data accounts

Concept	Recommended name	Description/definition	Comment
address	APN	See "APN".	-
APN	APN	Access Point Name, the address of the GPRS network gateway through which to connect to the external data network, either an IP address or a text string.	-
bearer	connection type	See "connection type".	-
connection type	connection type	The type of data connection used (e.g. GSM, GPRS, or HSCSD).	-
data bearer	connection type	See "connection type".	-
data call type	dial type	See "dial type".	-
dial number	dial-up phone number	See "dial-up phone number".	-
dial type	dial type	Analogue or ISDN connection.	GSM only.
dial-up phone number	dial-up phone number	The phone number of the Internet service provider.	GSM only.
DNS address	DNS address	The IP address of the DNS server.	GPRS only.
GPRS APN	APN	See "APN".	-
GPRS Network Gateway	APN	See "APN".	-
IP address	terminal IP address	The IP address that the terminal uses when communicating with the network.	GPRS only.

ETSI

Concept	Recommended name	Description/definition	Comment
login ID	user name	See "user name".	-
password	password	Password to log on to the external data network.	-
phone number	dial-up phone number	See "dial-up phone number".	-
preferred service	connection type	See "connection type".	-
primary DNS/Secondary DNS	DNS address	See "DNS address".	-
primary name server/Second. Name server	DNS address	See "DNS address".	-
user id	user name	See "user name".	-
user ID	user name	See "user name".	-
user name	user name	User ID to log on to the external data network.	-
username	user name	See "user name".	-

Table 1h: Terminology: Telephony (call preparation and set-up, making/accepting calls, in-call functions, call termination)

Concept	Recommended name	Description / Definition	Comment
3-party call	conference call	See "conference call".	-
access code	access code	In PBX-systems or MVPN implementation, the number to dial in order to get an external line. In mobile terminals, the Calling card activation code.	-
advice of charge	cost information	See "cost information".	-
alarm call	alarm call	The possibility for a user to request an alarm call (or calls) to be made to their line, hearing an appropriate announcement when the call is answered.	The alarm can be set to a time specified in advance, on a specified number of consecutive days, or can be programmed to any specific pattern. Not to be confused with alarm clock, a local terminal feature.
answered calls list	answered calls list	List of previously answered calls.	-
AOC	cost information	See "cost information".	-
automatic call acceptance	automatic call acceptance	Mode in which incoming calls are automatically accepted.	-
automatic off-hook	on-hook dialling	See "on-hook dialling"	-
auto-redial	auto-redial	Option for having a busy number automatically re-dialled at specified intervals.	-
call back	call back	This service allows (a) a calling user A encountering a non-answering destination to be notified when the destination B becomes available and (b) allows a calling user A encountering a busy destination B to have the call completed when the busy destination B becomes idle, without having to make a new attempt.	Covers both CCBS and CCNR as from the end user's perspective when the called party is unavailable and a connection is to be established at the earliest possible time. ES 202 076 [4] recommends "Keep trying" as corresponding voice command.

Concept	Recommended name	Description / Definition	Comment
call barring	call barring	The service provides the possibility for a fixed or mobile subscriber to prevent all or certain outgoing calls and/or service control operations from his telephone line. The service may be fully service provider controlled, registered by the service provider but subscriber controlled or fully controlled by the subscriber.	When all outgoing calls are barred, there are no outgoing call set-up possibilities, except for emergency calls. Some existing variants including barring options for incoming calls are not covered here (see note 1). The term may sometimes need to be expanded to describe the call barring variant.
call by call	call by call	Allows the user to specify a network operator to be used for the next outgoing call.	-
call charge	cost information	See "cost information"	-
call deflection	call deflection	This service enables the served user to respond to an incoming call by requesting redirection of that call to another user, terminal or answering position. It can only be invoked before the connection is established by the served user, i.e. in response to the offered call, or during the period that the served user is being informed of the call.	The served user's ability to originate calls is unaffected by the CD supplementary service. This service is often confused with call forwarding, call transfer and call diversion. ES 202 076 [4] recommends "Divert to" as corresponding voice command.
call diversion	call diversion	The feature that allows incoming calls to be forwarded to a previously denoted other terminal.	Also being referred to (e.g. in standards and in North America) as "Call forwarding". See also "Call diversion on busy" and "Call diversion on no reply". Other existing variants are not covered here (see note 2). The term may sometimes need to be expanded to describe the call diversion variant. ES 202 076 [4] recommends "Divert all calls to" as corresponding voice command.
call diversion (on) busy	call diversion when busy	See "call diversion when busy".	-
call diversion (on) no reply	call diversion when no reply	See "call diversion when no reply".	-
call diversion when busy	call diversion when busy	This service permits a served user to re-direct to another number all incoming calls, or just those associated with a specific basic service, addressed to the user's number and meeting busy.	The served user's outgoing calls are unaffected.
call diversion when no reply	call diversion when no reply	This service permits a served user to re-direct to another number all incoming calls, or just those associated with a specific basic service, which meet with no reply and are addressed to the user's number.	The served user's outgoing calls are unaffected.
call forwarding	call diversion	See "call diversion".	-
call forwarding (on) busy	call diversion when busy	See "call diversion when busy".	-
call forwarding (on) no reply	call diversion (on) no reply	See "call diversion when no reply".	-
call hold	Hold call	See "hold call".	-
call log	call log	List of previous incoming, outgoing, and missed calls made from the terminal	Comprised the entries of the "dialled calls list", "missed calls list", "answered calls list", and "rejected calls list".
call rejection no CLIP	reject calls with hidden number/name	See "reject calls with hidden number/name".	-

Concept	Recommended name	Description / Definition	Comment
call swap	switch calls	See "switch calls".	-
call tracing	call tracing	This service enables a user to request that the source of an incoming call is identified and registered by the network.	-
call transfer	call transfer	The feature that allows to transfer an ongoing call to another user.	Often confused with call forwarding and call deflection. ES 202 076 [4] recommends "Transfer" as corresponding voice command.
call waiting	call waiting	This service enables a user to be notified during a call of an incoming call in a waiting position. The notification indicates that no information interface channel is available. The user then has the choice of accepting, rejecting or ignoring the waiting call making use of switching orders.	See also "hold call" and "switch calls".
call(s) list	call log	See "call log".	-
calling name identification	show name to called party	See "show name to called party".	-
carrier selection	preferred carrier	See "preferred carrier".	-
CB	cell broadcast service	See "cell broadcast service".	-
CCBS	call back	See "call back".	-
CCNR	call back	See "call back".	-
cell broadcast service	cell broadcast service	The cell broadcast is a teleservice which enables an information provider to submit short messages for broadcasting to a specified area within the PLMN.	-
CFB	call diversion	See "call diversion".	-
CFNR	call diversion	See "call diversion".	-
CFNRc	call diversion	See "call diversion".	-
CFNRy	call diversion	See "call diversion".	-
CFU	call diversion	See "call diversion".	-
CLIP	show number to called party	See "show number to called party".	-
CLIR	hide number / name from called party	See "hide number / name from called party".	-
CNIP	show name to called party	See "show name to called party".	-
collective call	collective call	In DECT terminals, to place a call to all handsets registered with the DECT base station.	-
COLP	show name / number to calling party	See "show name / number to calling party".	-
COLR	hide number from caller	See "hide number from caller".	-
completion of calls on busy subscriber	call back	See "call back".	-
completion of calls on no reply	call back	See "call back".	-
conference call	conference call	This supplementary service provides a mobile subscriber with the ability to have a multi-connection call, i.e. a simultaneous communication with more than one party.	Covers 3-party calls; Conference call, 3-party; Conference call, add on; Conference Call, meet me; Multi-party call. ES 202 076 [4] recommends "Conference call" as corresponding voice command.
contacts (list)	contacts (list)	Allows the user to enter and store names, numbers and other data for easy and fast dialling.	Previously often called "phone book". In North America, frequently referred to as "directory".

Concept	Recommended name	Description / Definition	Comment
cost information	cost information	Provides the user with information on the charging/cost of a call or service.	There are many variants of this e.g. AOC at set-up, during a call (incremental and cumulative and at end of call). The term may sometimes need to be expanded to describe the AOC variant.
dialled numbers list	dialled numbers list	List of previously dialled numbers.	This does not depend on the dialling mode (e.g. number dialling or dialling from contacts).
divert call	call diversion	See "call diversion".	-
en-bloc dialling	en-bloc dialling	Dialling method allowing the number to be dialled to be composed and edited before it is sent to the network.	See also overlap dialling.
fast dialling	speed dialling	See "speed dialling".	-
fixed-destination call	fixed-destination call	The possibility for a subscriber to set up a call to a predetermined number, nominated by the subscriber, by lifting the handset only. The fixed destination is registered by the subscriber.	The service can also be referred to as hot line. See also fixed destination call, timed (with timeout), where the predetermined number will be called after a short time period if dialling has not commenced during this period.
hands free	hands free	Modes of using a telecommunications terminal that do not require the terminal to be held against ear and mouth.	Examples include headsets, car-kit systems and speakerphones. See also "speakerphone".
hide number / name from called party	hide number / name from called party	This service enables the calling party to prevent presentation of its number or name to the called party.	Covers CLIR and CNIR.
hide number from caller	hide number from caller	Connected Line Identification Restriction, allows the B-party to suppress presentation of their number to the calling party.	COLR.
hold call	hold call	This supplementary service allows a user to interrupt communication on an existing call and then subsequently, if desired, to re-establish communication.	Indicate the control for putting a call on hold ("hold call") and the indication for calls being held ("call held"). ES 202 076 [4] recommends "Hold" as corresponding voice command.
incognito	hide number / name from called party	See "hide number / name from called party".	-
malicious call identification	call tracing	See "call tracing".	-
MCID	call tracing	See "call tracing".	-
microphone off	microphone off	Allowing the user to temporarily turn off the microphone during a call.	ES 202 076 [4] recommends "Mike on" / "Mike off" as corresponding voice commands.
missed calls list	missed calls list	List of previously missed calls.	-
multi-party call	conference call	See "conference call".	-
mute	microphone off	See "microphone off".	-
network list	operator list	See "operator list".	-
network lock	operator lock	See "operator lock".	-
on-hook dialling	on-hook dialling	A form of overlap dialling: the phone goes off hook immediately after the first number has been entered.	Usually used in conjunction with hands-free mode.
operator list	operator list	Option for displaying all currently available operators / networks.	Often with indication of which networks / operators are blocked.
operator lock	operator lock	Denotes that a terminal cannot be connected to a particular network / operator.	-
overlap dialling	overlap dialling	Dialling method with the number to be dialled being sent directly to the network (no editing possible).	See also en-bloc dialling.
phone book	contacts (list)	See "contacts (list)".	-
preferred carrier	preferred operator	See "preferred operator".	-

Concept	Recommended name	Description / Definition	Comment
preferred network	preferred operator	See "preferred operator".	-
preferred operator	preferred operator	This service allows the user to select a preferred carrier from a number of alternatives that may be available.	Carrier selection, see also "call-by-call" for carrier selection on a per-call basis.
recall (later)	call back	See "call back".	-
redial	redial	Allows the user to dial again a previously dialled number.	ES 202 076 [4] recommends "Redial" as corresponding voice command.
redial list	dialled numbers list	See "dialled numbers list".	-
reject calls with hidden number/name	reject calls with hidden number/name	A call barring service which rejects incoming calls from a source which has implemented Calling Line/Name Identification Rejection.	See also Call Barring.
rejected calls list	rejected calls list	List of previously rejected calls.	-
reverse charging	reverse charging	A service allowing a called user to be charged for the actual communication, that is, for usage-based calls.	-
selective call deflection	selective call deflection	Option for deflecting specified calls (e.g. from a pre-defined list of callers or only at certain times).	See "call deflection".
show name / number to calling party	show name / number to calling party	Connected Line Identification Presentation, to identify the number of the called party, e.g. to know whether the B-party has forwarded their calls.	COLP.
show name to called party	show name to called party	This service provides the called party with the possibility to receive identification (name) of the calling party.	CNIP.
show number to called party	show number to called party	This service provides the called party with the possibility to receive identification (number) of the calling party.	CLIP.
speakerphone	speakerphone	Special implementation of hands free (often using a different loudspeaker or loudspeaker mode).	See also "hands free".
speed dialling	speed dialling	Allows the user to assign a number to a specific key. The number can then be dialled e.g. via long press on that key.	Also referred to as "abbreviated dialling" or "facilitated dialling".
switch calls	switch calls	Allows the user to switch between two calls (e.g. from an active call to a call on hold).	ES 202 076 [4] recommends "Switch call" as corresponding voice command.
three-party call	conference call	See "conference call".	-
transmitter off ("In-flight mode")	transmitter off ("In-flight mode")	In mobile terminals, to indicate controls and indications related to transmitter-off mode.	Used on board on airplanes but also in other protected areas such as hospitals.
vibration alarm	vibration alarm	Tactile mode of indicating an incoming call or alarm.	ES 202 076 [4] recommends "Vibrate on" / "Vibrate off" as corresponding voice commands.

NOTE 1: Barring, all services; Barring, of Incoming Calls when Roaming outside home PLMN; Barring, of Outgoing International Calls; Barring, of Outgoing International Calls except to Home Country; Barring, Incoming calls; Barring, Incoming Calls, all services; Barring, Outgoing calls; Barring, Outgoing calls, all services; Barring, Outgoing calls, Subscriber selected; Barring, Selective, Incoming Calls; Barring, Selective, Incoming Calls, up to 10 numbers barred; Barring, Selective, Incoming Calls, all but 10 numbers barred; Barring, Selective, Outgoing Calls, up to 10 numbers barred.

NOTE 2: CF All service; CF Busy, One of a Group; CF Conditional, All services; CF No reply, One of a Group; CF No reply to Dictated Announcement; CF Not Reachable; CF Selective, Registration; CF Selective up to 10 numbers; CF Selective all but 10 numbers; CF Unconditional to any number; CF Unconditional to Announcement; CF Unconditional to Dictated Announcement; CF Unconditional to Fixed Number; CF Unconditional to operator.

Table 1i: Terminology: Messaging

Concept	Recommended name	Description / Definition	Comment
answering machine	answering machine	The function of a terminal that offers the caller the option to leave a recorded message.	The network-based solution offering a comparable functionality is usually referred to as "Voice-mail (box)".
greeting message	greeting message	Message on an answering machine to be played to a calling party in case the called party does not answer.	-
ICM	message	See "message".	-
incoming message	message	See "message".	-
message	message	Information of any mode (e.g. text, picture or sound) for the recipient's attention.	-
message waiting indication	message waiting indication	Indication that at least one new message (i.e. a message not yet attended to) has been received.	The "message waiting indication" can be provided in various modes (e.g. audio or text).
MWI	message waiting indication		-
OGM	greeting message	See "greeting message".	-
outgoing message	greeting message	See "greeting message".	-
recorded announcement	recorded announcement	Special kind of outgoing message (just giving information without leaving the caller the option to leave a message).	-
remote answering machine access	remote answering machine access	Remote access to a network-based of physical answering machine.	Usually controlled by voice menus or DTMF codes.
SMS	SMS	Short message service.	-
voicemail	voice-mail	Message left on an answering machine.	Usually in the context of network-based answering machines.

Table 1j: Terminology: Terminal functionality

Concept	Recommended name	Description / Definition	Comment
alarm clock	alarm clock	Terminal function allowing the user to set an alarm to be activated at a specific time.	Not to be confused with "alarm call" which is a network-based service.
baby monitoring	baby monitoring	Telephony function initiating a call to a pre-configured number when a pre-set sound level in the surroundings is being exceeded (e.g. to alert parents that a baby is crying).	The term "Babyphone" previously used in products is copyrighted.
headset	headset	Headset (often combined with microphone for hands-free communication).	-
info	memory function	See "memory function".	-
IrDA	IrDA	Functionality for using infrared for the purpose of exchanging information between users or terminals.	-
keypad lock	keypad lock	Function allowing all keys to be temporarily disabled mainly in order to prevent calls to be made accidentally.	Emergency calls are always possible.
memory function	memory function	Allows the user to store a number or text (off line or during a call) for later use.	-
personal identification number	PIN	See "PIN".	-

Concept	Recommended name	Description / Definition	Comment
PIN	PIN	Personal Identification number, e.g. for registering SIM on mobile networks and for other local terminal features.	Covers registration "permitting the user to change or register his PIN in the SIM on mobile networks" and unblocking "changing the PIN in the SIM on mobile networks without having first to enter the existing PIN" for both PIN and PIN2.
presentation of IMEI	show IMEI	See "show IMEI".	-
PUK	PUK	Personal Unblocking Key, used to unblock a terminal that has been blocked after a maximum number of wrong PINs has been entered.	-
ringer volume	ringer volume	Control or indication related to setting the volume of the ringer signalling.	-
show IMEI	show IMEI	A facility which causes a terminal to display its International Mobile station Equipment Identity (IMEI).	-
signal strength	signal strength	Indication of strength of the signal from network or DECT base station.	-
SIM	SIM	Subscriber Identity Module.	Implemented on SIM card.
SIM card	SIM card	Card holding the Subscriber Identity Module (SIM). It has memory (for data and applications), a processor and the ability to interact with the user.	Also covers "USIM cards" used for UMTS networks.
SOS	SOS	Indication of functions related to emergency services.	E.g. to be used on softkeys to indicate that emergency calls can be made in spite of SIM card missing or key lock active.
speaker volume	speaker volume	Control or indication related to setting the volume of the terminal's speaker.	-
system lock	system lock	Option to completely lock a terminal from unauthorized use.	-
USIM	SIM / SIM card	See "SIM" and "SIM card".	-
voice memo	voice memo	Allows the user to record a memo (off line or during a call) for later presentation.	-

7.2   Symbols

7.2.1   General

Symbols (in some cases also referred to as icons or pictograms) are often used to denote the meaning of the controls or indications of a terminal or service. Compared to text labels of controls and indications, symbols have the advantage of being language independent (and therefore potentially universally understood) and more space efficient (e.g. for denoting the functionality hard keys). For this reason, symbols are particularly well suited for use in the context of telecommunications terminals and services. However, for a set of symbols to be successfully associated with the underlying functionality, the symbols have to be carefully designed, evaluated and selected (EG 201 379 [15] and ISO/IEC Guide 74 [58]).

Some de-facto or industry standards exist in telecommunications (e.g. the symbols for Bluetooth, GSM and GPRS) as well as in consumer electronics (e.g. the symbols used for media control representing functions such as "play", "pause", "rewind", etc.). Many of the core functions of telecommunications terminals and services, however, are represented by brand-specific symbols.

This clause deals with basic symbols to be used for representing the functions of telecommunications terminals and services. Reference is being made to existing recommendations for symbols from various standards bodies followed by proposals for symbols to be developed and recommended by standards bodies. Finally, suitable methods for evaluating candidate symbols are presented.

7.2.2   Existing recommendations for symbols

A number of recommendations for symbols related to mobile terminals and services already exist. The more relevant of these are listed, described and commented in table 2.

Table 2: Existing recommendations for symbols

Recommendation	Description	Comment
ISO/IEC 9995-7 [60]	Compilation of symbols for representing functions on keyboards for text and office systems. Includes navigation, editing, formatting, mathematical operations, and other functions.	Relevant as newly defined symbols (e.g. for editing) should be harmonized with existing ones.
ISO/IEC 11581 [61]	Multi-part standard covering symbols for objects, pointers, control functions, tools and actions.	Relevant as newly defined symbols (such as radio buttons, check boxes, scroll bars) should be harmonized with existing ones.
IEC 60417 [63]	A compilation of more than 800 symbols including some for identifying the equipment or a part of the equipment (for example a control or display); and for indicating functional states (for example on, off, alarm).	Relevant as newly defined symbols (e.g. for on/off) should be harmonized with existing ones.
ISO 7000 [62]	Provides a synopsis of those graphical symbols, which are placed on equipment or parts of equipment of any kind in order to instruct the person(s) using the equipment as to its operation. ISO 7000 covers more than 800 symbols including some for identifying the equipment or a part of the equipment (for example a control or display); and for indicating functional states (for example on, off, alarm).	Relevant as newly defined symbols (e.g. for on/off) should be harmonized with existing ones.
ISO/IEC 11581-5 [64]	Provides a collection of tool icons.	Draft under development.
ETSI EN 301 462 [31]	A set of symbols identifying telecommunications facilities for deaf and hard-of-hearing people, including amplification, coupling for hearing aids, text telephony, and video telephony.	Even though not strictly developed for mobile terminals and services, these symbols may also be applied for mobile scenarios (see also TR 101 767 [17] for the development and evaluation of this symbol set).
ETSI ETS 300 375 [24]	A set of symbols identifying video telephony functionality including switching between video and telephony mode, camera on/off, microphone on/off, self view on/off, still picture on/off, and document camera on/off.	Even though not strictly developed for mobile terminals and services, these symbols may also be applied for mobile scenarios (See also ETR 113 [16] for the development and evaluation of this symbols set).
ETSI EG 201 013 [32]	Compilation of definitions, abbreviations and symbols as guidance for preparing ETSI deliverables.	Currently only includes the symbols "*", "#", and "R", but may be extended in the future.
ITU-T Recommendation E.161 [46]	Layout of the 12-key keypad and assignment of the 26 letters "a" to "z" to the keypad.	Some relevance for symbols as it also covers the symbols * and #.
ETSI ES 202 130 [6]	ES dealing with the assignment of the character sets of 27 European languages to the 12-key telephony keypad.	Some relevance for symbols as it also covers a large number of special characters.
ITU-T Recommendation E.121 [47]	List of symbols telephony-related symbols.	Relevant as newly defined symbols (e.g. for Re-dialling) should be harmonized with existing ones.

7.2.3   Proposed areas for recommended symbols

Table 3 lists proposals for symbols to be developed and recommended by standards bodies. The wording in the descriptions and comments is targeted at the expert and is not necessarily suitable for describing symbol referents in symbol evaluation studies (see clause 7.2.4).

The proposed symbols are presented in the tables 3a to 3c:

- Table 3a: Symbols: Terminals user interface hardware and software
  Symbols related to hardware components of the terminal, e.g. keys

- Table 3b: Symbols: Voice and data calls (call preparation, making/accepting calls, in-call functions, call termination)
  Symbols related to voice and data call functions including all phases from call preparation to call termination

- Table 3c: Terminology: Terminal functionality
  Symbols related to terminal functionality other than telephony and messaging

Recommendations:

R 7.2.3.a   Tables 3a to 3c list candidate terminal and service-related functions to be supported by recommended symbols.

**Table 3a: Referents for proposed recommended symbols
Terminal user interface hardware and software**

Function	Description	Comment
accepted (general)	In mobile terminals, to indicate that a command or entered data has been accepted.	General positive feedback.
battery location / access	In mobile terminals, to indicate the access to the battery location (e.g. for changing the battery).	-
correction, go back, cancel	In mobile terminals, to indicate the control for correcting an input, going back a level in a hierarchical structure or cancelling an action.	These functions may need to be represented by more than one symbol.
delete e.g. character	In mobile terminals, to indicate the control for deleting a character (e.g. in editing).	-
terminal on/off	In mobile terminals, to switch on and off the terminal.	A general symbol for on/off is standardized in ISO 7000 [62].
down navigation	In mobile terminals, to indicate controls and indications related to navigating downwards in displays (e.g. menu or directory).	The de-facto standard is the representation of an arrow pointing downwards.
enter (CR+LF)	In mobile terminals, to indicate the enter character (CR+LF, e.g. for completing an input and send it to a terminal or network for further action).	See also ISO/IEC 9995 [60].
headset socket	In mobile terminals, to represent the socket for inserting a headset plug.	Standards exist for computer and consumer-electronics products.
left navigation	In mobile terminals, to indicate controls and indications related to navigating left (e.g. moving a cursor left) in displays (e.g. during editing).	The de-facto standard is the representation of an arrow pointing left.
memory card slot	In mobile terminals, to represent the slot for inserting memory cards.	Different symbols may be required for different types of memory cards.
not accepted (general)	In mobile terminals, to indicate that a command or data entered has not been accepted.	General negative feedback.
off-hook ("send")	In mobile terminals, to apply the "send"-function (e.g. in en-bloc dialling for initiating a call after entering a number).	The de-facto standard is the representation of a phone receiver (often in upright position), often printed in green colour.

Function	Description	Comment
on-hook ("end")	In mobile terminals, to apply the "end"-function (e.g. during a call to terminate the call).	The de-facto standard is the representation of a phone receiver (often in horizontal position), often printed in red colour.
PIN accepted	In mobile terminals, to indicate that a number or a string of characters entered as PIN has been accepted (see also "accepted").	In some terminals, "PIN accepted" is simply indicated by reaching the next step in the start-up flow.
PIN not accepted / limited number of re-tries	In mobile terminals, to indicate that a number or a string of characters entered as PIN has not been accepted (see also "Not accepted").	In cases of a limited number of re-tries left, this may need an additional representation of the number of attempts left.
power supply socket	In mobile terminals, to represent the socket for inserting the power plug.	Standards exist inter alia for computer and consumer-electronics products (possibly has to indicate also flash and polarity).
right navigation	In mobile terminals, to indicate controls and indications related to navigating right (e.g. moving a cursor right) in displays (e.g. during editing).	The de-facto standard is the representation of an arrow pointing right.
SIM card (slot)	In mobile terminals, to represent the slot for inserting the SIM card.	-
SIM card (symbol)	In mobile terminals, to represent the SIM card.	The de-facto standard is the representation of the shape of a SIM card (rectangular shape with a corner cut off).
space character (location of)	In mobile terminals, to indicate the (location of) the space character.	-
text input method	In mobile terminals, to indicate controls and indications related to (de-) activating or setting the parameters of predictive and/or assisted text-input methods.	-
up navigation	In mobile terminals, to indicate controls and indications related to navigating upwards in displays (e.g. menu or directory).	The de-facto standard is the representation of an arrow pointing upwards.

Table 3b: Referents for proposed recommended symbols
Voice and data calls (call preparation, making / accepting calls, in-call functions, call termination)

Function	Description	Comment
answered calls list	In mobile terminals, to indicate controls and indications related to accessing a log list of previously answered calls.	-
automatic call acceptance	In mobile terminals, to indicate controls and indications related to automatic call-acceptance mode.	-
call completion on busy subscriber (CCBS) (call back)	In mobile terminals, to indicate controls and indications related to Call Completion to Busy Subscriber.	Preferred term: "Call back".
call diversion (CF)	In mobile terminals, to indicate controls and indications related to call forwarding (mode not specified).	Preferred term: "Call back".
call diversion (CFB)	In mobile terminals, to indicate controls and indications related to Call Forwarding Busy.	Preferred term: "Call back when busy".
call diversion (CFNR)	In mobile terminals, to indicate controls and indications related to Call Forwarding No Reply.	Preferred term: "Call back when no reply".
call log lists	In mobile terminals, to indicate controls and indications related to accessing a call log list.	-

Function	Description	Comment
conference call active	In mobile terminals, to indicate that a conference call (three or more participants) is active.	-
connected to a network	In mobile terminals, to indicate an active connection to a network (network not further specified).	-
connected to CDMA network	In mobile terminals, to indicate an active connection to a CDMA network.	Indicates that high data speed and possibly separate voice and data channels are available.
connected to GPRS network	In mobile terminals, to indicate an active connection to a GPRS network.	-
connected to GSM network	In mobile terminals, to indicate an active connection to a GSM network.	-
connected to UMTS network	In mobile terminals, to indicate an active connection to a UMTS network.	Indicates that high data speed and possibly separate voice and data channels are available.
connected to W-CDMA network	In mobile terminals, to indicate an active connection to a W-CDMA network.	Indicates that high data speed and possibly separate voice and data channels are available.
data connection active (circuit-switched and package-based)	In mobile terminals, to indicate that the terminal has an active data connection (circuit-switched or package-based modes not specified).	-
data connection active: Circuit-switched	In mobile terminals, to indicate that the terminal has an active circuit-switched data connection.	-
data connection active: Package-based	In mobile terminals, to indicate that the terminal has an active package-based data connection.	-
data traffic active	In mobile terminals, to indicate that data traffic is active.	E.g. in GPRS or UMTS networks.
dialled numbers list	In mobile terminals, to indicate controls and indications related to accessing a log list of past outgoing calls.	This functionality is sometimes implemented on a dedicated key (e.g. in some DECT telephones).
emergency call being set up	In mobile terminals, to indicate that an emergency call is currently being set up.	This functionality is often associated with the letters "SOS".
missed calls list	In mobile terminals, to indicate controls and indications related to accessing a log list of past missed calls.	-
network / operator not available	In mobile terminals, to indicate that a selected network / operator is not available.	See also clause 8.3.
network lock / operator lock	In mobile terminals, to indicate that the terminal is blocked from a specific network / operator.	Preferred term: "operator lock".
new messages waiting	In mobile terminals, to indicate that new (incoming) messages.	De-facto standard is the representation of the back of an envelope.
PoC (Push-to-talk over Cellular)	In mobile terminals, to indicate controls and indications related to the PoC (Push-to-talk over Cellular) service.	-
received messages list	In mobile terminals, to indicate controls for accessing received messages.	-
remote call on hold	In mobile terminals, to indicate controls and indications related to putting a remote part on hold (e.g. during call waiting or switch call).	-

Function	Description	Comment
secure / encrypted communication	In mobile terminals, to indicate controls and indications related to secure and / or encrypted communication modes.	See also the de-facto standard symbol from internet browsers. See also clause 9.2.
service unavailable	In mobile terminals, to indicate that a selected service is not available.	-
SOS / emergency call	In mobile terminals, to indicate controls and indications (e.g. softkeys) related to placing an emergency call.	This should not be the representation of a number to be dialled (e.g. "112") as these numbers differ from region to region - in many regions, "SOS" will be acceptable (see also clause 8.2).
video telephony	In mobile terminals, to indicate controls and indications related to video telephony services.	See also ETS 300 375 [24].
voice control / voice commands	In mobile terminals, to indicate controls and indications related to voice commands.	See also clause 10.2.1.
voice dialling	In mobile terminals, to indicate controls and indications related to voice dialling.	-
voicemail (box)	In mobile terminals, to indicate controls and indications related to accessing the voicemail box.	-

Table 3c: Referents for proposed recommended symbols
Terminal functionality

Function	Description	Comment
alarm active	In mobile terminals, to indicate that an alarm is active.	See also available de-facto standards e.g. from clocks and wrist watches.
application switch	In mobile terminals, to indicate the Application switch (used e.g. for switching between different active applications).	-
Bluetooth headset mode	In mobile terminals, to indicate that the terminal is in Bluetooth headset mode.	See also the de-facto standard for Bluetooth technology.
Bluetooth interface	In mobile terminals, to indicate controls and indications for (de-) activating the Bluetooth interface.	See existing de-facto standard.
calendar access	In mobile terminals, to indicate controls and indications for accessing a calendar application.	-
camera	In mobile terminals, to indicate controls and indications related to functionality of the built-in or connected camera.	To be used inter alia on a hardkey related to camera functions.
car-kit voice mode	In mobile terminals, to indicate controls and indications related to car-kit functions.	-
contacts (terminal)	In mobile terminals, to indicate controls and indications related to functionality of the terminal-based contacts list (directory, phone-book).	The de-facto standard for a contacts or phone-book symbol is the representation of an open book seen from above.
contacts (SIM card)	In mobile terminals, to indicate controls and indications related to functionality of the SIM card-based contacts list (directory, phone book).	The de-facto standard for a contacts or phone-book symbol is the representation of an open book seen from above.
terminal locked (protected for non-certified uploads)	In mobile terminals, to indicate that the terminal is in locked mode, e.g. that it can be operated with certain SIM card only.	-

Function	Description	Comment
hands-free mode	In mobile terminals, to indicate controls and indications related to hands-free functions.	-
headset mode	In mobile terminals, to indicate controls and indications related to headset mode.	Standards exist for computer and consumer-electronics products.
IrDA interface	In mobile terminals, to indicate controls and indications for (de-) activating the IrDA (Infrared) interface.	See existing de-facto standard.
keypad lock	In mobile terminals, to indicate controls and indications related to (de-) activating of the keypad lock.	See also clause 9.2.
language selection	In mobile terminals, to indicate controls and indications related to selecting a language (e.g. as menu language).	-
profiles	In mobile terminals, to indicate controls and indications related to activating and setting of profiles.	ES 202 076 [4] recommends "Profile" as corresponding voice command.
ringer off	In mobile terminals, to indicate controls and indications related to (temporarily) switching the ringer off.	-
settings	In mobile terminals, to indicate controls and indications related to accessing the terminal's settings menu (referred to e.g. as "Settings", "Set up", or "Options").	The de-facto standard is the representation of a spanner or screwdriver.
transmitter off ("In-flight mode")	In mobile terminals, to indicate controls and indications related to transmitter-off mode.	Used on board of airplanes but also in other protected areas such as hospitals.
voice memo	In mobile terminals, to indicate controls and indications related to voice memo notes ("voice jotter").	-
volume control	In mobile terminals, to indicate controls and indications related to volume control.	Standards exist for computer and consumer-electronics products.
Wi-Fi interface	In mobile terminals, to indicate controls and indications for (de-) activating the Wi-Fi interface.	See the Wi-Fi logo issued by the Wi-Fi Alliance.

7.2.4   Evaluating and selecting symbols

Symbols to be recommended by standards bodies should be evaluated and selected applying a recognized methodology. The methods recommended by standards bodies are ETR 070 [14], ITU-T Recommendation F.910 [34] and ISO 9186 [54].

IEC 80416-1 [55], EG 201 379 [15], ETR 113 [16], TR 101 767 [17] and ETS 300 375 [24] provide guidance on symbol design and evaluation and report the procedure and results of symbol-selection studies.

Recommendations:

   R 7.2.4.a   Symbols proposed for standardization should be evaluated using a suitable test methodology applying human factors as well as technical criteria.

7.3   Auditory signals

7.3.1   General

Auditory signals used to denote the meaning of the controls or indications of a terminal or service have the advantage, compared to printed text or voice messages, of being language independent (and therefore potentially universally understood). The availability of acoustic signals benefits all users but in particular those with visual impairments and those who cannot direct their visual attention to the terminal e.g. when driving a car or when the display of a modular terminal is not available (e.g. a person wearing a Bluetooth headset while carrying his mobile terminal in a pocket). For this reason, auditory signals are well suited for use in the context of telecommunications terminals and services. However, for a set of auditory signals to be successfully associated with the underlying functionality, the signals have to be carefully designed, evaluated and selected.

Usually, humans can distinguish only a limited number of auditory signals in any given situation. Therefore, the potential for employing auditory signals should be carefully considered in product design focussing on the most important and/or critical controls and indications. In addition, people other than the user of a terminal may feel disturbed by auditory signals. The volume with which signals are being presented should therefore be scalable. In addition, in most cases, the sound should be played at the appropriate event and not repeatedly.

Since visually impaired users benefit most from the availability of auditory signals, a suitable set or profile of signals should be implemented that can be easily activated by blind or visually impaired users and are suitable for headset or car-kit use, see [74].

This clause deals with basic auditory signals generated locally by terminals or transmitted by networks in order to be used in the context of telecommunications functions and services. Reference is being made to existing recommendations for auditory signals from various standards bodies followed by proposals for auditory signals to be developed and recommended by standards bodies. Finally, suitable methods for evaluating candidate signals are presented.

7.3.2   Existing recommendations for auditory signals

Few recommendations for auditory signals related to mobile terminals and services exist. Most of those denote fixed-network service signals (e.g. "ringing", "busy line") that also apply to mobile networks and terminals. The more relevant of these are listed in table 4.

Table 4: Existing recommendations for auditory signals

Recommendation	Description	Comment
ETSI ETR 187 [28]	Definition of locally-generated tones (dial tone, ringing tone, busy tone, congestion tone, special information tone, call waiting tone, warning tone, caller waiting tone).	Relevant as newly defined auditory signals should be harmonized with existing ones.
ETSI TR 101 041-1 [29]	The document reviews standardization activities in ETSI and ITU, different tones in use in Europe and worldwide, human-factors research related to service tones and the technology for tone production.	Even though addressing network-based tones, the present document is of some relevance, e.g. to prevent confusion between similar terminal and network-based auditory signals.
ETSI TR 101 041-2 [30]	This second part provides detailed lists and an analysis of reported European and World network service tones, and compares them with existing international standards.	Even though addressing network-based tones, the present document is of some relevance, e.g. to prevent confusion between similar terminal and network-based auditory signals.
ITU-T Recommendation E.180 [48]	Technical characteristics of network or equipment-generated tones for various telecommunications services.	This recommendation gives guidance on recommended auditory (sound pressure) levels for tones taking into account the characteristics of the subscriber's line and terminal equipment.

Recommendation	Description	Comment
ITU-T Recommendation E.181 [49]	Recommendations for reducing customer confusion arising from telecommunications tones that are not internationally standardized.	The need for compensatory recommendations like E.181 [49] makes a case for internationally standardizing auditory signals in telecommunications equipment and services at the earliest possible stage.
ITU-T Recommendation E.182 [50]	This recommendation gives the responses that telephone networks should provide to subscribers in the operation of both basic and supplementary telephone services (services available in fixed and mobile networks).	Includes a listing of auditory responses used as indicators to telephone subscribers covering tones and recorded announcements.

7.3.3   Proposed areas for recommended auditory signals

Recommendations:

R 7.3.3.a   Table 5 lists candidate terminal and service functions to be supported by recommended auditory signals.

NOTE 1: For all auditory signals the rule applies that they should be used on request and be adjustable, i.e. the user should be able to turn the signals on or off and to adjust their volume.

NOTE 2: It should be carefully considered whether or not a particular auditory signal should be activated by default (i.e. when the terminal is turned on the first time).

NOTE 3: Auditory signals can be used in conjunction with vibration signals.

NOTE4:   When a user requests functionality that may or may not be available (e.g. a particular service or a particular WAP page) then the negative feedback sound should be given to indicate that the requested functionality cannot be delivered. If it is not obvious in some other way (e.g. content can be seen or heard), then a positive indication should be given to confirm that the requested functionality has been delivered to the user.

Table 5: Referents for proposed recommended auditory signals

Function	Description	Comment
alarm active	For mobile terminals, to indicate that an alarm is set.	-
battery charging	For mobile terminals, to indicate that the battery is in the process of being re-charged.	Indication of charging started and battery fully charged and upon request.
battery status indication	For mobile terminals, to indicate the strength of the internal battery.	E.g. low and full.
Bluetooth interface on/off	For mobile terminals, to indicate that the Bluetooth interface has been (de-) activated.	At least positive feedback sound.
Bluetooth interface partner terminal found	For mobile terminals, to indicate that a Bluetooth partner terminal has been found.	This could be the same signal as used for IrDA terminal found.
call diversion active	For mobile terminals, to indicate that Call diversion is active (i.e. incoming calls are not being signalled).	This signal offers at least the function of a status check. Possible variations can cover the different types of call forwarding (e.g. on busy or on no reply).

Function	Description	Comment
call in progress before B-party ringing	For mobile terminals, to indicate that the terminal is trying to establish a voice connection (after completion of dialling and before B-party ringing).	Auditory indication of the post-dial delay is important as at this stage the user's attention is directed away from the display and he may be unsure whether the call is proceeding or the terminal has returned to idle (e.g. because of network loss).
call terminated	For mobile terminals, to indicate that a call has been terminated.	-
confirmation "Message sent"	For mobile terminals, to indicate that a message has been successfully sent.	At least a positive feedback sound.
destination / target unavailable	For mobile terminals, to indicate that a selected destination (e.g. a WAP page) or target (e.g. for transfer) is unavailable.	At least negative feedback sound (see note 4).
IrDA interface on/off	For mobile terminals, to indicate that the IrDA (Infrared) interface has been (de-) activated.	At least a positive feedback sound.
IrDA interface partner terminal found	For mobile terminals, to indicate that an IrDA (Infrared) partner terminal has been found.	This could be the same signal as used for Bluetooth terminal found.
keypad lock	For mobile terminals, to indicate that the keypad lock is active.	To be played when keypad lock is active and any key is pressed.
language selection	In mobile terminals, to indicate that the terminal is presenting a prompt for selecting a language (e.g. as menu language).	-
menu wrap sound	For mobile terminals with ring-structure menus, to indicate that stepping through the list of menu items, the last item has been passed and the first item has been reached again (or vice versa in the case of upwards navigation).	-
negative feedback sound	For mobile terminals, to indicate negative feedback, e.g. for "Input has not been accepted" and "Command has not been executed".	The positive and the negative feedback sound may be the most important signals of the list as they can be used in situations, where specific sounds are not available. Often implemented as a decreasing cadence.
network found	For mobile terminals, to indicate that the terminal has been connected to a valid network.	-
new messages received	For mobile terminals, to indicate that new messages have been received.	The signal can indicate at least whether new messages are available or not.
no network found	For mobile terminals, to indicate that the terminal has unsuccessfully attempted to connect to a valid network.	The signals may not differentiate between the different reasons for failing to connect to the network (e.g. insufficient signal strength, or no roaming allowed with present networks).
PIN accepted	For mobile terminals, to indicate that the entered PIN has been accepted as correct.	At least a positive confirmation sound.
PIN not accepted / limited number of re-tries	For mobile terminals, to indicate that the entered PIN has not been accepted as correct and that only a limited number of re-tries is possible.	At least a negative confirmation sound.
PIN prompt	For mobile terminals, to indicate that the terminal is prompting for a PIN to be entered.	-

Function	Description	Comment
positive feedback sound	For mobile terminals, to indicate positive feedback, e.g. for "Input accepted" and "Command executed".	The positive and the negative feedback sound may be the most important signals of the list as they can be used in situations, where specific sounds are not available. Often implemented as an increasing cadence.
remote party on hold	For mobile terminals, to indicate that a remote party is on hold.	Signal to be presented on a change in connection (e.g. after switching of calls) or possibly at certain intervals to remind the user of a party being held.
ringer off	For mobile terminals, to indicate that the ringer is de-activated.	Indicated e.g. on request by blind people.
secure / encrypted communication	For mobile terminals, to indicate that the terminal is in secure communication / encrypted communication mode.	At least a status check.
signal strength indication	For mobile terminals, to indicate the strength of the (network) signal.	E.g. low signal, no signal.
start of recording	Beep announcing to the remote party that the audio / video recording of a call has started.	-
transmitter off ("in-flight mode")	For mobile terminals, to indicate that the terminal is in in-flight ("Airplane") mode.	At least a status check.
voice / video recording active	Indication to a remote party that the recording of voice / video has been initiated.	-
volume control	For mobile terminals, to indicate the volume currently set.	This signal can accompany the settings of all terminal features that have an adjustable volume.

7.3.4   Evaluating and selecting auditory signals

Auditory signals to be recommended by standards bodies should be evaluated and selected applying a recognized methodology. The methods below specify the evaluation of signals focussing on technical aspects such as loudness, transmission quality and compatibility with hearing aids. These may all apply, in particular if the auditory signal is being presented via a telephone network - any proposed new auditory signal has to be evaluated for confusion with existing network and service sounds and for technical characteristics such as loudness.

Currently, no established evaluation method is available that verifies the semantic association between the auditory signal and the service or function it represents. In the absence of a suitable test method for auditory signals, one of the recommended evaluation procedures for symbols (in particular ETR 070 [14]) can be modified for the purpose of evaluating auditory signals.

In addition, the use of evaluation methods ITU-T Recommendation P.76 [35] to ITU-T Recommendation P.911 [44] is recommended.

Recommendations:

> **R 7.3.4.a**   Auditory signals proposed for standardization should be evaluated using a suitable test methodology applying human factors as well as technical criteria.

7.4   User guides and reference documentation

7.4.1   General

End users often fail to make use of the full potential and benefits of mobile telecommunications terminals, applications and services because of the growing complexity of terminal and service features. While in a perfect world, communication concepts and user interfaces are fully self-explanatory to both novice and expert users, reality shows that users have to rely on instructions such as user guides. In the absence of minimum standard requirements, manufacturers tend to invest less and less in good user documentation. In many cases, detailed instructions are only provided on-line, via the Internet or on CD-ROMs. With very few exceptions, user guides leave out people with sensory or cognitive impairments and are hardly ever suited for young or elderly users, either.

A lower uptake of interactive services caused by users not coping with the complexity of terminals and services also has economic consequences and presents a burden to the creation of a European knowledge-based society.

There is a need for clear guidelines on how user instructions ought to be provided, taking into account the requirements of different user groups and the possibilities offered by different media.

7.4.2   Proposed generic approach to user-guide creation

The objective of the proposed work is to ensure minimum standards in user guidance for mobile terminals and services, and thereby to remove one of the barriers to the uptake of mobile services.

The aim is to provide manufacturers with guidance on minimum standards for user education. This should ensure that users will receive user instructions that are appropriate to their:

- needs, level of expertise and cognitive abilities;

- perceptual abilities and preferences (e.g. large-print and auditory versions of user guides);

- mental models and logical structures in a way that offers good navigation throughout the guide.

In addition, a common platform for user instruction and guidance documents could be provided to enable third-party manufacturers to develop tools for generating special variants of a user guide for specific requirements (e.g. extracting the script of a text-based user guide for spoken documentation).

The proposed work should be based on the "TCeurope SecureDOC Guidelines on usable and safe operating manuals for consumer goods" [75].

It should include, but not be limited to, the following issues:

- presenting information about unpacking, installation, set up, usage, maintenance, and disposal of the product;

- formal aspects of the documentation (e.g. table of contents, subject index, structure, cross references);

- minimum standards on typeface, line heights and borders as well as other editorial aspects;

- formal methods of assuring quality (e.g. quality checklists);

- empirical methods of assuring quality (e.g. usability tests and focus groups);

- guidelines on how to present the information in alternative media (including the tagging of references for audio presentation.

Recommendations:

> **R 7.4.2.a:**   It is recommended to develop guidelines and a common platform on how user instructions, applicable to the use of mobile terminals and services, ought to be provided, taking into account the requirements of different user groups and the possibilities offered by different media.

8   Configuration and guidance for terminal and service access, interworking, portability and error handling

8.1   General configuration procedures for service access

To be able to access common services, users should ideally not have to be exposed to configuration procedures. Configuration should be as automatic and transparent as possible, demanding minimal interaction from the user. For many services, however, users are still expected to put up with some configuration. This configuration may often be complex and may thus present a barrier both to getting started immediately with a service as well as to utilizing its potential in the long term. In order to widen and simplify user access to services the following recommendations on configuration procedures are proposed.

Configuration procedures can be arranged along a continuum of increasing user interaction and hence complexity for the user. The types of procedure referred to in the present document are:

- pre-configuration;

- guided configuration;

- manual configuration.

Configuration guidelines that apply to services in general, according to the above types of procedure, will follow in the remainder of this clause. Guidelines specific to configuration of certain services will be the topic of clause 8.2.

The scope of this clause does not include details on user guides and reference documentation, which often form an important part of the information needed for configuration procedures for terminal and service access (see also clause 7.4).

Transferring information from one terminal to a replacement constitutes a special case of configuration. Recommendations relevant to this type of configuration are analogous to synchronization as covered in clause 9.11.

8.1.1   Generic configuration

The Terminal Management Working Group of the Open Mobile Alliance [70] specifies protocols and mechanisms that achieve management of mobile terminals. The most recent versions of OMA Terminal Management protocols and mechanisms, with corresponding UI elements, are the recommended, generic technical solution for configuration for terminal and service access.

In addition, the below guidelines apply to more than one of the configuration procedures mentioned in clause 8.1:.

- Provide all configuration information in the user's language, e.g. non-English speaking users should not have to learn English to be able to access services.

- Provide a clear description of what equipment and information the user needs to have ready to hand during the configuration procedure, and if necessary, how to obtain it. The terminal manufacturer, operator and service provider may not be the same entity and may provide only their respective part of the total equipment and information needed by the user to configure the service. For example, to configure an e-mail client in a terminal the user may need:

  - a terminal with an e-mail client, support for Over The Air (OTA) delivery of settings, and necessary communication enablers like GPRS; as well as

  - a service plan with the operator that supports e-mail; and/or

- The user may need to know or find out:

  - the terminal brand;

  - model name or number;

  - subscription terminal number;

- configuration information from the operator; and

- configuration information specific to the e-mail service from the e-mail service provider.

- Convey what settings need to be configured and what effect configuring a setting will have by providing natural entry points into the configuration procedure. For example, it may not be apparent to a user that some general connectivity enabler settings must be configured in order to gain access to a specific service. Whereas users may see the relevance of configuring MMS or WAP, the relevance of configuring GPRS-based services may not be understood even though it may be a necessary part of enabling access to MMS or WAP (cf. meta-user requirement 1 in clause 6.3). In such a case, the menu structure could be organized to provide a natural mapping between the settings to be configured and the service they enable access to. Similarly, when accessing for the first time a service that has not yet been configured, the user could be guided through a configuration procedure ("just-in-time configuration", see clause 8.1.3).

- Configuration should be kept to the minimum number of steps. Any additional step introduces the potential for errors. See meta-user requirement 3 in clause 6.3.

- Indicate the progress of the configuration procedure to the user.

- Where necessary, provide explanations of concepts that need to be understood by the user during configuration. Provide a natural mapping between concepts and the terminology used, especially for the configuration settings. For example, a user may need to understand the difference and distinguish between the concepts of "network operator" and "MMS service provider" in order to be able to find the proper information and enter it during the configuration procedure. Further, a distinction should be made, where necessary, between settings that reside on the terminal as opposed to in the network.

- As far as possible, hide technical concepts that the user does not need to understand during configuration, e.g. through pre-configuration and to some extent guided configuration.

- The user should be informed at an appropriate level and through appropriate channels of the costs connected to the service to be configured. It is important that costs are sufficiently transparent to users, or they may be hesitant to access a service. However, the user may also be unnecessarily deterred if the cost is displayed for every single micro payment. See also meta-requirement 7 in clause 6.3.

- Provide consistent terminology across all sources of configuration information. The terminology used by service provider, operator and terminal manufacturer should not differ if the concepts referred to by the terms are the same. It is unlikely that the user will have sufficient knowledge to be able to decipher and translate between different terms that denote the same concept, in order to be able to configure the settings correctly. For example, to configure an e-mail client in a terminal the user may need to use the user interface and manual of the particular terminal, a configuration wizard on the operator web site, and information specific to the e-mail service from the e-mail service provider. The terminology used by all of these should be consistent. See also clauses 8.2 and 7.1.

- As far as possible, avoid forcing the user to input entries for settings. Provide appropriate default entries for settings.

- Provide clear indication and differentiation of what the setting is and what the actual entry of the setting is.

- Provide examples of the correct format for the required setting entries and support for handling the formats, e.g. do not use blank spaces in phone numbers if the terminal or service cannot handle it (see also clause 9.9.2) and prevent incorrect input of entries, respectively.

- Provide error handling to prevent a change of setting entries which would in turn prevent access to basic services, primarily voice telephony which would be needed to contact a customer support helpline.

Recommendations:

R 8.1.1.a   The most recent versions of management protocols and mechanisms, as specified in [70], with corresponding UI elements, are the recommended, generic technical solutions for configuration for terminal and service access.

R 8.1.1.b   Provide all configuration information in the user's language.

R 8.1.1.c   Provide a clear description of what equipment and information the user needs to have ready to hand during the configuration procedure, and if necessary, how to obtain it.

R 8.1.1.d   Convey what settings need to be configured and what effect configuring a setting will have by providing natural entry points into the configuration procedure.

R 8.1.1.e   Configuration should be kept to the minimum number of steps.

R 8.1.1.f   Indicate the progress of the configuration procedure to the user.

R 8.1.1.g   Where necessary, provide explanations of concepts that need to be understood by the user during configuration.

R 8.1.1.h   As far as possible, hide technical concepts that the user does not need to understand during configuration.

R 8.1.1.i   The user should be informed at an appropriate level and through appropriate channels of the costs connected to the service to be configured.

R 8.1.1.j   Provide consistent terminology across all sources of configuration information.

R 8.1.1.k   As far as possible, avoid forcing the user to input entries for settings. Provide appropriate default entries for settings.

R 8.1.1.l   Provide clear indication and differentiation of what the setting is and what the actual entry of the setting is.

R 8.1.1.m   Provide examples of the correct format for the required setting entries and support for handling the formats.

R 8.1.1.n   Provide error handling to prevent a change of setting entries which would in turn prevent access to basic services.

8.1.2   Pre-configuration

When access is pre-configured the user may access the service or application immediately, i.e. from the user's perspective there is no need for configuration. Subsequent updates of settings could be made OTA, transparent to the user.

One of the reasons for the increased uptake of SMS was the pre-configuration on the SIM card of the SMS Centre phone number, which previously had to be entered manually by users. It can be assumed that similar pre-configuration for other services would remove a barrier preventing use.

Furthermore, in order to ensure access for all users, pre-configuration makes dedicated service configuration solutions unnecessary forchildren, elderly, or disabled users.

- Pre-configuration is the preferred solution for configuration of access to services.

- Provide information to the user on which settings are pre-configured. This may include e.g. which services are set as default for data communication, which options are default for the service (e.g. voice-mail waiting indication via SMS or voice call), and whether certain functionality or content is included or not.

- If the user is permitted to change the setting entries, resetting the terminal to factory settings should present the user with a choice of whether to keep or reset the current settings for terminal and service access. In some cases the user may not wish for the reset function to adversely affect access to services, e.g. force the user to re-configure the settings for terminal and service access. In other cases it may be the explicit desire of the user to remove the setting entries from the terminal (e.g. when changing to another operator or service provider).

- Subsequent updates of settings, e.g. OTA, should provide the default entries for terminal or service resets.

Recommendations:

R 8.1.2.a   Pre-configuration is the preferred solution for configuration of terminal and service access.

R 8.1.2.b   Provide information to the user on which settings are pre-configured.

R 8.1.2.c   If the user is permitted to change the setting entries, resetting the terminal to factory settings should present the user with a choice of whether to keep or reset the current settings for terminal and service access.

R 8.1.2.d   Subsequent updates of settings, e.g. OTA, should provide the default entries for terminal or service resets.

8.1.3   Guided configuration

The user may initiate configuration with guidance from, for example, the terminal UI, a mobile Internet site accessed via the terminal, a web site accessed via a PC, or software on a PC connected to the terminal. A guided configuration procedure could also be initiated when the user tries to access a service that has not yet been configured ("just-in-time configuration"). The user may be required to walk through a sequence of instructions and choices, and to input certain entries (e.g. terminal brand, model number and name, operator, subscription phone number, etc.). Based on the user's input, the service will then be automatically configured. In the case of network-based services, configuration settings may be delivered OTA to the terminal, possibly requiring the user to accept the settings. Alternatively, the user may send an SMS containing a command to a certain phone number in order to receive the settings OTA. In the case of using software on a PC, settings could be transferred to the terminal via local connection. An example of a guided configuration procedure is a setup wizard.

The following constitute recommendations on guided configuration for terminal and service access:

- If pre-configuration cannot be achieved, some means of guided configuration should be provided, taking into consideration the needs of all users (including young, elderly or disabled users, see EG 202 116 [7] and TR 102 133 [8]). For example, users with poor eyesight or motor impairments would benefit from a web site or software on a PC that could offer speech input/output, or simply the larger keyboard and display for better text input/output capabilities.

- Optionally, and depending on factors such as legislation, it may be necessary to request a password to be delivered to the terminal e.g. via SMS. The password will then be used to log in to the configuration procedure on a web site. Such a step may also improve the user's feelings of trust and security against threats such as fake installation settings from a sender whose stated identity may not be accurate. However, this additional step also imposes a hurdle to convenient terminal and service access by adding extra steps to the configuration procedure.

- Provide a clear overview of the steps of the configuration sequence.

- Provide a logical and consistent order to the configuration procedure. For example, group together steps pertaining to the terminal, the operator subscription, and the provided service, respectively, since this will likely map to the respective information sources the user has ready at hand for the configuration procedure.

- Only provide steps that involve instructions, choices or feedback relevant to the configuration procedure. All other steps are redundant. See meta-user requirement 3 in clause 6.3.

- Navigation should be under user control throughout the configuration procedure. There should be no time-outs that automatically continue to the next configuration step. Timeouts may however be warranted when the configuration procedure presumes a network connection that incurs costs on the user, so that the user will not face a large bill should the user's attention be diverted from the configuration procedure for some period of time.

- Provide "back", "next", "cancel", and "finish" as well as "help" functionality and controls. The "cancel" and "help" controls are especially important when the user is not able to proceed for whatever reason.

- Provide clear instructions on what type of information is required at each step of the configuration procedure, i.e. what input information is expected from the user. Provide illustrative examples.

- Clearly describe the means by which the setting entries will be delivered to the terminal, e.g. via SMS.

- For remote configuration via a web site, provide a "send" control with instructions to confirm that the terminal is switched on, before sending setting entries OTA.

- Provide clear feedback when the configuration procedure ends.

- Provide information on how to change settings later.

- If the configuration procedure fails or is aborted the state of the terminal should revert to that previous to the start of the configuration procedure, i.e. no setting entries should be modified. The user should be informed on how to proceed in order to complete the configuration.

Recommendations:

R 8.1.3.a	If pre-configuration cannot be achieved, some means of guided configuration should be provided, taking into consideration the needs of all users (including elderly or disabled users).
R 8.1.3.b	Provide a clear overview of the steps of the configuration sequence.
R 8.1.3.c	Provide a logical and consistent order to the configuration procedure.
R 8.1.3.d	Only provide steps that involve instructions, choices or feedback relevant to the configuration procedure. All other steps are redundant.
R 8.1.3.e	Navigation should be under user control throughout the configuration procedure.
R 8.1.3.f	Provide "back", "next", "cancel", and "finish" as well as "help" controls.
R 8.1.3.g	Provide clear instructions on what type of information is required at each step of the configuration procedure. Provide illustrative examples.
R 8.1.3.h	Clearly describe the means by which the setting entries will be delivered to the terminal, e.g. via SMS.
R 8.1.3.i	For remote configuration via a web site, provide a "send" control with instructions to confirm that the terminal is switched on.
R 8.1.3.j	Provide clear feedback when the configuration procedure ends.
R 8.1.3.k	Provide information on how to change settings later.
R 8.1.3.l	If the configuration procedure fails or is aborted the state of the terminal should revert to that previous to the start of the configuration procedure. The user should be informed on how to proceed in order to complete the configuration.
R 8.1.3.m	It is recommended to undertake further, more detailed work in this area.

8.1.4   Manual configuration

The user configures access to the service by manually inputting entries for the necessary configuration settings, possibly in arbitrary order, without guidance other than that available through support material such as user manuals or support Frequently Asked Questions (FAQ's).

- If pre-configuration cannot be achieved, some means for guided and/or manual configuration should be provided by the terminal, since some users may not have access to guided configuration on the web via a PC.

- Provide consistent and coherent categories of settings. The grouping of settings should be consistent across all sources of information, e.g. terminal UI, user guide, support web site. It may be necessary to provide entry points in different parts of the UI to the same set of settings. However, settings should not be distributed across different parts of the UI, or users may configure only parts of the settings needed to enable terminal and service access.

Recommendations:

R 8.1.4.a	Provide means for guided and/or manual configuration in the terminal, if pre-configuration cannot be achieved.
R 8.1.4.b	Provide consistent and coherent categories of settings.

8.2 Configuration procedures for access to specific services

In order to promote increased service usage, a large number of services might benefit from some form of harmonization at the user interface level with regards to configuration for basic access. Specifically, if pre-configuration (see clause 8.1.2) is not available, the user will be confronted with certain terms needed for guided or manual configuration of the service.

As noted previously (see clause 8.1.1), such terminology may differ between the various sources of information used during the configuration procedure as provided by service provider, operator and terminal manufacturer. When configuring an e-mail client, the user will have a hard time sorting out terminology like "Login user name", "E-mail user name", "User name", and "Mailbox", whether they denote the same or different things, and what entries to input to which setting.

This plethora of different terms denoting the same concepts or similar terms denoting different concepts likely imposes a barrier toward manual or guided configuration of services. These terms as used by service providers, operators and terminal manufacturers could thus be candidates for harmonization.

At the same time, the choice of service-specific terminology may depend on factors such as the available screen size (enabling or constricting various text lengths), the way the service UI is arranged (providing different context to terms used), implementation of different sub-sets of service functionality across different terminals, or how the service is promoted in marketing. These and other issues may be regarded as brand-specific to manufacturers, operators or service providers.

Nevertheless, a basic set of terms pertaining to common services (voice-mail, e-mail, MMS, SMS, WAP/Internet, and supporting GSM/GPRS data connections) is presented in clause 7.1.4, tables 1b through 1g, in order to highlight the aforementioned problems and to serve as a foundation for further harmonization efforts.

Recommendations:

R 8.2.a   Tables 1b through 1g in clause 7.1.4 should be used.

8.3 Interworking and portability

When outside the range of the home mobile telephony network (e.g. abroad and roaming) users will still prefer to have the same easy access to their familiar services, or at least some subset thereof, as in their home mobile telephony network. Such services can include but are not limited to mobile internet browsing, e-mail, MMS and other GPRS based services, positioning services and other information locally available via the home mobile telephony network, CLI, voice-mail access, assistance and directory services, and dialling certain numbers that use specific formats, e.g. toll-free/national green-number such as information services or shared cost calls such as retrieving bank account information.

Currently, when roaming on another network and accessing network-based services, access may be denied from one instant to the next, due to switching between different roaming networks that may have different agreements with the home mobile telephony network operator. The reasons for this intermittent access to services will not be apparent to the user, who will however be concerned about costs and security. Dealing with issues of interworking and portability is thus important, ensuring that user requirements of trust, reliability, cost information and security are met across networks, terminals and services (cf. meta-user requirements 1, 2, 3, 5, 6, 7, 9 in clause 6.3; security issues in clause 9.8.2).

The following constitutes recommendations for harmonization:

- The aim should be for access to services to be seamless and transparent, providing the same access as in the home mobile telephony network, i.e. service mobility (see clause 4.2.3) should be achieved.

- No further configuration on the part of the user should be needed for terminal and service access when roaming, beyond that already undertaken for access through the home mobile telephony network.

- There should be no differences in access procedures compared to the home mobile telephony network. For example, if password and/or telephone number entry is not required to access voice-mail in the home mobile telephony network, it should not be required when roaming either. A further example is that when pressing a shortcut to access the voice-mail number, the terminal should detect that it is roaming on another network and use the roaming voice-mail number.

- If the conditions for terminal and service access are different from the home mobile telephony network, the user should be informed. This could be if only a subset of the services accessible through the home mobile telephony network can be delivered when roaming, and/or if the procedures for accessing them are different (e.g. voice-mail and customer service phone numbers). Today, upon entering a roaming network, some networks send an SMS to the terminal informing the user of the services accessible, in some cases as a class 0 SMS which cannot be dismissed to be read later. This may however be done with some delay and may interrupt the user's current activity, which may annoy the user. Informative yet unobtrusive ways of communicating differences are called for (see also clause 10.6).

- The user should be informed at an appropriate level and through appropriate channels of the costs involved when accessing services available in the roaming network. See meta-user requirement 7 in clause 6.3.

- The user should be informed of the present level of security, or be warned if and when changes occur.

- If a service can not be accessed when roaming, provide a correct explanation as to the reasons. Some services only ask the user to try again later, or ask for the service to be configured although it already has been. Such incorrect error message may be detrimental to the user's trust in the network and/or terminal. See clause 8.4 for more on help and error handling.

- Indicate potential interoperability problems, e.g. a receiving terminal may not be able to display an MMS message of a certain size, or not at all (see clause 10.8.1.2).

Recommendations:

R 8.3.a   The aim should be for access to services to be seamless and transparent, providing the same access as in the home mobile telephony network.

R 8.3.b   No further configuration on the part of the user should be needed for terminal and service access when roaming.

R 8.3.c   There should be no differences in access procedures compared to the home mobile telephony network.

R 8.3.d   If the conditions for terminal and service access are different from the home mobile telephony network, the user should be informed.

R 8.3.e   The user should be informed at an appropriate level and through appropriate channels of the costs involved when accessing services available in the roaming network.

R 8.3.f   The user should be informed of the present level of security, or be warned if and when changes occur.

R 8.3.g   If a service can not be accessed when roaming, provide a correct explanation as to the reasons.

R 8.3.h   Indicate potential interoperability problems.

8.4   Error handling guidance

Interpreting the contents of error messages on mobile terminals is an inherently difficult task for many users. Reasons for this difficulty include:

- The display size imposes serious restrictions on displaying error messages that can be understood by users.

- Due to memory limitations, help information has been a scarce resource on mobile terminals in the past.

- It is very difficult for users to correctly understand if an error situation and the corresponding message originates from the terminal, the network or a specific service being currently executed.

- Users have little or no understanding of the boundaries between the SIM card, the terminal, the network or a specific service or application.

- Service providers have to cope with a multitude of different displays and terminals when representing error messages. This, in turn, makes it quite difficult to offer generic error recovery procedures on mobile terminals.

Nevertheless, a number of generic recommendations can be formulated that deal with the representation of error messages as well as the necessity of user intervention for error recovery.

Recommendations:

R 8.4.a Error messages should always be formulated using the vocabulary of the user, both in terms of the language selected and the complexity of the contents. Terminal, network or service-internal error messages should usually be avoided.

R.8.4.b Where several error causes may result in a similar error from the user viewpoint, a specific error code may be appended to the simple error message. Such a code would assist a help-desk in identifying the real cause of an error when they assist a user. It is recommended to standardize these error codes, wherever possible.

R 8.4.c Error recovery can be initiated with or without user confirmation. After starting an error recovery procedure no further user assistance should be required, if possible.

R 8.4.d A terminal should always return to idle mode if turned off and then on again. There should never be persistent error modes. If possible, pressing the "end-key" (or one with a similar functionality, e.g. a long press on the "Cancel" key) should lead to the same behaviour, i.e. return to idle mode.

R 8.4.e During an error recovery procedure, communication processes like accepting incoming calls and setting up emergency calls should be possible.

R 8.4.f A terminal should clearly display the unavailability of specific network features or services and should prevent the user from trying to access these features by giving adequate information beforehand. This may be achieved by visibly invalidating menu entries ("greying out") or by supplying useful error messages on a user attempt to initiate a specific service (for further guidance on setting up network-related functionality, see clauses 8.1 and 8.2). If the above solution is not readily available, removing menu entries is a possible alternative.

9 Terminal- and network-related generic UI elements

9.1 International access code

In today's telecommunication networks, there are still different dialling requirements or options for starting an international phone call (e.g. "00<country-code>" in most European countries or "011<country-code>" in North America), see Council decision 92/264/EEC [69] and ITU-T Recommendation E.164 [45]. Replacing the international access code by the symbol "+" has become the procedure of choice for entering dialling information or telephone numbers in address books or phone directories [2, 12, 10]. This trend has been further strengthened by Microsoft's and Palm's adoption of this solution on PCs and PDAs.

Phone numbers saved or dialled with the international access code may be used in the mobile home network since the service centre is able to interpret the number correctly. There are currently three preferred ways of inputting the "+" symbol into a mobile terminal:

1) Terminals with a full keyboard (either implemented on a touch screen or in the hardware) use the "+" key.

2) Some manufacturers use double-"*" on the 12-key keypad to insert the "+".

3) Other manufacturers use a long press on the "0" key, "0-long" and/or two presses on the "0" key, "double-0", for the same purpose.

4) Possibly also "*"-long could be used for inserting the "+" into the dialling sequence (this is similar to option 2 but currently not supported by terminal implementations).

From a usability standpoint, option (3) would be the option of choice for a harmonization proposal. This approach is the mnemonically preferred since the "+" replaces or complements the "00" in all GSM networks.

There are, however, strong objections to changing the implementations from individual manufacturers who fear that their users might object to changing their long-trained habits.

It should be noted that a harmonization proposal for inputting the international access code should be carefully designed to avoid possible interference with different text input mechanisms. The user should not have to deal with different keypad mappings when entering phone numbers and other random text.

Recommendations:

R 9.1.a   Whichever option is used, the symbol "+" should be clearly displayed on the relevant key.

R 9.1.b   From a usability standpoint, the use of "0"-long and/or double-"0" is the option mnemonically preferred by users (as the "+" replaces or complements the "00" in all GSM networks) and thereby recommended.

R 9.1.c   If R 9.1.b is not easily achievable use of a double-click on the "*"-key is the second recommended option. It is additionally recommended to follow R 9.1.b, if and when any migration from R 9.1.c occurs.

9.2   Safety and security indicators

Users should not relearn indicators representing specific properties of the communication or the terminal itself whenever they switch from one terminal to another. Also, since some of these indicators may be safety relevant, it seems a valuable area of harmonization to address these indicators. Since several of these are not being used in the current generation of mobile terminals, generic user interface elements can more easily be developed.

The list of possible indicators includes:

- **Transmitter off (flight mode):** This indicator can be used for showing both the user and personnel, e.g. flight attendants or hospital staff, that a terminal is or is not emitting long-distance radio signals.

- **Secure/encrypted communication:** For all uses of a mobile terminal which require secure communication like banking or credit card transactions, the user should know that the network connection is secure. As these transactions might be performed using different mobile terminals trust in these secure connections might be raised by showing the state of protection with a unique easy-to-remember indicator - see also [51].

- **Network unavailable/SOS only:** Situations in which a user might not be able to start a call or even to set up an emergency call should clearly be indicated to the user. Users should be able to recognize this status of a terminal on the mobile terminals of others and in stress situation.

- **Keypad lock:** As with the unavailability of a network, the fact that a keypad is locked may prevent the set up of emergency calls from a telephone to which a user/rescue person is not accustomed. Keypad-lock should therefore be clearly and unambiguously indicated and the steps required to unlock a keypad should be consistent across terminals and/or visualized on the display. It should be noted that visually impaired users may not be able to understand visual hints for unlocking the mobile terminal. Therefore, unlocking the keypad should be possible without the use of soft keys or complex descriptions. As it may be very difficult to unlock a keypad, an indicator should be used, possibly as the description of a soft key which guides the user to the key sequence to unlock the terminal keyboard.

- **Ringer indication (ringer off/vibration/ringer on):** Most current generation telephones visualize the setting of the ringer to their users on the display. The symbols used are, however, not standardized and often not easy to understand. Also, vibration indication is not usual on current generation telephones.

- **Call diversion:** If a call diversion has been set in the network, the mobile terminal should clearly indicate this setting. If call diversion is not signalled the user may not realize that his calls are not be signalled on his terminal for this reason.

- **Battery low indication:** For the user it should be clearly visible that the mobile terminal will soon be out of power and the battery needs recharging. This event should also be signalled audibly for users with poor eyesight.

- **Tracking and positioning turned on:** As further described in clause 10.5, it is important for a user to know that he is being tracked by a system or another user or that his position may be used by push services for location-dependent contents. On the receiving side (i.e. the terminal of the user tracking a mobile terminal) it should be indicated that tracking of a mobile terminal is disabled by the tracked user or that the service is unavailable due to network problems.

- **User profile information:** If provided by or through the terminal or communication system (e.g. name, citizenship, serious health problems, medication and allergies, parents or career information), this should be indicated and made easily accessible and extractable (with the admission of the user).

- **Voice or video recording indication:** Should be provided to indicate voice or audio recording requests or ongoing recording, to both parties (see also clause 10.3).

Attributes of indicators are also addressed in clause 7.

Recommendations:

R 9.2.a   Visual and auditory indicators for the terminal and connection settings described in clause 7 and the set-up procedures required for these settings, described in clause 8, should be harmonized.

R 9.2.b   The respective symbols and auditory signals should be developed and harmonized.

R 9.2.c   Auditory indicators should only be presented on request or on a system event changing the terminal or connection setting.

9.3   Text entry, retrieval and control

With the advent of Short, Enhanced and Multimedia Message Services (SMS, EMS and MMS), text input has become one of the predominant functions of mobile terminal usage. Being able to write large amounts of text and finding/retrieving text both from the terminal and from the network will become even more important in the future.

Efficient and intuitive text entry and retrieval are one of the basic, important requirements -and stumbling blocks -in contemporary mobile terminals. It would be beneficial to the end users and operators to see efficient, intuitive, and also common solutions to text entry. However, the technologies are continuously evolving, so care should be taken not to stop innovation. The current keypad mappings and predictive text input solutions are still probably far from perfect.

While ES 202 130 [6] has standardized the repertoires, ordering rules and assignments of characters to the 12-key keypad, the appropriate functions and the way of initiating search and retrieval is totally up to the specific manufacturers.

Additional complexity arises through the necessary control functionality for assisted text entry systems, including the steps necessary to turn predictive text input on or off. Currently different manufacturers have different keypad assignments for this functionality as well as for special characters and control functions. Turning these systems on or off, input of a new, unknown word and the selection between prediction alternatives are major obstacles to using these systems for many users. Easy-to-use command shortcuts, harmonized over many different terminals, might broaden the possible user group of these predictive text entry systems.

At the moment there is no conclusive evidence of the kind or severity of problems caused by inconsistencies between manufacturers.

ES 202 130 [6] should be taken as the basis for continuous harmonization efforts in this area. In addition, an extension covering European minority and major non-European languages used in Europe should be developed.

It should be noted that in keypad assignment (and in any other topic in this proposal) there should be a possibility for a manufacturer to "opt out" in case a stronger requirement so requires. The design of terminals with a full keyboard, alternative keypad designs or even terminals without a keypad might be examples where opt-out is legitimate.

Control characters are used in mobile terminals for a variety of purposes, the most relevant being text formatting and text input. Currently, ways of inputting control characters or starting specific functions in a terminal with the use of the standard 12-key keypad are non-standardized and very hard to learn. ES 202 130 [6] has chosen not to address the input of control character/control functions in its standardization effort.

Recommendations:

R 9.3.a Each mobile terminal should provide assisted (e.g. predictive) text-input solutions. Additional recommendations for the harmonization of different, current solutions are not feasible at the moment.

R 9.3.b The predictive text input method should be turned on by default and be changeable as a user option. For specific activities (e.g. name input in an address book ("Contacts")), the default for this setting may be changed by the terminal manufacturer.

R 9.3.c Help on predictive text input should be available on the terminal.

R.9.3.d For predictive text input the choice of input language should be clearly available to the user.

R 9.3.e Input of special characters and punctuation marks should follow the rules in ES 202 130 [6].

R 9.3.f Repertoires, ordering rules and keypad assignment should follow ES 202 130 [6].

R 9.3.g ES 202 130 [6] should be extended (updated) to cover European minority languages and major non-European languages used in Europe.

R 9.3.h Navigation facilities (keys) for moving in the text should be present.

R 9.3.i The status for text input (predictive/non-predictive, capitals, numeric input) should be displayed on the screen either permanently or for a short period after a change of input mode.

R 9.3.j As a fallback solution or as a user preference, multi-key-press solutions ("multi-tapping") should be implemented on every mobile terminal with a 12-key keypad.

R 9.3.k Text input using multiple key presses should be available for input of unknown words and for users with limited eyesight who cannot interpret the feedback on the display.

9.4   Accessibility and assistive terminal interfaces

Generic user interface elements benefit in particular young, elderly and disabled users. While the fully-abled adult user may be able to cope with sub-optimal user interface implementations, users with special needs will often experience severe restrictions in the use of mobile terminals. For these user groups easy to use and remember user interface concepts are of crucial importance.

If a design-for-all approach is not readily possible to implement, assistive terminals offer specific end-user groups the possibility to get an optimized user interface terminal while not compromising the user interface solutions developed for mainstream users. With a harmonized interface to assistive terminals, end users will get terminals that support them better in their tasks and in achieving their goals while the manufacturers can more readily satisfy regulatory obligations to provide access to all users. ETSI has dealt with these issues and stated a set of requirements for these interfaces, found in TR 102 068 [3]. Finally, assistive technology manufacturers will get standardized interfaces and conventions that make it easier for them to attach their technologies, services, and terminals to mobile telephones.

Europe-wide standardization of assistive technology terminal interfaces across all information and communication (ICT) terminals is becoming an increasingly urgent topic and should be addressed with high priority by standardization bodies.

As accessibility requirements vary widely between and within different categories of users, access via assistive terminals often provide better solutions to the end user than access directly via the terminal terminal.

Recommendations (based on TR 102 068 [3]):

R 9.4.a A standard interface (consisting of both hardware for connectivity and software for data exchange) between assistive terminals and ICT terminals should be defined and implemented. This interface should allow for cable-based, connector-based and wireless hardware solutions.

R 9.4.b   For assistive terminals to become usable with a multitude of ICT terminals and thereby affordable and effective, the significant players in each field urgently need to agree on a set of protocols to be used in the communication between assistive terminals and the relevant ICT terminals. In general it is not necessary to develop either new protocols or new hardware interfaces. Interface and protocol standards should be chosen from those already available so as to form a coherent set which covers all major aspects of information exchange between the two sets of terminals.

R 9.4.c   Existing standards should be enhanced where the necessary commands for the communication between assistive and ICT terminals do not exist. Consensus on a set of interface standards should be reached in the appropriate standards fora in a process which involves manufacturers of mainstream terminals, manufacturers of assistive terminals and groups representing users with different special needs.

9.5   Common keys

Most mobile terminals are characterized by the availability of a 12-key keypad and a certain number and variety of control keys (or corresponding functions). As mobile terminals are mostly used in a network environment with certain standardized capabilities, a de-facto standard set of controls has emerged (see also clause 7).

Below is a list of common keys and their relative positions, meaningful for mobile terminals with hard keys, virtual (soft) keypads or touch screens. The keys and positions are:

- On/off: to switch the terminal on and off. This can be achieved through a dedicated hardware key or by assigning this functionality to another key.

- Send and End are interaction keys corresponding to the on-hook/off-hook procedure used in fixed line telephony. This metaphor is widespread and widely used, including a consistent use of colours on the Send and End keys:

  - Send or "Hook off" typically being positioned on the left of the keypad, and marked green or blue; while

  - End or "Hook on" is typically positioned on the right side of the keypad, and marked red.

- Clear key ("C"): the editing functionality of the C-key differs widely among different manufacturers. On most terminals, a short press on this key will delete the last entered digit or character. A long press on this key will typically delete larger sections of the previous input. Additional possible functionality of the Clear key is not addressed.

- Volume up/down: these are typically keys on the side of the terminal to adjust the volume in in-call mode.

- Camera key should be provided to activate the camera, if the functionality is available.

- Dot on the "5" key: ES 201 381 [18], should be followed. The marking on or around the "5" key is used to assist the keypad navigation of blind users or any user whose visual attention is not directed towards the keypad.

- On terminals with soft keys only, a short vibration or a beep upon touching the 5-key can approximate this feature.

- Access to voice-mailbox and messages: this is typically achieved through a long press on the "1" key. If pre-configured, a connection to the messaging centre will be set up.

- Operator or browser key: this is an operator and/or user configurable key, triggering the browser or initiating an operator-defined and pre-configured action.

- The international access code "+": this has already been addressed in clause 9.1.

- Keypad unlock, which is an inherently difficult procedure without adequate support information should be harmonized across manufacturers and terminals.

Recommendations:

R 9.5.a   On/off functionality to switch the terminal on and off, should be provided through a dedicated hardware key or by assigning this functionality to the End key.

R 9.5.b   A Clear key ("C") to delete the last entered number or character or clear larger sections of text or numbers entered previously should be provided.

R 9.5.c   Volume up/down keys to adjust the volume in in-call mode should be provided.

R 9.5.d   A camera key should be provided to activate the camera, if the functionality is available.

R 9.5.e   A dot should be placed on the "5" key (ES 201 381 [18]). If a hard keypad is not available, alternative solutions should be provided to assist the keypad navigation of blind users or any user whose visual attention is not directed towards the keypad.

R 9.5.f   Access to voice-mailbox and messages through a long press on the "1" key should be provided.

R 9.5.g   If a terminal has send and end functionality on hard or soft keys it is recommended to position the end key to the right of the send key. It is further recommended to place the send and end key above the 12-keypad if hard keys are used.

R 9.5.h   Provide an "Operator" or browser key (if the functionality is available) as an operator and/or user configurable key, triggering the browser or initiating an operator-defined and pre-configured action.

R 9.5.i   It is recommended to harmonize the editing functionality of the C-key across manufacturers.

R 9.5.j   It is recommended that a common procedure for unlocking a protected keypad be harmonized for all mobile terminals which have a need for keypad lock protection.

9.6   Language selection mechanisms

With tourism, employment and services (e.g. customer support) becoming increasingly global, there will be many more tourists and immigrant workers who do not fluently speak the language of the country in which they find themselves. These non-native language speakers will frequently encounter difficulties when they attempt to access services in those countries. When accessing services, non-native language speakers may be unable to understand any information output by the service and they may be unable to generate appropriate input for the service. In order for people to effectively use a service, that service should be available in their own language or in a language with which they have a sufficient level of competence.

In order that these basic requirements can be delivered, the two following conditions should be met:

*   the information content, user prompts and user input handling should all be available in a number of different languages;

*   either the system should know the user's language preferences and abilities or the user should have a way of choosing the desired language.

Provision of static information in a number of different languages is a technically straightforward task. The way in which material is presented and interpreted will have to take account of other culturally variable factors as well as language (e.g. choice of character sets, number/date formats, preferred gender used in a voice interface, particular dialect of a spoken language). The presentation of dynamically generated information is more complex as it may involve dynamic translation, but this is often technically feasible to a reasonable degree of accuracy.

In order that users are clear about the concepts being referred to in the service, there is a need for a harmonized set of names for the most frequently encountered technical terms. One instance where harmonized names are required is the names used for different types of messaging services (for further details, see clause 7.1).

The area where some form of harmonization would be valuable is in how the system informs a user of the range of available language options. Most current web sites use national flag icons augmented by the name of the different languages. Where flag icons are sufficiently visible, their visual distinctiveness can draw attention to the existence of a language selection mechanism without the intrusiveness of forcing the user into a language selection mode. However they have serious potential disadvantages:

*   the meaning of a particular flag may not be recognized;

- flags represent nationality, not language, and therefore the use of any one flag may annoy people of a different country that happen to share the same language as that represented by the flag. Furthermore, countries may have several national languages which cannot be represented by one flag;

- flags without names will not be acceptable to blind users;

- very small flags may easily be missed by people with limited vision;

- this method of providing language selection may not be appropriate for interfaces presented on small screens.

Good ways of presenting language choices that do not suffer from the cultural sensitivities of the use of flags are methods that present each language choice in a way the user would expect to see it. The two most obvious examples for methods of presenting languages and for providing the user with a selection mechanism are:

- a visual list of languages with the name of each language written as it is normally written in that language (e.g. Deutsch, Español, English, Français);

- a spoken list of languages with the name of the language and the name of any numeric menu choice spoken in the appropriate language (e.g. "Für Deutsch bitte Eins drücken; for English press two; för svenska tryck tre; suomenkieltä varten paina neljä").

Another mechanism that has been used to allow users to directly enter a language choice is to support the entry of coded language specifications such as: using *#{country code}# followed by pressing of the "Send" key -e.g. *#33# "Send" to specify the French language.

This method has a number of disadvantages:

- the method has to be learnt;

- the method has to be supported by each specific terminal;

- country codes do not, in a global context, map uniquely to languages (e.g. the code "41" would be used to indicate Switzerland, where four national languages coexist);

- use of codes other than country codes mean that an additional coding scheme has to be learnt;

- the method allows users to enter unrecognized country codes, not associated with any language.

This method is not recommended as a primary language selection mechanism.

Rather than relying on the user informing the system of the required choice of language, users would benefit from systems that are aware of their preferences and abilities and that respond appropriately. For this approach to work, there are two basic requirements:

- a mechanism by which the system can obtain the user's preferences and abilities;

- a standardized way of representing language preferences and abilities as well as any other culturally variant parameters;

The culturally relevant information referred to above could be as simple as the person's native language. This would be sufficient for identifying those users that speak one of the languages available in the multi-lingual service. Basic language names (e.g. French, English, Spanish) would be unlikely to be adequate for systems that used Automatic Speech Recognition (ASR) as differences in accents, forms of expression and vocabulary might be sufficiently different between national or regional variants of those languages (e.g. Spanish as spoken in Spain compared to the way it is spoken in various South American countries) to mean that the ASR would be unable to interpret the user's spoken input with sufficient accuracy. This would imply that the language coding would need to be more precise and would either need to specify more precisely differentiated languages or the basic languages and an indication of country of origin. At a minimum, languages should be coded in a form compatible with the international standards for language coding ES 201 381 [18], ISO 639-2 [56] and ISO 3166-1 [57] provides coding for the base languages (e.g. Spanish) and the country (e.g. USA).

Where a person's native language is not one of those supported by a multi-lingual service the automatic handling of that person's language preferences becomes very much more complex. One approach to solving this problem is for the user's preferences to be expressed as a list of preferences and abilities in understanding and generating spoken and written information across a range of different languages. This latter form of coding languages would enable users whose native language is not supported by the service to be offered a service that would best match their abilities with the languages supported by the service (including a choice of a text or voice interface where both types of interface are available).

The information on a user's language preferences/abilities would need to be stored in some form of personal profile. This profile could be stored and accessed in a number of different ways. These include:

1) The profile stored on some form of SIM card stored in a mobile terminal. This would require the SIM card to have a defined storage area for the appropriate language specifications and a means for the service to access the relevant data from the SIM. This method is most compatible with existing single SIM and dual-card telephone terminals, but it depends on the user always having access to their own mobile terminal.

2) The profile stored on some form of stand-alone smart card. This solution is independent of the terminal being used but it is dependent on some form of card reader being available at every terminal that the user uses. It also depends on services being able to access the external card data once scanned.

3) A profile stored on a central server. This solution requires a service that knows how to access the information on the server and a way for the user to convey to the application or service the location of the server. ETSI's Universal Communications Identifier (UCI, see EG 201 795 [11] and EG 202 249 [12]), provides a framework that supports such a mechanism.

Recommendations:

R 9.6.a   The names used for the different types of messaging services should be harmonized in such a way as to provide an agreed name in each language for each type of messaging service.

R 9.6.b   In lists of languages (e.g. in menus), the names of the languages and the instructions on how to make the language choice should be written or spoken in the language that corresponds to the language to be chosen.

R 9.6.c   Language selection mechanisms that rely on users entering strings of digits, "*"s, and "#"s are not recommended for use as primary language selection mechanisms.

R 9.6.d   Choices that allow the user to more finely define the required language are preferable to broader choices for language sensitive applications like automatic speech recognition (e.g. US-English and UK-English are better than just English).

R 9.6.e   At a minimum, languages should be coded in a form compatible with the international standards for language coding ES 201 381 [18] and ISO 639-2 [56], which will provide coding for the base languages (e.g. Spanish) and the country (e.g. USA).

R 9.6.f   A single harmonized way of encoding both simple and complex language preference/ability data needs to be developed.

R.9.6.g   A language menu should be available when a communication terminal (e.g. phone, PDA) is initially switched on (including after a full system reset). Once users have selected an option from this menu, they should be asked whether they wish to see this menu the next time they switch the terminal on.

R.9.6.h   When the language of a terminal is initially set (see R.9.6.g), the default text entry language should also be set to the same language.

R.9.6.i   When the user chooses a different language for messaging text entry (or in any other application context) it should not cause the default language setting for the terminal to be altered.

R.9.6.j   When users change the default language for the terminal, they should be asked whether the language for messaging text entry (and for other applications) should be changed.

R 9.6.k   The language setting for a service should be based on the menu language setting in the terminal.

9.7   Voice and speech user interfaces

9.7.1   General

Voice is a fundamental human paradigm for communications, forming an important foundation for universal access to the services and benefits of communications technology. Voice and speech user interfaces, enabled by recorded prompts, text-to-speech synthesis and speech recognition technologies, can to a large degree be independent of terminal, display and location.

In recent years, ICT terminals, services and applications providing a voice or speech user interface have become wide-spread and commercially viable off-the-shelf products. These user interface technologies are also beneficial to provide access through alternative modalities to young, elderly and disabled users, enabling spoken menus, spoken text input and voice controlled functionality.

Usability tests should be performed before the commercial launch of any product, as the potential risk of an increased frustration rate is evident.

In this clause, two main areas are addressed: dialogue design and spoken command vocabularies.

9.7.2   Dialogue design

The present document addresses generic dialogue design issues for automatic and interactive speech response-enabled systems. The provision of detailed design guidelines is outside the scope of the present document.

ETR 329 [25] provides useful guidance, especially for touchtone (DTMF-based) user interfaces and voice prompts. However, as the document was published in 1996 and developed before the advent of mass-market multimodal user interfaces, an update is recommended.

Recommendations:

R 9.7.2.a	The recommendations provided in ETR 329 [25] should be followed, where applicable.
R 9.7.2.b	ETR 329 [25] should be updated to be applicable to today's application areas and provide speech user interface design guidelines for a multimodal environment with speech recognition.
R 9.7.2.c	Usability tests should be performed before the commercial launch of any product supporting voice or speech user interfaces.
R 9.7.2.d	Help, Standby, Repeat and Undo functionality should always be provided, as specified in ES 202 076 [4].
R 9.7.2.e	Language selection mechanisms should be provided. For further guidance, see clause 9.6.
R 9.7.2.f	Emergency functionality should be supported.

9.7.3   Spoken command vocabularies

In order to simplify the user's learning procedure and enable transfer and reuse of knowledge between different terminals, applications and services deploying speaker-independent speech recognition, it is relevant to support standardized vocabularies for the most common and generic navigation, command and editing functions.

Uniformity of the basic interactive elements increases the transfer of learning between terminals and services using spoken commands and improves the overall usability of the entire interactive environment. Such a transfer becomes even more important in a world of ubiquitous terminals and services using speech recognition.

The standardized, minimum generic set of spoken command vocabulary provided in ES 202 076 [4] has been developed with a methodology that included spontaneous command generation and usability tests in several steps with native speakers of the five European languages (listed below). Thereby, it provides useful help to developers of ICT terminals and services, leading to quicker, more consistent, cheaper and better user interface development.

ES 202 076 [4] covers the five major European languages by number of users (English, French, German, Italian and Spanish). It provides a minimum, consistent, user-generated and usability tested ICT vocabulary. It specifies a minimum set of spoken commands required to control the generic and most common functions of ICT terminals and services that use speaker independent speech recognition. It is applicable to the functions required for navigation, information retrieval, basic call handling, configuration of preferences and the most common telecommunication services.

The following principles of use and minimum vocabularies should be supported:

1. If a speaker-independent speech recognition user interface is provided, the ICT terminal or service should support all common user commands specified in the applicable languages, covered by ES 202 076 [4] (only provided in English in the present document):

    -   Options, Goodbye, Main menu, Standby, Operator, Go back, Help and Repeat.

2. If the functionality related to a specific common command is not supported in the terminal or service (e.g. due to lack of the specific functionality), the common command should still be accepted as user input and guidance information still be provided back to the user.

3. For domain-specific functionality supported by the mobile terminal or service, the domain-specific user commands specified in ES 202 076 [4] should be supported. In addition to the commands listed below, alternative and additional commands may be offered:

    -   Core commands: Yes, No, Stop;

    -   Digits: Zero, Oh, One, Two, Three, Four, Five, Six, Seven, Eight, Nine, Double, International, Plus;

    -   Name and digit dialling: Dial, Call, Home, Work, Mobile, Car, Personal number, Emergency;

    -   Basic call handling and supplementary services: Answer, Busy, Divert to, Redial, Keep trying, Conference call, Divert all calls to, Transfer, Hold, Switch call;

    -   Media control: Play, Pause, Continue, Stop, Fast forward, Rewind;

    -   Browseable list for navigation: Next, Previous, Details;

    -   Editing commands: Edit, Delete, Save, Reply, Forward, Add, Send, Move, Record, Play, Pause, Continue, Cancel, Redo;

    -   Terminal settings: Choose network, Volume up, Louder, Volume down, Quieter, Sound off, Sound on, Speaker off, Speaker on, Mike on, Mike off, Vibrate on, Vibrate off, Status, Profile;

    -   Word spotting mode: Wake-up.

ES 202 076 [4] does not cover dialogue design issues, the full range of supplementary telecommunications services, performance related issues, natural spoken numbers covering more than one digit (other than "double") or speech output.

There is an urgent need to expand the coverage of ES 202 076 [4] from the five major to all official European languages, certain European minority languages, non-European language versions used in Europe and preferably US English, in the support of European cultural diversity.

Recommendations:

R 9.7.3.a   If a speaker-independent speech recognition user interface is provided, the mobile terminal, service or application should support all common user commands specified in the applicable languages, covered by ES 202 076 [4] (only listed in English here):Options, Goodbye, Main menu, Standby, Operator, Go back, Help and Repeat.

R 9.7.3.b   If the functionality related to a specific common command is not supported in the terminal, service or application (e.g. due to lack of the specific functionality), the common command should still be accepted as user input and guidance information still be provided back to the user.

R 9.7.3.c For domain-specific functionality supported by the mobile terminal, service or application, the domain specific user commands specified in ES 202 076 [4] and listed below must be supported and in addition, alternative and additional commands may be offered:

- Core commands: Yes, No, Stop;

- Digits: Zero, Oh, One, Two, Three, Four, Five, Six, Seven, Eight, Nine, Double, International, Plus;

- Name and digit dialling: Dial, Call, Home, Work, Mobile, Car, Personal number, Emergency;

- Basic call handling and supplementary services: Answer, Busy, Divert to, Redial, Keep trying, Conference call, Divert all calls to, Transfer, Hold, Switch call;

- Media control: Play, Pause, Continue, Stop, Fast forward, Rewind;

- Browseable list for navigation: Next, Previous, Details;

- Editing commands: Edit, Delete, Save, Reply, Forward, Add, Send, Move, Record, Play, Pause, Continue, Cancel, Redo;

- Terminal settings: Choose network, Volume up, Louder, Volume down, Quieter, Sound off, Sound on, Speaker off, Speaker on, Mike on, Mike off, Vibrate on, Vibrate off, Status, Profile;

- Word spotting mode: Wake-up.

R 9.7.3.d It is strongly recommended to extend the coverage of ES 202 076 [4] to cover all 28 official European languages, certain European minority languages, non-European language versions used in Europe and US English.

R 9.7.3.e In addition, it is recommended to extend the coverage of ES 202 076 [4] to additional non-European (e.g. Indonesian) and country-specific (e.g. Brazilian Portuguese) languages, supported by ICT products and services in the global market.

9.8 Users' data privacy, security and access control

9.8.1 General

With the increasing interconnectedness of society, issues of privacy and security will become ever more important. If the security of communications products, networks and services are such that they are vulnerable to attacks that allow the user's information to be observed, stolen, or altered then users will lack confidence in these products, networks and services. Similarly, if private personal data is made available to the wrong people, then users will lose confidence in the products, networks and services that allowed that data to be misused.

Increasing threats to both privacy and security are emerging due to factors such as:

- the large amount of personal information that is now being collected in order to personalize products and services;

- communication convergence (the moving of data across different domains and the usage of transport mechanisms of lower security such as Wi-Fi);

- the storage of personal information on remote customer databases and the weak controls on how that information may subsequently be used;

- the low and misconceived level of understanding of privacy and security threats in the general public;

- the almost inevitable trade-off between security and usability (e.g. multiple security levels such as PINs, shared-secrets; etc.).

9.8.2   Control of privacy

To ensure that users are confident that their information is not used in ways of which they disapprove, they will need standardized ways to both control how and to whom their information is made available. They also need status visibility e.g. to be warned when there is a risk that information is about to be shared in ways which they may find unacceptable (see clause 9.2).

Users may not wish to make explicit choices on whether their privacy preferences are being respected each time they use a communication or information service. For this reason, mechanisms (such as the W3C's P3P initiative [73]) that attempt to compare users' privacy preferences against a web site's published privacy policy present a potential model that ensures users' privacy preferences are being respected.

As users will not want to define independent privacy preferences for every service that they use, there is a need for a common way to define privacy preferences such that they apply across the widest possible range of services. What is also needed is an assurance that any claims made by service providers are accurate and can be trusted. Whatever method is adopted, there needs to be mechanisms for providing users with both positive and negative feedback on whether their privacy preferences are being respected. Where it is determined that a user's privacy preferences are not being respected, users will need a mechanism to ensure that they do not participate in ways that compromise their privacy preferences.

Recommendation:

> **R 9.8.2.a**   Mechanisms that respect user's personal preferences with respect to the privacy of their personal information should be used. At this time, mechanisms that are based upon the W3C's [73], should be used for web-based services.

> **R 9.8.2.b**   Users should be provided with feedback on whether their privacy preferences are being respected. Users should be given positive indications that their privacy preference are being met. Where their privacy preferences cannot be met, users should be informed and offered an option that ensures that their privacy preferences will not be violated.

> **R 9.8.2.c**   Users should be provided a mechanism to request details of any information stored about or relating to them.

9.8.3   Control of security

Open programming standards and environments and user-uploaded applications increase the demand for clear user feedback on security aspects to help user protect themselves from threats such as viruses hidden in a program upload or e-mail attachment, applications designed with a bad intention (e.g. changing a homepage default setting without the user's consent or knowledge) or false configuration messages sent over the air.

Users need confidence that information that they make available cannot be seen by others, as a result of insecure communication links. Users perceive the issues of security of communications and personal data as increasingly important, as indicated by:

A yearly study reported by Mobinet, the Mobile Survey performed by AT Kerney, EDS and Cambridge University Business School since June 2000, see ETS 300 178 [21], indicates that mobile data services (M-Services) are maturing, due to the increasing capacities of terminals, user's increasingly positive experience with the services offered as well as the ever-improving ease of use. The survey indicates that the three most important end user issues in 2003 are data security, user data privacy and technical complexity (compared to 2002, when content, price and data transmission speed were the key issues).

A study by RSA Security (15 April 2003) identified that when people were asked the question "Which of the following has had the most impact on your awareness of security issues," 46 % of the respondents listed the World Trade Centre attacks and 22 % listed identity theft. The war in Iraq and global computer viruses received 19 % and 6 %, respectively. 29 % of people in this survey thought that identity theft was the security issue they were most likely to encounter, with 15 % also listing denial of service attacks. These statistics show that, at present, levels of confidence in the security of online systems are not high.

Despite the above concerns, most users will not have a detailed understanding of the many factors that contribute to the overall security of a communications session. What is therefore needed, apart from inherently secure communications systems, is a way to convey to users that they can be confident about the security of a communication session. An example of such a mechanism is the padlock symbol that appears on web browsers when Secure Socket Layer (SSL) security is active (see clauses 7.2 and 9.2).

Users are only likely to be able to understand a few levels of security, such as:

- the communication session is insecure and could easily be intercepted;

- the communication session meets acceptable levels for normal personal or business communication;

- the communication session meets stringent (e.g. military or security services) levels of security.

The user will need to receive some indication which of these levels of security applies to the current communication session. An indication like the padlock icon would be an appropriate solution to apply to all communication sessions. In the above examples of security levels, the icon would apply to the middle level, with no icon and some specialized indication applying to the first and third level.

When receiving communications, the user may be concerned to know the trustworthiness of the communication source. When users wish to download new applications or updates to existing applications, or even more so when users receive messages that say an application should be updated, users may need to reassure themselves that the sources of the applications or updates are valid. Where the providers of the applications, updates or information have security certificates, users should be informed of the existence in such a way that:

- it is clear to users what the certificate means;

- it is clear to them why it is valuable to check the validity of the certificate;

- it is clear to them how to check the certificate.

Where the system determines that a certificate may be invalid, this should be pointed out to users in a way that:

- makes the nature of the potential invalidity clear;

- gives possible reasons why this invalidity may be a threat;

- gives possible reasons why this invalidity may be harmless;

- provides users with a means to accept or reject the application, update or information that is to be downloaded.

There are security issues that relate to a user's terminals and applications as well as their communications services. These include issues related to alerts from virus protection, spam detection and firewalls as well as the issues of ensuring that the effectiveness of these applications/services are maintained. Users should be offered options that allow them to determine the degree to which they feel confident in maintaining control over these applications/services and the degree to which they are happy to allow these applications/services to manage their own effectiveness. These options would include giving users options to determine:

- the amount of information about ongoing activity (e.g. the detection and removal of viruses) that they want to receive;

- the amount of control over the application/service's ability to manage its own effectiveness (e.g. by automatically downloading the latest virus detection/removal updates) that they wish to exert.

Recommendations:

R 9.8.3.a The security level of a data connection session should be indicated to users. The use of a padlock icon is a recommended mechanism for visually conveying a secure data connection session to users.

R 9.8.3.b For communications services where multiple levels of security can be achieved, the user should be given an indication of which level of security is in place. This indication should be given in a form that is meaningful to a user (e.g. "insecure", "normal security", "high security").

R 9.8.3.c   Where the providers of the applications, updates or information have security certificates, users should be informed of the existence of these certificates in such a way that it is clear to users what the certificate means; why it is valuable to check the certificate's validity and how to do so.

R 9.8.3.d   Where the system determines that a certificate associated with the provider of applications, updates or information may be invalid, this should be pointed out to users in a way that makes the nature of the potential invalidity clear, and gives possible reasons why it may be a threat as well as why it might not be. Finally, the user should be provided with a means to accept or reject the application, update or information that is to be downloaded.

R 9.8.3.e   Users should be given options that allow them to specify the degree of control they wish to have over security related applications/services such as virus protection, spam detection and firewalls. Users should be given options to determine: how much ongoing activity they wish to be informed of (e.g. notification of virus detection/removal) and how much control they wish to have over the application/service's ability to manage its own effectiveness (e.g. to automatically upload new virus detection/removal updates).

9.8.4   Access control

Terminals and services will, if accessed, provide a mechanism for people to gain access to users' confidential information and to gain access to their means of communication. For this reason, users may need mechanisms to allow them to exercise access control to their terminal or service. Mechanisms such as password control, smartcard access and biometric monitoring can all be used as mechanisms for providing a level of access control security.

Mechanisms that heavily rely on users memorizing passwords and PINs may appear to be very secure, but such mechanisms may frequently be undermined by users writing down their passwords and PINs to avoid forgetting them. Many service providers attempt to increase the security of their services by increasing the number of elements that a user has to enter in an access control procedure (e.g. username, password plus one of a number of personal secrets, by putting constraints on the format of these elements (e.g. insisting that a password has a defined mixture of letters and numbers) and by insisting that some of these elements should be changed on a regular basis. Each new requirement appears to reduce the chance that an unauthorized person can access the service. However, as the complexity of the procedure increases, so does the chance that users are unable to memorize the necessary information and this results in many users resorting to writing down this information. Once the information is written down, the security of the access control procedure will be totally compromised. Thus, attempts to increase the security of an access control procedure by adding input fields and constraints can very easily lead to the procedure being less secure in practice.

Replacing elements of access control procedures with methods that do not rely on users memorizing passwords and personal secrets will tend to make these procedures easier for users and will reduce the risk that users will resort to writing the information down. The use of smartcards (or information beamed from terminals that have smartcards) and biometric methods (e.g. iris recognition, voice-prints, fingerprints) will all reduce the chance that users will compromise system security by writing down security information.

Recommendations:

R 9.8.4.a   The methods of access control provided should be appropriate to the context in which it is used. Thus it would be inappropriate to require a very difficult and secure access procedure if no valuable or personal information is potentially under threat.

R.9.8.4.b   Where a terminal, service or application has distinct sub-applications within it, different access control mechanisms should be considered for some or all of the sub-applications as well as for the terminal, service or application itself (e.g. a user should be free to choose to use the access control procedure provided for their contact information but not to use the access control for all terminal data).

R.9.8.4.c   Mechanisms that require explicit user presence or intervention but that do not rely heavily on user memory should be considered for use when important security validations are required.

R 9.8.4.d   Avoid increasing the number of elements that a user has to enter in an access control procedure (e.g. username, password plus one of a number of personal secrets) and putting constraints on the format of these elements (e.g. insisting that a password has a defined mixture of letters and digits).

R 9.8.4.e   Replacing elements of access control procedures that rely on human memory with other methods such as smartcards or biometric methods will reduce the risk of users compromising security by writing down security information.

R 9.8.4.f   Where there is a possibility for a password to be stored on a user's terminal, users should be asked whether they wish to enter the password every time or whether they wish to have the terminal remember it for future usage. Where such an option is presented, the user should be warned of the ability of other users of the terminal gaining access to the service or application.

R 9.8.4.g   Any requirements or limitations of a password (e.g. on the content and/or length) should be clearly indicated to the user when the user is first asked to generate the password.

9.9   Telephone number format and handling

9.9.1   Relevance of number format

The issue of telephone number format is relevant in several contexts:

- the different ways that people may expect to see written numbers;

- how users enter numbers into a number store;

- the different ways that networks will handle alternative number formats;

- how users should enter numbers when dialling;

- how users expect to see stored numbers presented to them;

- how a terminal or system can help users handle numbers;

- how redialling from call logs should work.

9.9.2   Written number presentation and storage

Telephone numbers presented in written or printed material are frequently presented in a format that relates to the expected use of the number. Where local dialling within a national district is supported, people will often exchange written local telephone numbers with the national district code omitted. Where national services are advertised within the host country the telephone numbers are most frequently presented in the national dialling format, with the country code absent. The full international form of a telephone number is most frequently offered where communications from international contacts is expected.

Users will find it easiest and most convenient to store telephone numbers in the form in which they are presented to them. Conversion of a telephone number presented in one format into another format will cause an unwanted additional format conversion task for the user and it will be a source of potential transcription problems. Once a number has been written down or stored in an abbreviated form (e.g. local dialling, or national dialling form) it will not be possible to determine the full form of the number by examining the number. A national number in one country may look identical to a national number in another country, but will refer to a totally different telephone subscriber. People or applications may be able to use other information related to a telephone number (e.g. an associated address) to guess the full form of a telephone number, but even when this option is available it will not guarantee success.

9.9.3   Handling of number formats by networks

Where telephone numbers are stored in GSM telephones, the strategy of storing numbers in the format in which they are presented will produce unpredictable results. Numbers stored in a local dialling format will not successfully lead to connection to the expected recipient. Additionally, such numbers may not always be successfully transferred between different terminals (e.g. from DECT to GSM). Numbers stored in a national dialling format should work successfully when calls are initiated from the home country of the owner of the telephone but will fail when calls to these national numbers are dialled from abroad.

For terminals that are connected to fixed telephony networks, users will often store and use numbers in the simplest format that they believe will be correct. Hence local numbers will be stored and used in local format, other numbers within the same country will be stored and dialled in a national format, and numbers related to other countries will be stored and dialled using the national variant of the international dialling prefix. The use of a full international format for dialling a local number may, in some networks, affect the way that the call is charged.

In general, fixed networks and terminals will not provide support for the use of the standard international access code ("+") or dialling format.

9.9.4   Ideal number format for retrieval from storage

Only a full international version of the telephone number (see ITU-T Recommendation E.123 [33]) can be retrieved from an address book and then processed by a user or by format conversion software to produce other variants of the number such as a version for local dialling on fixed networks or a version for national dialling within a country. Storage of numbers in any form other than the fully specified version of the international telephone number will mean that conversion to the full international version of the number cannot be guaranteed.

Recommendations:

R 9.9.4.a   Numbers in terminals should be stored in full international form whenever that version is available.

R 9.9.4.b   The full international form should include the standard international access code (see clause 9.1) where support for this code is available. Where the standard international access code is not supported, the national prefix for international calls should be used.

R 9.9.4.c   All terminals should support storage of the standard international access code (see clause 9.1).

R 9.9.4.d   All terminals should support translation of the standard international access code to the numeric national code unless network support for this translation will always be available to the terminal.

9.9.5   Assisting the user to handle telephone numbers

Clause 9.9.2 suggests that users would find it easiest to enter a telephone number in a format that is identical to the format in which the number is presented to them. When viewing telephone numbers during call setup, it is likely that a user would prefer the display of the number to be in a format appropriate to the underlying task. This would mean that when dialling or receiving an international call the user would see the full international version of the telephone number. However when making or receiving local or national numbers, the display to the user of local or national variants of the numbers would be appropriate.

Ideally, logic within a terminal or terminal that assists a user could be used to help a user to enter a local or national number into a contact record and to be asked relevant questions that would provide the information necessary to determine what additional digits need to be added to the number in order to turn it into a full internationally specified number. In practice this may prove difficult or impossible to do this reliably so the user should always be able to correct or reject the proposed changes.

Recommendations:

R 9.9.5.a   The fact that numbers are internally stored in a standardized international format does not mean that service and product designers are obliged to present similarly formatted numbers to users. Users should be able to specify the way in which they wish numbers to be displayed to them (e.g. always in international format, in national or international format dependent on context, divided into multi-digit "chunks" separated by spaces).

R 9.9.5.b   Users should be offered dialogues that help them to ensure that the numbers entered in their terminals can be converted into international form and stored. As it is impossible to guarantee that the process used is 100 % reliable, users should be given the option to manually edit or to reject the suggested changes.

9.9.6   Intelligent handling of numbers

With appropriate terminal, service and network logic, it should always be possible to take an internationally formatted number and use it to make a successful communication. As such, solutions that use numbers stored in international format should be encouraged. Similarly, users should also be encouraged to capture and store numbers in the full international format - with system support as suggested in clause 9.9.4. Such widespread adoption of the storage and processing of internationally formatted numbers should greatly reduce the incidence of mis-dialled numbers by people who are roaming. This reduction in errors will be a major benefit for network and service providers in reducing the amount of non-chargeable abortive call attempts. Given these benefits to network and service providers, charging mechanisms should be designed to ensure that users who adopt the use of internationally formatted numbers should not be charged more for making calls than users in the same circumstances who use full or abbreviated forms of nationally formatted numbers.

Intelligent handling of numbers becomes a priority within dual-mode terminals (that work on fixed and mobile networks) as numbers in local (abbreviated) format will be correctly routed by fixed networks in environments where local dialling is supported (see clause 9.9.2), but numbers in this format will not usually be correctly handled by mobile networks. To guarantee that stored numbers are handled correctly whether dialled via a fixed network or via a mobile network it will be necessary for the numbers to be stored in international format (or in national format if roaming or dialling other countries will never occur). It will also then be necessary to ensure that either internationally formatted numbers dialled on a fixed network are charged at the lowest possible cost (i.e. local charging rates if dialled in the local area) or that numbers are converted before use to achieve the same correctness of charging (e.g. stripping of international prefixes and country codes when dialling takes place over the fixed network to avoid calls being routed and charged as international calls). Under no circumstances should users need to perform such conversions themselves.

It is also important that numbers are handled intelligently when transferred between different types of terminal. Transferring numbers from terminals where numbers are stored in international format to terminals where international format is not the normal default should pose few problems (as most terminals will accept internationally formatted numbers and only intelligent handling of the international dialling prefix will be required e.g. replacing "+" with the national version of the international dialling prefix). However, transferring numbers from terminals where numbers are frequently stored in national or local formats (e.g. fixed telephones) to terminals that do not support these formats (e.g. mobile terminals) will require the use of some form of assisted dialogue to ensure that the user can confirm that any automatic translation of a number has been correctly carried out (see clause 9.9.5).

Recommendations:

R 9.9.6.a   All networks, i.e. mobile, fixed and IP, should handle internationally formatted numbers that include the standard international prefix irrespective of whether the intended destination is in another country or in the caller's own locality.

R 9.9.6.b   In dual-mode (fixed and mobile) terminals, the user should not need to be involved in ensuring that numbers are dialled correctly and that appropriate charging rates are applied to all calls dialled (this will require the storage of numbers in international (or at least national) format and the correct routing and charging of these numbers when dialled on any fixed networks).

R 9.9.6.c   When numbers are transferred between terminals, intelligent dialogues will be required to support the user in ensuring the correct translation of numbers stored in local formats into an international format when these numbers are moved to terminals that do not support the dialling of local format numbers (see also clauses 9.9.2 and 9.9.5).

9.9.7   Retrieval of numbers dialled with no international prefix

Users will often want to be able to make a repeat call to a person they recently contacted or who recently contacted them. An obvious way to do this is for the user to locate the previous call in an outgoing or incoming call list and instruct the terminal to redial that number. If the number in the list is not in a full international form, the attempted redial will not work if the number in the list is dialled from a country different to that from which the original call was made or received. Users will be unlikely to immediately identify the cause of the call failure that will result from dialling a national number whilst in the wrong country.

An approach that may help users avoid the frustrating and confusing results that can occur when numbers from a call list are redialled in inappropriate situations is to warn the user that an attempt to make the may not succeed because of the changed location. This warning could be triggered if the user is roaming and the number dialled from the call list is not in its full international form. This warning would be inaccurate if the number in the outgoing or incoming call list was a national number of the country to which the user has roamed.

An alternative, that will not prevent an abortive call attempt, is to generate a message to a roaming user that explain the possible cause of failure if a number not in international format fails to be connected. This would be more likely to be an accurate explanation than a warning before the connection attempt.

Both of the above messages would educate users on the benefits of working with numbers in their international format. The only way to ensure reliable calling from call lists is for all numbers in these lists to be available in full international form - even if the number shown to the user is expressed in a shorter national form.

Recommendations:

R 9.9.7.a   Numbers in incoming and outgoing call lists should be stored in full international format whenever it is possible for the terminal or application to determine what that format is.

R 9.9.7.b   If a roaming user attempts to dial a number that is not in international format from an outgoing or incoming call list then either a) warn the user that the call may not be successfully connected because it is not in international format or b) when a call is not successfully connected, give the user a message that explains that connection failure may be due to the fact that the number was not in international format.

9.9.8   Retrieval of numbers dialled from the phone book

Where a number is dialled from a phone book, the full international form should be placed in the outgoing call list where such a number is available, even if it is felt preferable to display a shorter (national) version to the user.

Recommendations:

R 9.9.8.a   Where numbers are dialled from the phone book, they should be stored in full international form in the outgoing call list irrespective of what digits were actually dialled to complete the call.

NOTE: This can only be guaranteed if the number in the phone book is stored in its full international version.

9.10   Universal addressing in converging networks

At present, users of communication services have a range of communication addresses that vary from service to service. A user normally has a different telephone number for each separate telephony subscription. Similarly if a user chooses to have multiple email services they will have a number of different email addresses as a consequence. As a user acquires more services, they will begin to acquire a wider range of communication addresses. This clause looks at the issues associated with this proliferation of communications addresses. It looks at potential solutions that move from the current situation of address anarchy towards a situation where a user has fewer communications addresses that relate to their individual communication requirements and not to the technical and commercial limitations of communications networks and services.

9.10.1   Service subscription related communications addresses

As indicated above, the number of communication addresses a user has is very closely related to the number of communications services a user subscribes to. These communications addresses are mostly tied to a specific service subscription and hence the address identifies the service subscription and not the user. As a consequence of this association of the address and the subscription, a user's communications address is not really their own as they are frequently unable to use it if they choose a new service provider (e.g. the email addresses provided by one ISP will usually be withdrawn if the user ceases to use that Internet Service Provider (ISP)). Also, a communications address provided for one service (e.g. email) cannot be used for another service (e.g. telephony). It is these limitations of conventional service subscription related addresses that mean that if a person's mobile telephone number is known, it will not be possible to use this information to contact the person on their fixed telephony home telephone.

Historically a further problem with telephone numbers was that when a person decided to move their telephony subscription from one service provider to another the person had to be issued with a new telephone number. Such changes were a primary source of difficulties for people trying to contact the person as the telephone number that originally worked suddenly no longer worked. The introduction of "number portability", where a user is allowed to have their original number reassigned to the new telephony service to which they have subscribed, has greatly improved the problems caused when people move between different telephony service providers. However, the restricted availability of number portability solutions and restrictions on the flexibility of when numbers can be ported (e.g. the porting of numbers between fixed and mobile networks is rarely allowed) mean that telephone numbers that once worked ceasing to work is still a common problem.

Outside the field of telephone numbers, portability of addresses associated with communication service subscriptions is not normally provided. As well as commercial disincentives to allow such portability, there are technical limitations that make such portability solutions very unlikely. Hence, if a person acquires internet service from one ISP they will usually be given one or more email addresses to use. If the user then wishes to terminate their contract with this ISP and obtain their internet service from another ISP they will not be allowed to use old email addresses as they will be issued with new email addresses by the new ISP. People usually resolve this difficulty by either:

- attempting to maintain several email addresses by keeping a number of ISP subscriptions active just to ensure that the e-mail address still works (most relevant to people using free ISPs);

- informing a selected set of contacts of a change of e-mail address;

- using e-mail forwarding addresses.

Where corporate e-mail addresses are concerned, people do not usually have the option of maintaining old email addresses that relate to their previous employment as corporate email providers normally terminate email accounts when the person's employment is terminated.

The problems that a person will often experience when acquiring a new service or moving a service from one service supplier to another act as a disincentive to making these changes. Thus many of the limitations described in this clause acts as a barrier to the development of a thriving and competitive telecommunications market.

9.10.2   Type of communications addresses

As communication addresses are usually associated with communication services, the type of communication address differs greatly from service type to service type. It has not normally been possible to have a communications address that is typical of one type of service for use with another type of service. Normally an email address cannot be used as the address for a voice telephony service and a telephone number cannot be used as an email address.

The implication of this limitation is that even if someone's email address is known, it will not be possible to use this to contact the person by telephone even when e-mail account and telephony service are provided as a package by the same service provider. This tying of communications address to communications service type is a major barrier to free and flexible communications.

A rare example of where the same communications address is used for more than one service is in GSM where a person's telephone number is used as the address for both voice telephony and SMS services. The extraordinary success of SMS should, in some part, be due to the flexibility and ease with which people can decide whether to send a text message to someone or talk to that person on the basis of their own preference and not on whether they have access to the appropriate service specific communication address for that person. In order to gauge the impact of the provision of more than one service behind a single communication address, people only need to consider how frequently their choice of whether to phone, email, or have an instant message dialogue with a person is limited by whether the appropriate communications addresses for the other person are known.

9.10.3   Address book issues

The problems of the potentially large number of communications addresses and the likelihood that these addresses will become obsolete over time leads to severe problems in the management of electronic address books (whether on PCs, in telephones or whether stored on remote servers). The problems divide into three basic problems:

- different fields are needed in an address book record to handle the communication addresses for different services. Where novel services are introduced, existing address book records will need to be upgraded to allow for the recording of new communications addresses that correspond to these new types of services;

- as the range of different types of communication service increases, the size of address book record templates will need to increase to handle the new information. This will result in users having to hunt for the specific fields that they need to fill in from the many other fields that are irrelevant for many of their contacts;

- the information held in address book records will "decay" over time and this will be invisible to the owner of the address book. This decay, caused by people abandoning and changing their communications services will only become apparent to address book owners when they attempt to contact someone and they discover that the communication address no longer works.

Recommendation:

R 9.10.3.a   An identifier that is permanently associated with a person and all of their services (e.g. UCI or an ENUM number) should be used wherever possible. Such identifiers eliminate the dual problems of a large number of identifiers per person in an address book and identifiers in address books that cease to be valid as people change services and service providers.

9.10.4   Identifying the other person/party

Some communication addresses, such as email addresses, contain text that may appear to identify the user of the communication address. The checks used to verify that the information contained within an email address accurately reflects the true identity of the owner of the email address are usually weak or non-existent. Even where such checks are made, the ease with which Internet identities, including the "From" field of an email, can be "spoofed" makes reliance on existing Internet communication addresses very risky.

Other communications addresses, such as telephone numbers, contain no explicit information that inherently identifies the person using the communication address. For these communication addresses, the only means of providing information on who is attempting to communicate is:

- the existence of a "calling name service" that provides name information to accompany an incoming telephone call;

- associating locally held name information with the Calling Line Identity (CLI) of the incoming communication.

In both of these solutions, the name information only identifies a single person associated with a specific calling line. The first solution is dependant on the availability of a calling name service and on the accuracy of the database that associates names with telephone numbers. In the second option, where calling line information is unavailable, or the calling line identity is unrecognized by the receiving terminal, no identity information can be provided to the call recipient.

The provision of a reliable means to identify a person who is attempting to communicate will make the provision of effective call screening and call management solutions possible. At present call screening and call management systems have to use existing communications identifiers as a way of associating an incoming communication with a person from whom a communication is or is not desired. As has been shown above, the assumption that a communication identifier is a reliable identifier of a person may not be true. As a result, most attempts to screen and manage incoming communications fail to some degree. It is the identification weaknesses of communications addresses that are exploited by people sending spam (unsolicited and unwanted messages) and viruses and by unscrupulous telephone sales organizations that make uninvited calls.

9.10.5   Solutions for converging networks

There are some basic principles that will minimize some of the usability issues associated with communication identifiers. These are:

- options that associate more than one service, including different types of services, with a single communications identifier will provide a simpler environment for users, will maximize the number of services that can be chosen from when contacting a person and will minimize the size of address book records;

- options that detach the unbreakable link between a communications identifier and the provider of a specific communications service will greatly reduce the need for communications identifiers to be abandoned by their users when they move between service providers;

- options associated with communications identifiers that reliably identify the person attempting to communicate will reassure users and also allow them to utilize effective call screening and call management schemes.

Recommendations:

R 9.10.5.a   Try to minimize the number of addresses for the user. Any options that associate more than one service with a single identifier should be used in preference to options where each different service from each supplier has its own identifier.

R 9.10.5.b   The use of addresses that will be remain the same as users change service providers is recommended. This implies that addressing options that are not permanently linked to a single communications service provider should be used in preference to those that are.

R.9.10.5.c   Addressing options that enable the person or organization making the communication to be reliably identified should be used in preference to addressing options that either do not allow the person or organization to be identified or options that allow false identities to be passed off as true identities.

Existing solutions that should be considered as ways to satisfy some of the above requirements are:

- wider adoption of "personal number" solutions that allows users to offer a single stable number to external contacts whilst allowing them to transparently change service providers and acquire or abandon services to meet their personal requirements;

- wider marketing and adoption of cost-effective domain names that are "owned" by the individual and not by the provider of internet services. Such solutions allow people to offer stable internet addresses such as email and web addresses whilst retaining the freedom to change ISPs;

- the emergence of directory services that provide contact information for people that covers communications addresses provided by a range of communications services and service suppliers.

Emerging solutions that solve many of the issues raised should be considered when they are available for use. Examples of such services are:

- ENUM based services, where ranges of different types of communication services are mapped to a single telephone number style (see ITU-T Recommendation E.164 [45]) communications address. These services may vary in the range of the issues that they resolve, but they all offer a means of radically reducing the range of communications addresses that are needed. Resolution of the clear identity of the person (or organization) associated with a communication address is not an inherent part of basic ENUM services.

- EG 202 067 [5] and EG 202 249 [12] provides a new communication identifier, Universal Communications Identifier (UCI) that can be used for all forms of current and future electronic communications. It explicitly addresses all of the recommendations and issues raised in clause 9.10. In addition, it offers a comprehensive solution to providing people with a user (not service) oriented way of managing the entirety of their personal and business communications.

9.11   Synchronization and back-up

9.11.1   Synchronization

As the mobile terminal and service market expands and diversifies, people will create, capture, store and display personal data in a number of different terminals and services. This personal data includes calendar-, address book-, v-cards and other organizer-data. Currently, the information that is stored and the format in which it is stored may be different from terminal to terminal and between terminals and services. As a result it is often impossible to easily and reliably move this data between terminals and services. In mobile communicating terminals it would also be useful to synchronize the settings of the terminal between multiple mobile terminals e.g. network configurations for different bearers. Since terminals have more and more personalized features, such as ringing tones, logos, etc. it would also be beneficial for the user to be able to synchronize these features as more people own and use several telephones. The technical issues will not be taken into account, as these are covered in [51]. There are many technical ways to achieve synchronization but there needs to be a general guideline about how to make these different techniques usable for the end user.

Synchronization of data is becoming more and more complicated as the user might have many different terminals holding the same personal data. The user might still want to keep all the terminals up-to-date but without manually inserting the same information into several terminals. The overall user requirement is to have all the terminals up-to-date (see clause 6.3 meta-requirement 5). The synchronization should in most cases be seamless two-way synchronization that chooses the most up-to-date information regardless of which terminal the data was entered into. There are some concepts already tackling this issue and the most user friendly solution seems to be to have a secure, regularly backed up, database in the network that all the terminals can easily and cost efficiently use. The synchronization would be easy as the database would have all the recent up-to-date information and all terminals could then synchronize the data from there. This would also help those users who do not have their own PC or laptop.

One major obstacle in synchronization is the different formats of data used within different terminals from different manufacturers. It would be beneficial if internally held data was either stored in or could be converted to a common set of standards. If this issue is not handled, seamless synchronization will not exist in the future. Synchronization may be achievable, but only by awkward solutions. Even now, multiple terminals can be synchronized to some degree, but it needs a lot of effort from the user. If the user has, for example, a couple of terminals and a laptop, the synchronization of all these terminals can be achieved by synchronizing first one terminal and the laptop and then the second terminal and the laptop. Still the issue of interoperability of the different data remains.

Using a synchronization application, the synchronization usage model should not be more difficult for a user than transferring a file between two terminals. Through a user interface, users should be able to select objects they want to be synchronized, for example calendar or contacts or both. Terminals should be able to remember previously synchronized terminals and configurations. Furthermore, initiation of the synchronization process should not be a cumbersome sequence of user actions.

With multiple terminal ownership, the user's data synchronization usually becomes even more complex. The user might have a certain terminal where only family and leisure related things are stored and, in contrast, a terminal related to work. But in everyday life, these work and home life cannot be considered totally separately. On the work terminal it would be good to also have leisure related items (e.g. the hobby times of children) available so that the user would remember them and not schedule work agendas at the same time and vice versa. Detailed information would not be required but some notion of the time should be indicated. This also applies to terminal book data; some of the work-related people are needed in the home terminal but some are not, and again, this reverse situation applies to the work related terminal. There might also be occurrences that users might not want to be synchronized between the different terminals at all e.g. a birthday party at the weekend does not need to be shown on a work terminal for a person who has no work activities during weekends. With all these different needs, users are still reluctant to invest much up-front effort into configuration even though it would ease their life in the future. Intelligent methods will be required to help the user satisfy these complex needs.

The synchronization process can be divided into three major areas: first time usage, continuous usage and making a back-up of data.

Recommendations:

> **R 9.11.1.a**   The most recent version of OMA Data Sync (SyncML) specification [70], with corresponding UI elements, is the recommended, generic technical solution for multi-platform and multi-terminal synchronization.

> **R 9.11.1.b**   When synchronizing multiple terminals, a secure "mother" database somewhere in the network should be considered as a robust solution.

> **R 9.11.1.c**   Clearly indicate to the user which terminal is the master and which is the slave if such a distinction exists.

9.11.1.1   First time usage and set-up

A password and some configuration may be required for first time synchronization but, subsequently, synchronization should be transparent if so desired by the user. Users have to specify the information they wish to be synchronized during the first use. They also have to configure whether terminals will automatically attempt to re-synchronize and if/how password protection is required to access a synchronization application. The configuration process should be as minimal as possible for the users and default values should be set for as many settings as possible (see clause 8).

The user interaction for first time synchronization is a set of user actions:

- configuring the synchronization application;

- selecting items and terminals to be synchronized;

- configuring the data mappings between the terminals, if needed.

To ensure that the terminals find each other, users might first need to connect the two (or more) terminals with appropriate connection methods before starting the application. Such methods are e.g. infrared, Bluetooth, cable connection, GPRS, etc. Sometimes users first need to activate/establish the connection before the set-up of the synchronization can start. There are also cases when this connection method is asked for or advised by the application when the application is started. The user should clearly be advised of the connection procedure when it is used for the first time.

In this phase, there might also be a need to set passwords between the terminals so that a trusted connection can be established. The password options should clearly be indicated to the user.

When the user is configuring the application for the first time the application should also offer certain time-dependent synchronization schemes or profiles. A user might want to synchronize certain data more often than other, less volatile, data. Another possibility is automatic synchronization whenever the terminals are close to each other, or connected in other ways that may be unrelated to the synchronization task. As many users forget to synchronize their terminals, which could result in them losing data if something goes wrong with the most important terminal, having the synchronization application prompt the user to synchronize the terminal would be beneficial.

When the connection is established, the user should be given a clear indication of the available options of what can be synchronized. These options could be shown to the user as a multiple selection list of items to be chosen from e.g. calendar, contacts, etc.

If one or more terminals have a memory card, the user should be clearly informed that data from that source could also be synchronized. It would be beneficial if the user is given a chance to select the location of where information from the memory card will be synchronized to.

If the connection and the synchronization can be done with multiple terminals simultaneously, the user should also be given a multiple choice list of the different available terminals and the user could then select the required terminals. In some cases, the user might not want to synchronize certain things with all of the terminals, but just with a selected group of terminals.

After the first time set-up, users should be able to configure all the items easily according to their wishes whenever they want to do so. This should not be a one time possibility and all the settings should be changeable. The users should also have possibility to create different synchronization profiles if they use many different terminals and synchronize them separately. This might include different connection methods and different data mapping possibilities.

During initial synchronization the user might need to create mappings between the different data formats supported by the different terminals. These mappings should be required only once and, after that, the synchronization process should automatically keep the mappings and utilize them. Such mappings might occur e.g. when phone book fields used in different terminals do not match. When multiple terminals are synchronized, it should be possible for the user to do the mappings with only one of the terminals and the application would then take care of the mappings with the rest of the terminals.

Recommendations:

R 9.11.1.1.a The user should clearly be advised of the connection procedure between terminals on initial synchronization.

R 9.11.1.1.b When first setting the synchronization, users should be presented with a dialog/wizard where they can select which applications and what kind of attributes they want to be synchronized (or can be synchronized) e.g. calendar, contact information, etc., and their respective mappings.

R 9.11.1.1.c Users need to be informed with a dialog when some of the attributes of different terminals do not match, to ensure that they are aware of potential differences, and preferably be given the chance to select alternative mappings. There should be an option to turn off the information dialogue if users are aware of these differences. This option should be possible to reset by the users.

R 9.11.1.1.d   Terminals should be able to remember previously synchronized terminals and configurations so that the user is not required to perform setup operations every time.

R 9.11.1.1.e   All the settings of the synchronization should be changeable by the user.

R 9.11.1.1.f   Different profiles for synchronization should be supported.

9.11.1.2   Continuous usage

Starting the synchronization process should be clearly indicated to the user. For the first time, the synchronization of the data could be started from the configured synchronization application. There might also be other means to start the synchronization process e.g. a hardware button on a terminal cradle. The user should be able to see the status of an ongoing synchronization and also see the connections used. Synchronization progress could be indicated as a simple percentage bar or with more sophisticated means e.g. time remaining. The connection type can be shown via symbols (see clause 7.2).

There should also be an indication when the synchronization process is over and whether it was successful or not. This notification can be shown as either a notification requiring user action or as a timed notification. Presentation of this notification should be optional.

In error situations, the system should always inform the user of the error. It should also give help to the user about the next steps and, if possible, why the synchronization failed. Users should be asked to confirm error messages so that they are aware of the information and they do not miss it (see clause 8.4 for further information on error handling).

If the user has selected automatic synchronization, the synchronization process should start automatically when the terminals are connected or as the result of certain user set values, without user initiation. If the next synchronization is not set to be automatic, the user needs to activate the process either by pressing a button e.g. situated in a terminal cradle or by activating the process from the synchronization application. It should also be possible for the user to have an option that every time an item is changed it is synchronized with other terminals.

If a data conflict appears during synchronization, the system should ask the user how to proceed. If the user has entered conflicting data into multiple terminals (e.g. a home phone number in one terminal that is different to that listed under the same person's home number in another terminal) and both of the items have changed since the last synchronization sequence, this conflict should be presented to the user in an understandable way so that the user could select the preferred item. Such information should include meaningful information about the item for which the conflict occurs and also about the times when the changes were done.

If the user decides to cancel the synchronization operation, no data should be lost but the terminals should either reflect the synchronized data (and inform the user that only the part of the task that was done before cancellation was achieved), or inform the user that no data was synchronized.

In cases of remote deletion, the application should be smart enough to understand which of the user actions was performed most recently and act accordingly. If, for example, the user deletes a calendar appointment, this should be reflected to the other terminals. The deletion should be clearly indicated to the user and also confirmed by the user. Sometimes it might be appropriate to ask the user if the appointment should only be deleted from the memory of one terminal or if it should also involve the other terminals. This information should also be reflected when the synchronization happens.

If all data is erased from one terminal, the system should ask the user if the synchronization should act accordingly and also delete the data from the other terminal. It is possible that this is not what the user desires, therefore the synchronization application should give a high priority warning to prevent unwanted data loss.

Recommendations:

R 9.11.1.2.a   Provide the user with different types of synchronization possibilities.

R 9.11.1.2.b   Users need to be indicated that the synchronization process is in progress once it has been started.

R 9.11.1.2.c   Users need to be informed with an easily understandable dialog that indicates the time remaining until the operation is expected to end (e.g. percentage bar, time counter).

R 9.11.1.2.d   If automatic synchronization is used, the operation should be clearly indicated to the user after it has started e.g. via a symbol and the user should be allowed to easily cancel the operation without loosing any data.

R 9.11.1.2.e   Failed or interrupted synchronization processes should be clearly and understandably indicated on the terminals.

R 9.11.1.2.f   Synchronization of more than two terminals should by done automatically as far as possible. In case of contradictions, users should be informed of the conflict in an understandable way and be offered a mechanism to select the required solution.

R 9.11.1.2.g   If a data conflict appears during synchronization, the system should ask the user how to proceed.

R 9.11.1.2.h   Provide the user with a choice whether an occurrence/item should only be deleted from the memory of one terminal or it should also involve the other terminals.

R 9.11.1.2.i   Unwanted data loss should be prevented in redundant ways.

9.11.1.3   Issues relating to specific data types

Communication identifiers

The user interface of the address book and related editing functionality is explicitly excluded from the scope of the present document. It is assumed that these issues are important for manufacturers' brand positioning.

There are two fundamentally different models which communication terminals, and services may use for storing and presenting communications identifiers (e.g. work telephone numbers, home telephone numbers, fax numbers and email addresses). These are:

- each communication identifier in a separate data record with the identifier paired with a user-supplied label (e.g. "Bruno (home)", "Bruno (office)" "Bruno (mobile)");

- all communication identifiers for a single person in a single data record with a user-supplied label (e.g. "Maria Smith") and with each identifier in a separate field labelled by the type of communication service the identifier is associated with (e.g. "Home telephone: +46 8 567 1234").

The second model for storing communication identifiers is typically used as part of a more general "contacts book" record (see below). When data is synchronized between terminals and services that use these two different models of storing implementation addresses, the user should be supported in enabling them to successfully move data from one model to the other.

In general, moving data from the single record for all communications identifiers to the one record per communication identifier model could, if the user wished it, be handled automatically. In this case, each communication identifier specific record could be assigned a label that comprised the name of the combination record with the name of the service type implement to it (e.g. "Bruno von Niman: Home telephone") or a suitable truncation of this, potentially lengthy label.

Forming a combination record from a set of communication specific identifier records could not, in general, be handled automatically as software would not be able to reliably identify which user-labelled records were associated with the same person. In this case, users would need to be offered a user interface dialogue that allowed them to specify which records belonged together and to assign a label for the new combination record.

The synchronization difficulties and the range of different types of communication identifiers that have to be listed, mapped and stored disappears if terminals and services all use a multi-service communications identifier (e.g. EG 202 067 [5]).

Calendar

Calendars can have different attributes for different terminals. An attribute that is desired in one terminal might be very annoying in another context. These attribute settings (e.g. automatically setting the Busy attribute in MS Outlook when synchronizing with a terminal not requesting determination of the availability attribute) should be changeable so that all such "unwanted" attributes could be easily changed. There should also be a possibility to map different attributes from one terminal and change them into different ones in another terminal (as already discussed with communication identifiers).

E-mail: attachments

When certain application data consists of many different formats and also has some more advanced functionality, the user should be clearly informed which of this information is synchronized. E-mail attachments that might not be downloaded to a certain terminal are examples of this. It should be clearly indicated to the user what happens with this data. If the attachment is not downloaded to the terminal together with the e-mail, it is unlikely to be synchronized yet the user might subsequently need the attachment. On the other hand, if the attachment is automatically downloaded and synchronized, this might be an unwanted situation if the memory of the terminal will not be able handle it.

The format of the attachment is also a problem with synchronization. If an attachment is not downloaded because it cannot be displayed, the system should be intelligent enough to understand that the user does not want to lose the attachment on the original terminal. This could happen if the simple rule that the latest version of the e-mail (the one that was moved to the second terminal without its attachment) should be reflected back to the terminal that holds the older version (the original e-mail with its attachment).

When synchronizing e-mail between terminals, the safest way to avoid uncertain or unwanted situations is to present the user with a choice of whether to synchronize attachments or not. This choice could be presented during configuration or when this situation occurs for the first time. The user should be given different options of handling this situation:

- always allowing attachments or certain, selected attachment types to be synchronized;

- having the user decide whether to synchronize each time;

- never allowing attachments to be synchronized.

Issues relating to synchronization of many types of information

As indicated in the discussion of communication identifiers above, a particular issue in moving information between terminals and systems is the potential differences in how detailed the information is, how the various fields in the data are categorized, and the formatting and size limitations of the various fields within the data. Because of these variations it is necessary to have software that is either pre-configured or user-configured to map the information from one stored format to another. Where a number of different terminals need to interchange information, it may be necessary to have several differently configured versions of data interchange software.

One way in which data can be successfully moved between terminals is by interchanging standardized forms of data records between these terminals. Where, for example, telephone numbers in terminals are held internally as standard contact records (e.g. vCards) it should be possible to transfer the telephone numbers, together with the name of the person or organization associated with the number, to any other terminal that supports the same contact record standard (see also clause 9.5.1).

Further issues arise from the complexity of handling information where support for multiple character sets and languages is required. In this case, the issue of handling the sorting order of information in ways that are meaningful to the target audience of the product is of great importance. To avoid the complications that arise because of the different ways in which data is stored, it is necessary to ensure that all internally held data is either stored in or can be automatically converted to a common set of standards.

Media: synchronization and presentation capabilities

With different terminals, the media presentation capabilities may vary widely. What is supported in one terminal might not be feasible to do in another. These differences should be clearly presented to the user. If the differences are not crucial, the synchronization should happen, so that the media could still be presented on the terminal. If some media is not at all supported in a terminal, this should be clearly communicated to the user and synchronization of such media would be skipped.

Personal and terminal settings

Since more and more settings can be achieved with mobile terminals, such as all connection related settings, personalization themes and wallpapers, it may give users added value also to synchronize these with all the terminals. The user should be able to choose which setting to synchronize and which not to. Users may want to synchronize the terminal settings relating to connections but not the personalized settings.

Recommendations:

R 9.11.1.3.a The use of widely accepted standards for the transfer of data is recommended. The most recent versions of OMA Data Synchronization protocols and mechanisms [70], with corresponding UI elements, are the recommended.

R 9.11.1.3.b Where data is stored differently in different terminals, users should, as part of the synchronization process, be offered a dialog that enables them to specify the way in which they wish the data to be mapped from one form of data storage to another.

R 9.11.1.3.c In the area of sorting orders, the solutions proposed in ES 202 130 [6] for mobile terminals should be universally adopted.

9.11.2 Back-up

As already discussed, mobile terminals are becoming assistants and much of the information stored in a mobile terminal is not stored anywhere else. It should be possible for users to back up the information since, if the information is not stored anywhere else, the information might be lost or at least recovering the information would take a lot of effort from the user if the terminal was damaged, lost or stolen.

All of the information on a mobile terminal should be backed up periodically. Users can perform the back-up operation in several ways. The user could do a simple back-up of the data within the terminal to a memory card, if the terminal has a memory card and if it has enough free memory to save the data. Memory card back-up is an insecure option since, in case of theft it is likely that the card will also be stolen unless it is a separately stored memory card used solely for backing up data. The terminal could be backed up to a remote terminal e.g. a computer or to a secure network location. As already suggested in clause 9.11.1, a secure network location could be the most effective option for protecting data for users who have no computers or other terminals where this information can be stored.

Many users have an opportunity to back-up their terminals but they still ignore this operation as it is thought to be time-consuming and difficult to perform. If users synchronize terminals, backing up the terminal could be part of this procedure. On first time synchronization the user would be advised to back up data and the user could either accept or reject this option. Subsequently, the synchronization system could remind users to back-up their data or users could set a re-occurring back up sequence to happen automatically.

Not all of the information in the mobile terminal is of same value to the user. The most valuable part of the data for many people is the phone book. This is usually the minimum requirement to be backed up. After the phone book data most people value data with emotional values, calendar data, things that are of monetary value to the user (e.g. downloaded applications, pictures and ringing tones that were paid for) and after these come all of the other data on the mobile terminal.

It might also be of value for the user if settings, both personalization and other settings, could be backed up and recovered. This information is also critical, but more easily recoverable than a user's personal information. When a user wants to change a mobile terminal or an operator, at least some of this data becomes obsolete, as it might not be re-usable in the new terminal.

When storing the back-up data, user should also be informed of where the data is backed up, how it can be recovered and how the next back up will be stored. If not done during the first back up, the user should be told when performing the procedure the second time and oferred the option to overwrite the previous back-up or save several versions of back-up entries.

Recommendations:

R 9.11.2.a Users should have the option to back up the information in their terminals.

R 9.11.2.b When synchronizing for the first time(s), users should be adviced to back up their data (together with reject, remind and accept options).

R 9.11.2.c The synchronization system should remind users to back up their selected data on a single-event basis (with the possibility to include settings) or offer the possibility to perform an automatic, scheduled back-up sequence.

R 9.11.2.d When storing the back-up data, users should be informed of where the data is backed up, how it can be recovered and how and where the next back-up will be stored.

R 9.11.2.e   Users should be offered the options to save a specific back-up version in addition to or instead of previous back-ups.

10   Service and application specific UI elements

10.1   Emergency call services

Emergency calling is a most appropriate candidate feature for harmonization. Since users are often contacting the emergency services in stressful situations, they should be able to initiate an emergency call from any type of terminal without further analysis or thinking. Users should be able to use their own or another person's terminal, in the network subscribed to, and even without a SIM-card or without knowing the access code to the terminal. Furthermore, legal requirements have to be taken into account by all manufacturers of terminals.

SOS functionality has been the subject for standardization, e.g. in GSM, where access to emergency calling without a valid user subscription is required by regulations. Also, access to the European Emergency Call Number (ECN), 112, has been (partly) harmonized in the GSM networks (TS 122 101 [26]). The European Commission has set the framework for European harmonization of emergency call functionality: Directive 2002/22/EC [67] mandates the use of a single European emergency call number "112", while [68] deals with location information during emergency calls, which has been standardized in several countries, as e.g. Sweden [76].

The user procedure to start an emergency call (keys to be pressed, dialogues for user confirmation) has already been subject to harmonization efforts. Especially in this area, a harmonized user interface seems to be important. Everyone has to be able to start an emergency call from every communication terminal while keeping the number of unnecessary emergency calls at the lowest possible limit. Also, in this area, there is no brand advantage to be gained from implementing non-harmonized user interfaces.

The results of these previous harmonization efforts have, however, been very rudimentary. A short analysis of terminals of the top five mobile terminal manufacturers (by means of global market penetration fugures as of early 2004)reveals large differences in the user interface procedures of emergency calling. Also, the set of terminal states in which emergency calls can be initiated, differs profoundly between manufacturers. Even between different terminals of single manufacturers various implementations of the user interface procedures can be found.

There are a number of requirements to be fulfilled by implementations of emergency call facilities:

1. Emergency calling should be possible without a SIM card or a valid SIM password. The methods of choice to fulfil these requirements are:

    (a) an "SOS" key or one with equivalent wording, which when pressed initiates a procedure to start an emergency call; or

    (b) the possibility to dial 112 as the first three digits of the pin.

    If this key sequence is recognized the terminal shows a soft key which can be pressed to initiate the procedure as in (a).

2. Emergency calling should be possible with the keypad locked. This is important because people in stress situations might not be able to unlock the keypad of a terminal unknown to them. There are two implementation alternatives:

    (a) pressing the key sequence "112" shows a dialogue to start the emergency call procedure; or

    (b) the option is visible at all times during the keypad-locked state.

3. Emergency calling should be possible without knowing the emergency call terminal number
(see SR 002 180 [9]). This requirement is often implemented by associating an emergency number to a soft
key or to an "SOS"-entry in the phonebook. As long as a mobile terminal is only used in networks using the
standardized "112" for emergency calling this implementation works well. Problems arise; however, if mobile
terminals are used in areas where non-standard emergency phone numbers are used ("911" in the USA, while
standardized in the US, does not adhere to the GSM standard.). In TS 122 101 [26] the mapping of different
emergency services to the respective emergency number through a list stored on the SIM card is standardized.
This solution allows the use of local emergency numbers in a user's home country even when roaming in
countries which use a different emergency numbering scheme.

(a) An alternative to mapping SOS to a specific phone number in the mobile terminal would be to inform the
mobile terminal about the valid emergency number upon registration in a mobile network. Using this
approach would free the user from the requirement of knowing the valid emergency phone number. This
solution would, however, complicate the synchronization and roaming procedures unduly.

(b) It should be noted that, using option 1 (b) or 2 (a) interferes with the usage of specific phone numbers in
different service provider's networks.

4. The number of inadvertent emergency calls should be kept to a minimum. SR 002 180 [9] requires that
numbers like 112xx should not be routed to an emergency centre. A feedback dialogue to the user is, however,
required to ensure that not setting up an emergency call is what the user wanted. Also, inadvertent pressing of
an "SOS" key should be followed by a short dialogue which forces the user to confirm the intention of calling
the emergency centre.

An alternative/additional solution to the use of soft keys in emergency dialogues should be selectable. Apart
from the obvious problems for blind users research shows that elderly people do not like soft keys. Research
indicates that elderly people react badly to voice dialogues because they lack confidence and panic easily [74].

5. For blind users an emergency call set-up procedure, which makes no use of soft keys, should be provided in
every mobile terminal.

6. In terminals with speech recognition facilities ES 202 076 [4] should be followed when selecting the
appropriate vocabulary.

7. Emergency call set-up should be possible for users who do not understand the menu language being used on
the terminal (SR 002 180 [9]).

Recommendations:

R 10.1.a   Each mobile terminal should allow for Emergency-calling functionality in any of the following
states: idle mode, keypad-locked, no SIM, before PIN-entry, no registration with a network.

R 10.1.b   In each of the following terminal states typing the key-sequence "112<send>" should result in an
emergency call set-up: idle mode, keypad-locked, no SIM, before PIN-entry, no registration with a
network.

R 10.1.c   A dialogue should ensure that emergency calls are not dialled inadvertently.

R 10.1.d   There should be a set-up-procedure for emergency calling which uses no soft keys and no voice
prompts during the confirmation dialogue to support both users with special needs and users not
being able to understand the terminal language.

R 10.1.e   TS 122 101 [26] should be followed for the definition and handling of emergency telephone
numbers and their mapping defined in the SIM-card. Country-specific emergency numbers will be
provided via the home service provider on the SIM card.

10.2   Voice call services

This clause addresses the provision of terminal-independent access and control procedures to diversions and common, essential second-line services. Specifics of video calls are addressed in clause 10.3.

Most users consider basic telephony functionality in a handset as the most important functionality of their mobile terminal and users appreciate being able to reapply available knowledge to other terminals and network environments. In addition, for users with visual impairments, the lack of more common approaches, the rigidity of modalities in user interfaces and the requirement for simultaneous audio, visual, dexterity and cognitive abilities make teleservices often unnecessarily difficult to access and use. Even if alternative inclusive solutions can be achieved through deploying assistive terminal or multimodal interface approaches (as recommended in TR 102 068 [3] and EG 202 191 [13] and described in clause 9.4), common access and control procedures and command sequences would be extremely helpful.

On the other hand, the variety of user interface concepts presented by present and future mobile terminals is on the increase and innovation and improvements are continuous. The present document does not provide specific recommendations for every variety of keypad shapes, designs and interaction concepts provided by handset manufacturers (in line with the scope), but addresses the area from the generic perspective

This clause makes only high-level recommendations relating to some of the most common and essential second-line and diversion status related functionality. Terminal-specific implementations, e.g. soft keys, dialogue structures or the ordering of items in menus is outside the scope of this present clause.

The recommendations on terminology, symbols, auditory signals and user guides, presented in clause 7, apply and should be followed. In addition, recommendations for the handling of the international access code in clause 9.1, safety and security indicators in clause 9.2, accessibility and assistive terminal interfaces in clause 9.4, key controls in clause 9.5, voice and speech user interfaces in clause 9.7, telephone number format and use issues in clause 9.9, emergency services in clause 10.1 and messaging and instant mobile messaging in clause 10.9 apply and should be followed, together with the additional recommendations provided in table 7.

Table 7: Generic UI elements for voice call services

Function	Description	Recommendation	Comment
Network attribute (service and functional capabilities) indicators (when roaming)	Network services and capabilities such as diversions, short number services, availability of video calls, GPRS access, availability of instant talk services.	Key attributes of foreign networks (such as support for short number dialling, availability of video calls, GPRS access, and availability of push-to-talk over cellular) should be indicated during a network selection process and/or provided upon request.	The number and variety is increasing; possible combinations of indicators for groups of services and features should be considered.
Terminal-initiated terminal and network settings	Diversions on no reply, busy subscriber, not reachable, etc.	Menu entry with clear explanations, preferably also presented as shortcuts.	
Diversion of all calls (unconditional)	If all incoming calls are diverted (unconditionally).	Clear, redundant diversion indicators should be provided in idle mode and other terminal states, using indicators specified in clause 7.	It is important to provide redundant indications to the user, if unconditional call diversion is activated (as no calls at all will be received).
Second line call acceptance or rejection	Accept or reject a second incoming call (with or without user initiated busy indication).	Provide user procedures consistent with the handling of first-line services, support by context sensitive guiding dialogues.	The variety of terminals and UIs limits the recommendations.
Call switching, call transfer and conference calls	Call switching between two calls, transfer a call before or after answer, set up a conference call.	Provide context-sensitive commands and controls, in combination with supporting guiding dialogues.	Recommended for details/ further harmonization by future work.
NOTE: Recommendations applicable to the terminology, symbols, auditory signals and user guides in clause 7, the handling of the international access code in clause 9.1, safety and security indicators in clause 9.2, accessibility and assistive terminal interfaces in clause 9.4, key controls in clause 9.5, voice and speech user interfaces in clause 9.7, telephone number issues in clause 9.9, emergency services in clause 10.1 and messaging and instant mobile messaging in clause 10.9 apply and should be followed.			

Recommendations:

R 10.2.a   The generic recommendations in table 7 should be followed.

R 10.2.b   The handling of additional user procedures should integrate well with the requirements presented in table 7, without negative impacts on the user interaction.

10.3   Video call services

With the advent of 3G/UMTS services, video calls are expected to be readily available to the mass market for the first time. It is therefore important to address certain:

- user requirements and design of video telephony terminal capabilities;

- parts of the user interface necessary to access services;

- specifics of UMTS video calls.

Stand-alone video conferencing systems, video conferencing, multi-point video telephony and audio functions are outside the scope of this clause.

This clause is based on user meta-requirements presented in clause 6.3 and recommendations presented in ETR 297 [10] and ES 201 275 [27], updated to apply to today's mobile service environment. Additional detailed guidance can be found in these documents and ETS 300 375 [24].

Terminal and network/service facilities specific to video calls include:

- Hands-free mode: since the user is supposed to look at the screen and into the camera during a video call, built-in or external attached handsfree equipment will most often be used for the auditory part. Therefore, at least a minimum acceptable level of voice quality, including a high-enough volume provided through the handsfree equipment, should be offered.

- Indication and selection of the call mode: both parties should be able to detect the call mode, on a call-by-call or permanent preference basis (e.g. video call or voice-only).

- For privacy reasons, users may choose to set their terminal such that all videotelephony calls are answered in an audio-only mode. Where this is done, the calling videotelephone user shall be informed that the called party has a videotelephone currently set to operate in audio-only mode (general user data privacy and security recommendations presented in clause 9.8 apply to video calls).

- In addition, camera on/off functionality to switch the camera and video pause functionality on and off (together with the appropriate user indications to confirm the current status and status changes) should be provided.

- Upgrading or downgrading the teleservice: either party should be able to request the communication mode of a call to established, upgraded or downgraded e.g. from an audio only to video call or vice versa.

- Recording requests invoked by the other party as well as on-going recording should be clearly indicated to both parties.

- Self-view: to enable the user to check their own video image (the invocation of this facility will have no effect on the remote image).

- Screen adjustability (e.g. for colour, brightness, and contrast): should be supported, as it has a considerable impact on the perceived quality of the communication.

Video telephony holds many promising opportunities for disabled and elderly users. Sign language communication offers itself as a most important application area, when the picture quality allows it and the screen refresh rate is sufficient, opening up mobile telecommunication to the hard of hearing in a very useful way. Specific design challenges should be addressed to ensure that the terminals and services are usable for the above mentioned groups of users. Designers should pay dedicated attention to the use of video telephony by disabled and elderly users (e.g. the trade-off between the use of colour for information coding and the effective use of colour displays by colour-blind people).

The explicit facts and related privacy issues are not addressed here: camera phones are outlawed by various cultures, and are banned by certain companies that see them as a threat to corporate security or to user privacy. However, recommendations related to privacy aspects are provided.

Recommendations:

R 10.3.a   It should be possible to pre-select video or voice call mode as a default and change it on a single-event basis by both parties, before establishing the call and during a call (without the necessity to terminate the call).

R 10.3.b   In addition, camera on/off key and camera freeze/video pause functionality should be provided.

R 10.3.c   An indication should be provided to the users if video mode is not supported by the network on the A- or B-party side.

R 10.3.d   User data privacy and security recommendations presented in clause 9.8 should be followed.

R 10.3.e   A self-view function should be provided.

R 10.3.f   Screen adjustability functionality should be provided.

R 10.3.g   Recording requests and ongoing recording should be clearly indicated to both parties.

R 10.3.h   An acceptable level of voice quality, including a high-enough volume, should be provided through handsfree equipment.

R 10.3.i   Dedicated attention should be paid to the design of video call services addressing disabled, young and elderly users.

R 10.3.j   For further detailed recommendations, see ETR 297 [10] and ES 201 275 [27].

10.4   Mobile browsing and Internet services

Access to the Internet from a fixed terminal is becoming an everyday activity and certain user groups require similar capabilities in the mobile communication service environment, offering high-speed access and content and application delivery. However, the fixed-browsing mechanism does not translate well to mobile usage and users will not use mobile services if they can not find them or they are too hard to use.

WAP over a dial-up connection was the first technical step towards a mobile Internet, followed by packet-switched WAP over GPRS and 3G/UMTS, providing higher speeds and single log-on. Present and future browsers tend to offer similar capabilities to those developed for fixed access, adapted and optimized for the characteristics of the mobile usage environment.

The advent of a new Internet top domain, .mob, is anticipated to further support users by providing access to content designed specifically to be accessed from mobile terminals. This should make the mobile Internet more accessible and easily navigable.

As mobile data services are becoming a focus area for future revenue streams, operators require standardized solutions to allow the download of content and applications to terminals, see [51].

No additional terminal- or network configuration should be necessary to get access to the mobile Internet and its applications. If additional configuration is required, it should be provided to the user easily and preferably, automatically, e.g. sent to the terminal as an OTA message (preferably including all necessary access information) and follow the guidance provided in clause 8. Additional log-on for Internet access should not be required, once a mobile terminal is switched on and functional.

WAP carries standardized but not user-oriented error messages. Some handsets provide two versions to the user: one explaining the error and one providing the complete and correct technical error information service and support staff might be interested in. No terminal provides relevant status information and additional error handling guidance and information. Some operators would like to improve this, as a courtesy to the user and ask for improved or operator-configurable, specific error messages. For example, "Access to Internet is not possible as the server is temporarily down. For additional information, click on the screen to place a free-of-charge customer support call. Voice services still work as usual".

In the case when a foreign GPRS network does not allow access through roaming, this should be indicated to the user (preferably in the form of an attribute of the network service), instead of "Unknown error" (see recommendation 8.3.g).

For further guidance on error handling, see clause 8.4. For further guidance on terminology, symbols and auditory signals, see clause 7. Detailed guidance for configuration is provided in clause 8.

Recommendations:

R 10.4.a	No additional terminal or network configuration should be necessary to access the mobile Internet and its applications.
R 10.4.b	If additional configuration is required, it should be provided to the user, e.g. sent to the terminal as an OTA message, preferably including all necessary access information and follow the guidance provided in clause 8.
R 10.4.c	Additional log-on for Internet access should not be required, once a mobile terminal is switched on and functional.
R 10.4.d	Error messages should provide user-oriented information.
R 10.4.e	In addition, error messages may provide technical status information, error handling guidance, operator-configurable information and other specific error messages (see recommendation 8.3.g and clause 8.4 for details).
R 10.4.f	For further guidance on error handling, see clause 8.4.
R 10.4.g	Terminology, symbols and auditory signals should follow the recommendations in clause 7.
R 10.4.h	Necessary navigation functions should be provided by the browser and the terminal, allowing for simple and direct information access and navigation.

10.5   Positioning-related services

10.5.1   General

This clause addresses positioning from the user's point of view (see meta-requirements in clause 6.3). Positioning is a very personal and private issue for users but can also provide them with help depending on the positioning service. However, privacy issues are a very important factor to be taken into consideration, see clause 9.8.

Positioning services include different types of services, e.g. there are location information services such as maps, tracking services that show to other people where the person is located and location-based push services. There are some general usability issues of positioning that can be applied to the whole positioning area.

The legislation of each country needs to be considered when positioning services are being addressed because these rules differ and services should be designed according to the appropriate laws. Legislation exists for some positioning services, as in case of emergency calls (see clause 10.1). In most cases, users should be able to turn the positioning off themselves, but there may also be cases where this kind of functionality is not allowed e.g. for children.

Accuracy of positioning may influence the usability and utility of positioning services. Sometimes the accuracy needs to be really high but in other cases even positioning on the scale of entire continents might be enough. Accuracy needs should be taken into account when different positioning services are designed e.g. when designing a way-finding service the accuracy needs to be very high since users do not get any added value if their current place is not known within a couple of meters.

10.5.2   Tracking services

Users are not usually willing to give details of their position to other people but everyone would like to get information on others. Users need a way to know when positioning is taking place and to whom the information is given. There also needs to be a quick way to turn off the positioning if needed. Even if the positioning was beneficial to users in case of an accident; users still should be able to decide what information they are willing to give to the authorities. In some cases, turning off the surveillance is not a preferred action. Such cases include security services that are provided for tracking children and other people that need special care. Also, this kind of functionality should be provided with tight security control.

When tracking (positioning) of a certain person is requested, this person should be presented with information of who is requesting this service, for how long and also the person should be presented with the choice of accepting or declining activation of the service. It should also be clearly indicated how the service can be turned off. Turning off the service should not require web access but should be as simple as sending a pre-formatted text message to a well-known number. Activation of the service could also be done with a pre-defined text message. The format should be such that it can be accessed via any mobile terminal that has mobile messaging capabilities.

Users should be able to decide to whom they provide access to their positioning data. They also need to be able to refer to the data when they want and also change the data e.g. users could be presented with an editable list of people they have allowed to track them. Users also need to see a list of disallowed or banned people. These lists and the properties of individual entries should be modifiable by the users.

When tracking has been allowed, there is a need to track reliably. When the sending end suddenly does not send information anymore, the user on the receiving end might react or even panic. There should be a clear indication to the user at the receiving end if the system providing the service is down or if the person who has been tracked switched the tracking off.

Recommendations:

R 10.5.2.a   Users need to be informed who is tracking them. This should occur both when tracking is activated and also continuously e.g. as a static list that the user can access when he so wants.

R 10.5.2.b   The user (both ends; the user and the one tracking the user) needs to get information when the service is down because of technical failure (network/server/out of range, etc.).

R 10.5.2.c   Activation and de-activation of tracking should be possible via simple pre-defined messaging so that all mobile terminals can execute this.

R 10.5.2.d   When a user turns off tracking, the indication of this should be shown at the other end.

R 10.5.2.e   A symbol that represents positioning and/or tracking should be displayed so that users are reminded when tracking and/or positioning is taking place.

10.5.3   Map and way finding services

Positioning services in this clause include services such as "Where am I?" and "How do I get to a certain place?". They are some form of map /guidance applications. These applications place quite high demands on the screen and memory of the terminal in order to be useful for the user. If the screen of the terminal is not capable of showing the map in a way that can really be understood, the service should detect this and then provide an alternative method of showing the information, e.g. in textual format.

If the user is given a map of the area as a picture on the screen of the terminal, it should be possible to navigate in this map as well as to modify the scale of the map (zooming). In addition to these typical navigational functionalities that should be clearly presented to the user on the UI of the terminal, the user will need the possibility to save the map for future use if so desired. Navigational functionalities should include at least: scrolling vertically and horizontally and zooming in and out.

If the map is presented to the user in a textual format, it should not only contain coordinates but also detailed information, e.g. the name of the place/street etc. Most users do not understand latitudes and longitudes and this information is not usable in this format.

Information should be presented according to the user's current need. For example, it is not safe to give only textual or pictorial information in a car where audio information that gives guidance to the user would be most useful. In a foreign country, the information should still be presented in the users own language, if possible. As a minimum the users should be able to choose a language that they understand (see clause 9.6).

In these services, automatic positioning of the user would be very beneficial. As well as seeing the way ahead, in real time, it might also be beneficial to show users the way they have already travelled. This information would be extremely beneficial in assisting users in determining the orientation of the map used.

Recommendations:

R 10.5.3.a   Information should be presented so that the user easily understands it (presentation in the user's language, sequential guiding information for driving or walking, automatic position update on maps).

R 10.5.3.b   The service provider should receive information on terminal capabilities so that the navigational information can be presented to the user in an appropriate format without any user action.

R 10.5.3.c   Optimal necessary accuracy for successfully achieving a specific task should be presented to the user.

10.5.4   Location-based push services

Location-based push services will evolve when positioning is more generally used. These services will affect the user considerably. Push services will eventually allow commercials and similar material to be sent to a user's terminal and care will be required to avoid the terminal becoming spammed with unwanted information. On the other hand, if the user has enough control to decide which information to receive, these kinds of services could help the user.

This kind of push service ability should be clearly indicated to the user so the user can act accordingly. Users should be able to decide if they allow particular kinds of push messages or not and they should also have an easy way to change their preferences, if they want to. When a specific type of service is allowed, this should be indicated to the user e.g. with a symbol on the screen, as specified in clause 9.2. At least three different options should be presented: turn off, allow with a certain set of rules and allow all.

Users should be able to select what kind of messages they wish to allow to be sent to their terminals, if any. This kind of rule setting should not take too much time and effort from users. Rule settings could be presented as a list of different choices which the user then selects. These rules should be changeable according to the user's current needs. Some kind of categorization of different services/message types could be used in this situation. In the future there might also be a need to create more intelligent rules than just simple categorization but these rules should be easy for the user to set, regardless of the mobile terminal.

Commercials received by the user's terminal should not take up terminal memory unless the user wants to store them for future use. Therefore automatic time settings for how long the information stays in the terminal should be implemented. Users will completely disable the service if it requires them to delete hundreds of messages from the terminal's memory. The service should also understand when it last sent the same information to the same terminal so that users are not spammed with messages they do not want to receive repeatedly.

Recommendations:

R 10.5.4.a   Support automatic time settings with the push messages so that they can be automatically deleted if the user does not want to save them for further actions.

R 10.5.4.b   Support personalization of which types of message are wanted and which are not.

R 10.5.4.c   Supply a symbol for reminding the user that push messages are enabled.

R 10.5.4.d   Users should have control if push services (location-based or independent) have access to their.

10.6   Service and content presence, availability and connectivity

Users of mobile communication services have traditionally had continuous access to a set of well-known, well-configured and always available services, at a well-defined cost. This is no longer the case, with the advent of ad-hoc networking complementing infrastructure networking.

The feature-richness of mobile networks, systems, services and applications is on the increase, enabled by the on-going convergence between traditional voice and data services, new mobile media applications such as video streaming and games and the migration from second to third generation mobile networks. A key attribute of this evolution is the non-continuous, location-dependent access to and availability of certain services. For example, in 2004, international GPRS roaming between operators is not always offered to roaming users, thereby limiting their access and influencing established communication patterns. This situation will persist and carried over to third generation mobile services until full coverage is offered, without the need to rely upon fall-back access to GSM and GPRS networks.

Ad-hoc services, often using local wireless, unlicensed access, e.g. a museum guide offered to visitors in a certain area or a parking fee payable with the mobile terminal. In such a situation, the connectivity as well as charging should be clearly indicated.

It is important to make the end user aware of the availability of communication services described above in a non-intrusive way and independently of the manufacturer of the terminal or the operator and service provider used, in line with the user meta-requirements presented in clause 6.3..

There is a variety of media and information-related content that can be reached from mobile telecommunication terminals, downloaded and later possibly even locally retrieved in the terminal with or without limitations (e.g. ring signals and background images). This also includes downloadable media content offered as streamed video (e.g. the goals from yesterday's football game). Such content can be blocked for further distribution (e.g. Digital Rights Management (DRM) system), in order to prevent unauthorized copying and content distribution

Streaming refers to the ability of an application to play synchronized media streams (e.g. audio or video) in a continuous way, while the streams are transmitted over a network. Mobile multimedia content is often streamed at a relatively low bit rate, thereby creating long latencies and causing interruptions.

Recommendations:

R 10.6.a	The availability and choices of communication infrastructure and offered services should be presented to the user in a non-intrusive way.
R 10.6.b	The connectivity options as well as the charging and security attributes should be clearly indicated to the user.
R 10.6.c	Indication and corresponding attributes for blocked media distribution (DRM) should be provided, preferably together with payment-related options.
R 10.6.d	Streaming start-up times should be kept reasonably short (not more than 10 s recommended).
R 10.6.e	Streaming playback should be provided without interruptions (even if a longer start-up time is required).
R 10.6.f	For communication services consisting of several levels and/or modalities (e.g. video calls implying voice and image), users should be able to pre-define or actively select the desired level or modality (e.g. voice-only instead of video calls).
R 10.6.g	The safety and security of the terminal and the included user data should be well protected and only disclosed and shared upon the owner's desire and approval (for details, see clause 9.8).
R 10.6.h	Terminology, visual and audio indications should follow the recommendations provided in clause 7.
R 10.6.i	Setup and configuration should follow the recommendations provided in clause 8.

10.7   Payments, cost of services and content

More and more mobile terminals are supplied with payment functionality which allow them to offer credit card capabilities. This coincides with the fact that users of communication terminals and services require clear cost-related information to be provided in order to control their communication. Due to the continuous evolution of mobile communications, e.g. number portability, user selectable communication modalities, downloadable games and ad-hoc connections, users do not have a clear, reliable and applicable mental model about the cost of their communication. There is evidence indicating that the lack of such information will undermine the airtime and use of communication solutions as users are simply afraid of over-charges. A variety of aspects described in previous clauses involve or relate to payments. Basic generic aspects are addressed below.

A basic user requirement is the availability of cost indication information for voice and data calls, see ETS 300 179 [22] and ETS 300 180 [23]. As this information can not always be provided with the required accuracy, user indications should be focused on the indication of deviations (e.g. when the cost of communication is considerably higher or lower) and selectable options (e.g. a 3G video call versus a voice call).

The advent of ad-hoc services, roaming and non-telephony related payments create the need for indications of connection availability, security, advice of charge, confirmations, undo options and the issuing of receipts.

Privacy and integrity aspects are not taken into consideration by the present document (e.g. paying for leisure parking with a corporate SIM card).

Further details relating to security aspects can be found in clause 9.8.

Recommendations:

> **R 10.7.a**   Available connections should be indicated (automatically or upon user request), together with associated total costs (including possible commission fees and additional charges) on a comparable format. All cost information should be indicated to the users, before they decide to use the service or not.

> **R 10.7.b**   User selectable and optional communication connections and modalities should be indicated to the user when available or upon request, preferably together with the related cost indicators.

> **R 10.7.c**   Premium service charges should be indicated to the user, before they are accessed by the user.

> **R 10.7.d**   The cost of payments should be included in the service and be free of additional charges.

> **R 10.7.e**   Confirmation and a receipt should be provided, upon request or as a general procedure.

> **R 10.7.f**   The level of security should be indicated to the user, as recommended in clause 9.2, while a non-telephony related payment is being made.

> **R 10.7.g**   Alternative payment options should be offered and information about their availability provided, if possible.

10.8   Messaging services

The user interface of messaging applications and the related editing functionality etc. is explicitly excluded from this harmonization proposal as it is assumed to be too closely tied to manufacturers' brand positioning. Messaging is divided into two different areas; text/data messaging and voice-mail. The main difference between these two is that with text and data messaging users create messages in their terminals anytime but with voice-mail messages are created via calls to other terminals that force the users to a message service without the need for any user action.

Messaging applications are becoming more and more complex and difficult to understand for the user because of the various names used by manufacturers and operators and also because of the functionalities and formats they are providing for the user. Also, different evolutions of mobile terminals have different capabilities to support these different messaging services and users are not totally aware of these differences. Operator dependent services and co-operation agreements also differ and the user is totally lost when and where all of these terminals supported messaging services exist.

Most usability issues are not directly dependent on the technology, but depend more on the actual implementation of the system. On the other hand, users would most likely just want to create a message, select recipients and then send it without having to deal with issues such as selecting a message type. This kind automation of the messaging sending process would be most welcome, but, due to technical restrictions, this has so far been nearly impossible to create.

10.8.1   Text and data messaging

In the user interaction for sending a message to someone, the common elements are:

- Opening the messaging application/functionality:

    - All the common interaction and presentation elements should be easy for the user to use independent of the type of the message being handled. It should be possible to have a single messaging application that handlse all the different message types so that messages can be composed in as similar a way as possible.

- Composing the message (text, images, etc.):

    - If the choice of an appropriate message type cannot be taken by the terminal/system the user should be presented with a list that shows available message types so that the user can easily select the preferred one. If the message type needs bearer configuration that does not yet exist, this should be indicated to the user and an easy access to the configuration procedure should be offered.

    - The different fields that are available for the message (e.g. if a message has a subject field) should be clearly indicated to the user.

    - Text entry is covered in clause 9.3. Attaching other media to the message should not require too much effort from the user and it should be clearly indicated to the user when this is possible e.g. text message creation should not offer the opportunity to insert video clips.

    - Initiating message creation from other applications than messaging application should also be available to users e.g. when sending a picture message from a picture gallery application the message composer should open and users should be able to add some text around the picture if they wish. Even with this capability, the composition should reflect the familiar messaging application. Users should then be able to determine what kind of message to send (SMS/email etc.) and only valid message sending options should be shown.

    - Some of the messaging technologies restrict message size while others allow messages of practically unlimited size. If there is a size limit (e.g. usual, non-concatenated SMS size is maximum 160 characters) this should be indicated to the user so the user knows the restrictions. Where it is possible, the user should also have up-to-date information of how much more can be added to the message while during composition.

- Entering receiver or multiple receivers information:

    - The user should be clearly informed where to insert the receiver data and only supported formats should be allowed e.g. when entering a mail address one should not be allowed to enter a phone number (unless the system can handle referencing the info through its contacts directory). There should be an easy way to open the contacts selection so that the user can choose the required recipient(s) from there. Users should be able to select multiple recipients at a time or at least one by one if message transfer to multiple recipients is possible.

- Sending the message:

    - In most cases, after composing the message and selecting the recipients, the users want to send the message immediately. This option should be clearly presented on the user interface of the terminal. No additional user actions should be needed to send the message (more than selecting the send option).

    - Users may be provided with several sending options relating to a message. Message sending rules can relate to times, available connections etc. All these options need to be clearly indicated to the user and easily selectable.

- The user should be able to get feedback when the message is sent e.g. with a textual pop-up message, an appropriate icon and/or audio feedback (see clauses 7.1, 7.2 and 7.3). If the message is queued for some reason, this should also be indicated to the user for the duration of the queuing e.g. with a symbol in the list of outgoing messages. While the message is queued, it should be saved so that user can easily access, change or cancel it.

- The actual message size depends on the content of the message. Plain text takes one or two bytes per character whereas a black-and-white image takes one bit per pixel and colour image several bits per pixel. Users usually have no knowledge of how big their messages are or if they need to be sent in several messages, which increases the amount they need to pay for the message. If the message is sent in multiple parts, this should also be indicated to the user. It would be beneficial for users if they are given information about the cost of sending a message before it is sent (see clause 10.7). This advance cost notification should be controlled by a user defined setting.

- The user can receive notification that the message has been read:

  - When certain messages are sent, it might be useful to the user to see that the message has been delivered. This indication could be done either via an information message or as an entry in a general log file.

- The sent message can be stored in the terminal:

  - Users usually have a sent-mail mailbox in their PC mail application and this functionality should also be available in the mobile terminals for the user to check sent messages regardless of message type. The downside is that the sent items will take up memory space and the sent-mail mailbox will need to be emptied by the user from time to time.

When receiving messages, common actions include:

- Notifying the user of the received message:

  - The user should always get feedback when a message has been received e.g. with a textual pop-up message or symbol or audio feedback (or several of these) (see clauses 7.2 and 7.3). If the textual pop-up message is cleared from the UI then at least some other indication should be shown to the user about unread messages e.g. a symbol on the screen.

  - In the inbox, unread messages should be indicated to the user by some means e.g. by presentation in bold face. Recent messages should be shown to the user first e.g. when messages are presented to the user as a list; new messages should be on the top.

- Opening the message:

  - When an unread message is selected, the first choice presented to the user should be to open the message. If a textual pop-up is used to indicate received messages, reading messages should be possible with no more than one click and the message(s) could be opened from the indication.

  - If the message includes data that the user's terminal is unable to show, this should be indicated to the user. Preferably only a link with relevant information should be sent to the user's terminal so that the user can receive the message with another terminal that is capable of showing the message. The other choice is to show the message within the capabilities of the present terminal but also provide a means to see the whole message as it was composed e.g. a link to a place where the message can be retrieved.

  - If the message includes information that needs installation of additional software or execution of existing programs (e.g. logos, settings), this should be very clearly indicated to the user. The relevant action options should be shown to the user instead of the usual reply-forward functions.

- Replying, deleting or forwarding the message:

  - After users have read their message(s), they should be presented with all the relevant options about what can be done with each message. All these functions should be clearly presented to the user and actions should be invoked with the minimum number of dialogue steps possible.

- Inspection of message properties:

    - The user sometimes needs more detailed information about the message such as date, time or sender details. Since the screen on a mobile terminal is usually quite small, it may not be feasible to show every bit of this detailed information in the message. However, users may need to access this information if it cannot be shown together with the message.

10.8.1.1   Message storage

For the user the necessity to store a message depends on its perceived value and importance. Some messages can contain only short and time-dependent information that may be deleted after reading. On the other hand, some messages may carry such personal values for users that they may want to store the message for a very long time (Some people even copy their important message with pen and paper).

Since the message storage memory on mobile terminals is limited, it is necessary to cope with situations in which messages can no longer be stored. When memory for message storage is full, this should be clearly indicated to the user. The user should also be guided through the different options for emptying this storage. Sometimes automatic deleting of the oldest messages is quite useful but if emotionally important messages are deleted the user may be annoyed.

10.8.1.2   Media types and interoperability

Users have different mobile terminals with different capabilities for handling/showing different messages. They do not necessarily know what kind of terminal the receiver has and therefore sending messages, especially more complex ones, might lead to interoperability problems. Both, the sender and receiver should be notified if there are problems with the message. Almost all current mobile terminals support SMS. EMS messages and Smart Messages can be sent to any mobile terminal that supports SMS. EMS is standardized in a way that any mobile terminal can display the text part of the message if the terminal strictly follows SMS standards. Smart Messages can be sent over SMS but might display only garbage SMS or be disposed of according to the SMS standard.

For messaging technologies that support an extensive set of media formats it is not easy to guarantee interoperability between mobile terminals. With MMS, a minimum set of supported media formats is defined in order to guarantee interoperability at some level. With email there is no such requirement so the sender of the message cannot be sure if the recipient can see the message as intended. With messaging technologies with a limited set of media formats it is much easier to guarantee that all the media formats are handled properly in most mobile terminals.

It is possible to deliver any kind of data with email and MMS. It would be very beneficial for the user, if:

- a terminal being used could contain information about the supported media formats and this information could be accessed by the message server;

- messages containing unsupported data formats could be automatically forwarded to an address/terminal that would be able to show the whole message if the user has such an address/terminal;

- notification of such forwarding would be then generated and sent to the receiver.

Recommendations:

R 10.8.1.a   Provide a generic messaging application to the user where all the different message types and message actions can be found so that users have access to all messaging features. This application need not be the sole application from which messages can be sent.

R 10.8.1.b   Provide easy selection of message type and indication on how the selection can be done.

R 10.8.1.c   Restrictions on format and size that are based on the users' terminal or the available service should be clearly indicated to the user.

R 10.8.1.d   If any such restrictions apply, the message editor should inform the user about unusable functions if necessary.

R 10.8.1.e   Clearly indicate to users the different fields of a message.

R 10.8.1.f   Provide easy ways to insert recipients and offer only relevant formats.

R 10.8.1.g   Provide easy access to the relevant user actions in the different states of messaging e.g. easy access to send when the user is in message composition state.

R 10.8.1.h   Clearly indicate the different messaging states (e.g. when a new message has been received) to the user.

R 10.8.1.i   Provide status messages, if the user requests them.

R 10.8.1.j   Clearly indicate to the user the existence of unread messages in the folder of incoming messages.

R 10.8.1.k   Provide the user with a way to store messages in different states (sent, received, etc.).

R 10.8.1.l   Messages containing unsupported data formats should be automatically forwarded to an address/terminal that will be able to show the whole message if the user has such an address/terminal. Notification of such forwarding to the receiver should then be generated and delivered to the recipient of the original message.

R 10.8.1.m   Users need to be informed if their terminal cannot present the data formats of an arriving message.

R 10.8.1.n   Cost indicators should be made available for messaging.

R 10.8.1.o   Premium services with a special charge should be indicated.

R 10.8.1.p   Stored messages should have a validation stamp (possibly with default "none") for deletion or other means for deleting messages without user action should be provided (e.g. push messages could have a time period after which they are deleted automatically). If no such validation stamp exists the terminal should create an appropriate time stamp which may be modified by the user.

R10.8.1.q   A separate mechanism which uses different rules than those used for deleting ordinary messages may be required to handle the deletion of push messages.

10.8.2   Voice-mail (voice messaging)

Voice-mail (or voice messaging) is a computerized answering service that can answer calls according to the user's specified preferences, play a greeting in the user's own voice (if one was recorded) and record a message for the user, when not available. Depending on the sophistication of the service, it can also notify users that a call has been received via a text message or an automated telephone call. After users have retrieved their messages, they can delete them, save them, reply to them or forward them to someone else on the same voice-mail system.

When using the system for the first time, the configuration of settings for the voice-mail should be as simple as possible, see clause 8.

After initial configuration is done, access to voice-mail should be very simple. This could be achieved by automatically providing a short cut for dialling the voice-mail system by using a long press of the number 1 key, as specified in clause 9.5. The voice-mail symbol proposed in clause 7.2 should be put on that key and it should indicate to the user the availability of access to the voice-mail service.

If speech commands for accessing voice-mail are supported, they should be aligned with ES 202 076 [4]. If an audio message is composed, it should be clearly indicated to the user with audio cues when the message composition can start and also when it should end, see clause 7.3.

If a new voice-mail message is received, this should also be indicated to the user in a way that includes all of the relevant information e.g. using a text message that includes items such as the message time and the phone number (or preferably the name) of the caller or a call from the voice-mail.

The relevant user actions should be clearly indicated to the user.

Recommendations:

R 10.8.2.a   The user should be immediately informed of a received voice-mail either via a text message or a call from the voice-mail.

R 10.8.2.b   A short-cut to accessing the voice-mail system by using a long press on the "1" key should be implemented.

R 10.8.2.c   The voice-mail symbol proposed in clause 7.2 should be on or associated with the "1" key.

10.9   Instant mobile messaging services

Instant mobile messaging extends wired desktop text-based instant messaging to mobile chat and walkie-talkie alike functionality to mobile network-based instant talk (also known as Push-to-talk Over Cellular (PoC)).

The current, first generation of instant mobile messaging services are not very sophisticated, due mostly to first generation releases and interoperability issues.

The two main application areas covered by the present document are text- and voice-based instant mobile messaging.

10.9.1   Text-based mobile instant messaging (mobile chat)

Text-based mobile instant messaging is additionally known as mobile chat. These services are becoming popular and as they are expected to drive mobile data traffic volumes, they are focused and promoted by operators and manufacturers.

For first-time use of the system, the configuration and settings for mobile chat should be as simple as possible (for recommendations, see clause 8). When the user accesses the mobile chat application for the first time, the application should indicate to the user that certain settings are required, before chatting is possible.

Mobile chat can be point-to-point or group messaging. In point-to-point messaging, the user is involved in chatting with one person, while in group conversation, more than two people communicate with each other. Both modes of chatting should be accessed via the same application. The login sequence should be presented to the user and clearly indicate all appropriate steps.

Users should easily either select a group or invite people with whom they want to chat. As users get to know the people they are chatting with, they should be able to create friends" or buddy-lists, including presence/ availability attributes and indicators. Blocking and un-blocking certain users from chatting should be possible and easy.

Finding and joining a new conversation group should be straightforward. As chatting is a text-based on-line activity and the users can not see each other, the input provider should be clearly indicated. The conversation history should be made available, in a list that can be scrolled and saved.

When a new instant message is received, an indication should be provided, as specified in clause 7, just like for other message types (unless the user is in an active conversation).

As chatting or instant messaging has its roots in the wired world, there is some heritage to be supported. For example, users should be able to use the same kind of smileys (emoticons) as in PC-based solutions. Text entry should be supported as described in clause 9.3.

Recommendations:

R 10.9.1.a   One or several simultaneous point-to-point and/or group sessions should be supported, from the same terminal.

R 10.9.1.b   Users should have access to and control over both group and point-to-point sessions via the same application.

R 10.9.1.c   It should be possible to easily select, block and unblock one or several conversation parties, based on the indication of their identities.

R 10.9.1.d   The conversation history should be easy to access, navigate and save.

R 10.9.1.e   The presentation speed of a conversation flow should be a user setting.

R 10.9.1.f   It should be possible to set up public or private chat rooms.

R 10.9.1.g   The use of smileys (emoticons) in conversations should be supported.

R 10.9.1.h   The presence/availability of buddies/friends should be clearly indicated.

R 10.9.1.i   System status messages should be provided upon request.

R 10.9.1.k   New instant messages and chat invitations should be provided and indicated, just like for other message types (unless the user is in an active conversation view), as specified in clause 7.

10.9.2   Voice-based mobile instant messaging (push-to-talk (over cellular))

PoC or Mobile Instant Voice (MIV) is a GPRS application relying upon IP Multimedia Subsystem (IMS) technology, with functionality similar to push-to-talk services supported by walkie-talkies and certain other mobile network implementations. Combining aspects of mobile communication, presence information and walkie-talkie style communications, the service provides end users with the ability to engage in brief, quick, half-duplex (transmission in both directions but not at the same time) communication.

A user can look up available users in the address book and choose one or several receivers (even groups) to address. After pushing a dedicated key, the terminal connects to the PoC server over GPRS, using the SIP protocol, establishing a data connection to the other party's handset. Communication begins (voice being digitized and transported in packages through the PoC server to the receiving handset(s)). Once the pressed key is released and the message delivered, the other party may begin to talk (after an approximated delay of one second, under optimal network conditions).

When using the system for the first time, the configuration and settings for mobile voice-based messaging should be as simple as possible (for details, see clause 8). When the user accesses the application for the first time, the application should indicate to the user that certain settings are needed before communication becomes possible. If a PoC client must be downloaded and configured, assistance and guidance should be provided (for detailed recommendations, see clause 8).

The terminology, symbols and auditory signals used should be aligned with the guidance provided in clause 7.

PoC mobile instant voice can be point-to-point or group messaging. If point to point, only two users are involved in the communication, while in groups broadcast conversations more than two users communicate with each other. Both modes of chatting should be accessed via the same application. The login sequence should be presented to the user and clearly indicate all appropriate steps.

Recommendations

R 10.9.2.a   Applicable recommendations provided in previous clauses, applicable to configuration and setup (clause 8) and terminology, symbols and auditory signals (clause 7) should be followed.

R 10.9.2.b   The terminal should have a dedicated key for activation of and interaction with PoC.

R 10.9.2.c   Connection to the communication infrastructure should be established in a similar time as for voice calls or data connections.

R 10.9.2.d   Single login (entering activation and authentication data only once, in one place) should be supported.

R 10.9.2.e   Messages should be delivered to the other party without noticeable delays.

R 10.9.2.f   Quality of speech should be provided on acceptable levels.

R 10.9.2.g   Service availability and unavailability should be clearly indicated, also when roaming.

R 10.9.2.h   It should be possible to look up available users in the address book and choose one or several receivers (even groups) to address.

R 10.9.2.i   Both point-to-point and broadcast communication modes should be accessed via the same application.

Annex A (normative):
Collective table of all recommendations

In table A.1, all recommendations presented in previous clauses of the present document are collected and listed. No new requirements are introduced. The recommendations carry an indication about their application area and the clause they can be found in in the present document.

The recommendations in table A.1 should be regarded as a minimum, common, basic set of generic user interface recommendations. They will improve the user experience of mobile solutions, if considered and supported in designs, specifications and implementations.

Intended users of the recommendations listed in table A.1 are the user experience and interaction design professionals, developers of mobile terminals, services and applications, mobile network and system providers, terminal approvers and standard writers and developers.

Table A.1: Collection of all recommendations

Recommendation number	Recommendation area and recommendation
	7 Terminology, symbols, auditory signals and user guides
	7.1 Terminology
R. 7.1.a	The terms used in tables 1a to 1j should be used in all communication with the user (e.g. in menus and user guides): • Table 1a: Terminology: Terminals user interface hardware and software Terms related to hardware components of the terminal, e.g. keys • Table 1b: Terminology: Configuration procedures for voice-mail Terms related to the set up and configuration of voice-mail services • Table 1c: Terminology: Configuration procedures for e-mail Terms related to the set up and configuration of e-mail services • Table 1d: Terminology: Configuration procedures for MMS Terms related to the set up and configuration of MMS services • Table 1e: Terminology: Configuration procedures for SMS Terms related to the set up and configuration of SMS services • Table 1f: Terminology: Configuration procedures for WAP Terms related to the set up and configuration of WAP services • Table 1g: Terminology: Configuration procedures for data accounts Terms related to the set up and configuration of data services • Table 1h: Terminology: Telephony (call preparation, making / accepting calls, in-call functions, call termination) Terms related to telephony (voice-service) functions including all phases from call preparation to call termination • Table 1i: Terminology: Messaging Terms related to voice, text and media messaging, including terminal and network-based functionalities (e.g. network-based answering machines) • Table 1j: Terminology: Terminal Functionality Terms related to terminal functionality other than telephony and messaging NOTE 1: If there is more than one popular term for one and the same concept, the preferred term is given in the "Recommended name" column (based on expert judgement). Descriptions and comments are only given in the rows listing the recommended names. NOTE 2: In many cases, e.g. for use in menu lists presented in the terminal's display, terms have to be abbreviated. No general recommendations can be given on how to abbreviate a given term, adhering to a consistent set of abbreviation rules. It is, however, recommended to evaluate the abbreviated term in a usability test in the context of other terms used in the terminal or service. NOTE 3: The terms listed in the tables below are presented in a neutral form (e.g. Call barring). Other morphological forms of a term will be required depending on the context in which it is employed (e.g. "Bar calls" for a command or "Calls barred" for an indication). NOTE 4: The usage of capital letters at the beginning of terms used in the user interfaces and support documentation for products/services is a potentially complex issue and requires the application of a consistent set of rules that cover all usage of these terms. To avoid causing confusion on where capitalization should be used, all of the terms in the "Recommended Name" have been presented in lower-case only. Once capitalization rules have been applied, many of the terms will be used with an initial capital letter (e.g. as key labels or menu items) but may remain in lower-case when describing a functions in product documentation. In particular, precise rules will be needed to decide how to handle terms that are described with more than one word (e.g. should a capital letter be used only for the first word or for all words? - this is where a consistent rule is required). NOTE 5: Tables 1a to 1j deal with recommended terms and do not in any way make recommendations about menu structures.
	7.2 Symbols
R 7.2.3.a	Tables 3a to 3c list candidate terminal- and service-related functions to be supported by recommended symbols.
R 7.2.4.a	Symbols proposed for standardization should be evaluated using a suitable test methodology applying human factors as well as technical criteria.
	7.3 Auditory signals
R 7.3.3.a	Table 5 lists candidate terminal and service functions to be supported by recommended auditory signals.
R 7.3.4.a	Auditory signals proposed for standardization should be evaluated, using a suitable test methodology applying human factors as well as technical criteria.

Recommendation number	Recommendation area and recommendation
7.4 User guides and reference documentation	
R 7.4.2.a	It is recommended to develop guidelines and a common platform on how user instructions, applicable to the use of mobile terminals and services, ought to be provided, taking into account the requirements of different user groups and the possibilities offered by different media.
8 Configuration and guidance for terminal and service access, interworking, portability and error handling	
8.1 General configuration procedures for service access	
8.1.1 Generic configuration	
R 8.1.1.a	The most recent versions of management protocols and mechanisms, as specified in [70], with corresponding UI elements, are the recommended, generic technical solution for configuration for terminal and service access.
R 8.1.1.b	Provide all configuration information in the user's language.
R 8.1.1.c	Provide a clear description of what equipment and information the user needs to have ready to hand during the configuration procedure, and if necessary, how to obtain it.
R 8.1.1.d	Convey what settings need to be configured and what effect configuring a setting will have by providing natural entry points into the configuration procedure.
R 8.1.1.e	Configuration should be kept to the minimum number of steps.
R 8.1.1.f	Indicate the progress of the configuration procedure to the user.
R 8.1.1.g	Where necessary, provide explanations of concepts that need to be understood by the user during configuration.
R 8.1.1.h	As far as possible, hide technical concepts that the user does not need to understand during configuration.
R 8.1.1.i	The user should be informed at an appropriate level and through appropriate channels of the costs connected to the service to be configured.
R 8.1.1.j	Provide consistent terminology across all sources of configuration information.
R 8.1.1.k	As far as possible, avoid forcing the user to input entries for settings. Provide appropriate default entries for settings.
R 8.1.1.l	Provide clear indication and differentiation of what the setting is and what the actual entry of the setting is.
R 8.1.1.m	Provide examples of the correct format for the required setting entries and support for handling the formats.
R 8.1.1.n	Provide error handling to prevent a change of setting entries which would in turn prevent access to basic services.
8.1.2 Pre-configuration	
R 8.1.2.a	Pre-configuration is the preferred solution for configuration of terminal and service access.
R 8.1.2.b	Provide information to the user on which settings are pre-configured.
R 8.1.2.c	If the user is permitted to change the setting entries, resetting the terminal to factory settings should present the user with a choice of whether to keep or reset the current settings for terminal and service access.
R 8.1.2.d	Subsequent updates of settings, e.g. OTA, should provide the default entries for terminal or service resets.
8.1.3 Guided configuration	
R 8.1.3.a	If pre-configuration cannot be achieved, some means of guided configuration should be provided, taking into consideration the needs of all users (including elderly or disabled users).
R 8.1.3.b	Provide a clear overview of the steps of the configuration sequence.
R 8.1.3.c	Provide a logical and consistent order to the configuration procedure.
R 8.1.3.d	Only provide steps that involve instructions, choices or feedback relevant to the configuration procedure. All other steps are redundant.
R 8.1.3.e	Navigation should be under user control throughout the configuration procedure.
R 8.1.3.f	Provide "back", "next", "cancel", and "finish" as well as "help" controls.
R 8.1.3.g	Provide clear instructions on what type of information is required at each step of the configuration procedure. Provide illustrative examples.
R 8.1.3.h	Clearly describe the means by which the setting entries will be delivered to the terminal, e.g. via SMS.
R 8.1.3.i	For remote configuration via a web site, provide a "send" control with instructions to confirm that the terminal is switched on.
R 8.1.3.j	Provide clear feedback when the configuration procedure ends.
R 8.1.3.k	Provide information on how to change settings later.
R 8.1.3.l	If the configuration procedure fails or is aborted the state of the terminal should revert to that previous to the start of the configuration procedure. The user should be informed on how to proceed in order to complete the configuration.
R 8.1.3.m	It is recommended to undertake further, more detailed work in this area.
8.1.4 Manual configuration	
R 8.1.4.a	Provide means for guided and/or manual configuration in the terminal, if pre-configuration cannot be achieved.
R 8.1.4.b	Provide consistent and coherent categories of settings.

Recommendation number	Recommendation area and recommendation
8.2 Configuration procedures for access to specific services	
R 8.2 a	Tables 1b through 1g in clause 7.1.4 should be used.
8.3 Interworking and portability	
R 8.3.a	The aim should be for access to services to be seamless and transparent, providing the same access as in the home mobile telephony network.
R 8.3.b	No further configuration on the part of the user should be needed for terminal and service access when roaming.
R 8.3.c	There should be no differences in access procedures compared to the home mobile telephony network.
R 8.3.d	If the conditions for terminal and service access are different from the home mobile telephony network, the user should be informed.
R 8.3.e	The user should be informed at an appropriate level and through appropriate channels of the costs involved when accessing services available in the roaming network.
R 8.3.f	The user should be informed of the present level of security, or be warned if and when changes occur.
R 8.3.g	If a service can not be accessed when roaming, provide a correct explanation as to the reasons.
R 8.3.h	Indicate potential interoperability problems.
8.4 Error handling guidance	
R 8.4.a	Error messages should always be formulated using the vocabulary of the user, both in terms of the language selected and the complexity of the contents. Terminal, network or service-internal error messages should usually be avoided.
R.8.4.b	Where several error causes may result in a similar error from the user viewpoint, a specific error code may be appended to the simple error message. Such a code would assist a help-desk in identifying the real cause of an error when they assist a user. It is recommended to standardize these error codes, wherever possible.
R 8.4.c	Error recovery can be initiated with or without user confirmation. After starting an error recovery procedure no further user assistance should be required, if possible.
R 8.4.d	A terminal should always return to idle mode if turned off and then on again. There should never be persistent error modes. If possible, pressing the "end-key" (or one with a similar functionality, e.g. a long press on the "Cancel" key) should lead to the same behaviour, i.e. return to idle mode.
R 8.4.e	During an error recovery procedure, communication processes like accepting incoming calls and setting up emergency calls should be possible.
R 8.4.f	A terminal should clearly display the unavailability of specific network features or services and should prevent the user from trying to access these features by giving adequate information beforehand. This may be achieved by visibly invalidating menu entries ("greying out") or by supplying useful error messages on a user attempt to initiate a specific service (for further guidance on setting up network-related functionality, see clauses 8.1 and 8.2). If the above solution is not readily available, removing menu entries is a possible alternative.
9 Terminal- and network-related generic UI elements	
9.1 International access code	
R 9.1.a	Whichever option is used, the symbol "+" should be clearly displayed on the relevant key.
R 9.1.b	From a usability standpoint, the use of "0"-long and/or double-"0" is the option mnemonically preferred by users (as the "+" replaces or complements the "00" in all GSM networks) and thereby recommended.
R 9.1.c	If R 9.1.b is not easily achievable use of a double-click on the "*"-key is the second recommended option. It is additionally recommended to follow R 9.1.b, if and when any migration from R 9.1.c occurs.
9.2 Safety and security indicators	
R 9.2.a	Visual and auditory indicators for the terminal and connection settings described in clause 7 and the set-up procedures required for these settings, described in clause 8, should be harmonized.
R 9.2.b	The respective symbols and auditory signals should be developed and harmonized.
R 9.2.c	Auditory indicators should only be presented on request or on a system event changing the terminal or connection setting.

Recommendation number	Recommendation area and recommendation
9.3 Text entry, retrieval and control	
R 9.3.a	Each mobile terminal should provide assisted (e.g. predictive) text-input solutions. Additional recommendations for the harmonization of different, current solutions are not feasible at the moment.
R 9.3.b	The predictive text input method should be turned on by default and be changeable as a user option. For specific activities (e.g. name input in an address book ("Contacts")), the default for this setting may be changed by the terminal manufacturer.
R 9.3.c	Help on predictive text input should be available on the terminal.
R.9.3.d	For predictive text input the choice of input language should be clearly available to the user.
R 9.3.e	Input of special characters and punctuation marks should follow the rules in ES 202 130 [6].
R 9.3.f	Repertoires, ordering rules and keypad assignment should follow ES 202 130 [6].
R 9.3.g	ES 202 130 [6] should be extended (updated) to cover European minority languages and major non-European languages used in Europe.
R 9.3.h	Navigation facilities (keys) for moving in the text should be present.
R 9.3.i	The status for text input (predictive/non-predictive, capitals, numeric input) should be displayed on the screen either permanently or for a short period after a change of input mode.
R 9.3.j	As a fallback solution or as a user preference, multi-key-press solutions ("multi-tapping") should be implemented on every mobile terminal with a 12-key keypad.
R 9.3.k	Text input using multiple key presses should be available for input of unknown words and for users with limited eyesight who cannot interpret the feedback on the display.
9.4 Accessibility and assistive terminal interfaces	
R 9.4.a	A standard interface (consisting of both hardware for connectivity and software for data exchange) between assistive terminals and ICT terminals should be defined and implemented. This interface should allow for cable-based, connector-based and wireless hardware solutions.
R 9.4.b	For assistive terminals to become usable with a multitude of ICT terminals and thereby affordable and effective, the significant players in each field urgently need to agree on a set of protocols to be used in the communication between assistive terminals and the relevant ICT terminals. In general it is not necessary to develop either new protocols or new hardware interfaces. Interface and protocol standards should be chosen from those already available so as to form a coherent set which covers all major aspects of information exchange between the two sets of terminals.
R 9.4.c	Existing standards should be enhanced where the necessary commands for the communication between assistive and ICT terminals do not exist. Consensus on a set of interface standards should be reached in the appropriate standards fora in a process which involves manufacturers of mainstream terminals, manufacturers of assistive terminals and groups representing users with different special needs.
9.5 Common keys	
R 9.5.a	On/off functionality to switch the terminal on and off, should be provided through a dedicated hardware key or by assigning this functionality to the End key.
R 9.5.b	A Clear key ("C") to delete the last entered number or character or clear larger sections of text or numbers entered previously should be provided.
R 9.5.c	Volume up/down keys to adjust the volume in in-call mode should be provided.
R 9.5.d	A camera key should be provided to activate the camera, if the functionality is available.
R 9.5.e	A dot should be placed on the "5" key (ES 201 381 [18]). If a hard keypad is not available, alternative solutions should be provided to assist the keypad navigation of blind users or any user whose visual attention is not directed towards the keypad.
R 9.5.f	Access to voice-mailbox and messages through a long press on the "1" key should be provided.
R 9.5.g	If a terminal has send and end functionality on hard or soft keys it is recommended to position the end key to the right of the send key. It is further recommended to place the send and end key above the 12-keypad if hard keys are used.
R 9.5.h	Provide an "Operator" or browser key (if the functionality is available) as an operator and/or user configurable key, triggering the browser or initiating an operator-defined and pre-configured action.
R 9.5.i	It is recommended to harmonize the editing functionality of the C-key across manufacturers.
R 9.5.j	It is recommended that a common procedure for unlocking a protected keypad be harmonized for all mobile terminals which have a need for keypad lock protection.

Recommendation number	Recommendation area and recommendation
9.6 Language selection mechanisms	
R 9.6.a	The names used for the different types of messaging services should be harmonized in such a way as to provide an agreed name in each language for each type of messaging service.
R 9.6.b	In lists of languages (e.g. in menus), the names of the languages and the instructions on how to make the language choice should be written or spoken in the language that corresponds to the language to be chosen.
R 9.6.c	Language selection mechanisms that rely on users entering strings of digits, "*"s, and "#"s are not recommended for use as primary language selection mechanisms.
R 9.6.d	Choices that allow the user to more finely define the required language are preferable to broader choices for language sensitive applications like automatic speech recognition (e.g. US-English and UK-English are better than just English).
R 9.6.e	At a minimum, languages should be coded in a form compatible with the international standards for language coding ES 201 381 [18] and ISO 639-2 [56], which will provide coding for the base languages (e.g. Spanish) and the country (e.g. USA).
R 9.6.f	A single harmonized way of encoding both simple and complex language preference/ability data needs to be developed.
R.9.6.g	A language menu should be available when a communication terminal (e.g. phone, PDA) is initially switched on (including after a full system reset). Once users have selected an option from this menu, they should be asked whether they wish to see this menu the next time they switch the terminal on.
R.9.6.h	When the language of a terminal is initially set (see R.9.6.g), the default text entry language should also be set to the same language.
R.9.6.i	When the user chooses a different language for messaging text entry (or in any other application context) it should not cause the default language setting for the terminal to be altered.
R.9.6.j	When users change the default language for the terminal, they should be asked whether the language for messaging text entry (and for other applications) should be changed.
R 9.6.k	The language setting for a service should be based on the menu language setting in the terminal.
9.7 Voice and speech user interfaces	
9.7.2 Dialogue design	
R 9.7.2.a	The recommendations provided in ETR 329 [25] should be followed, where applicable.
R 9.7.2.b	ETR 329 [25] should be updated to be applicable to today's application areas and provide speech user interface design guidelines for a multimodal environment with speech recognition.
R 9.7.2.c	Usability tests should be performed before the commercial launch of any product supporting voice or speech user interfaces.
R 9.7.2.d	Help, Standby, Repeat and Undo functionality should always be provided, as specified in ES 202 076 [4].
R 9.7.2.e	Language selection mechanisms should be provided. For further guidance, see clause 9.6.
R 9.7.2.f	Emergency functionality should be supported.

Recommendation number	Recommendation area and recommendation
9.7.3 Spoken command vocabularies	
R 9.7.3.a	If a speaker-independent speech recognition user interface is provided, the mobile terminal, service or application should support all common user commands specified in the applicable languages, covered by ES 202 076 [4] (only listed in English here):Options, Goodbye, Main menu, Standby, Operator, Go back, Help and Repeat.
R 9.7.3.b	If the functionality related to a specific common command is not supported in the terminal, service or application (e.g. due to lack of the specific functionality), the common command should still be accepted as user input and guidance information still be provided back to the user.
R 9.7.3.c	For domain-specific functionality supported by the mobile terminal, service or application, the domain specific user commands specified in ES 202 076 [4] and listed below must be supported and in addition, alternative and additional commands may be offered: • Core commands: Yes, No, Stop; • Digits: Zero, Oh, One, Two, Three, Four, Five, Six, Seven, Eight, Nine, Double, International, Plus; • Name and digit dialling: Dial, Call, Home, Work, Mobile, Car, Personal number, Emergency; • Basic call handling and supplementary services: Answer, Busy, Divert to, Redial, Keep trying, Conference call, Divert all calls to, Transfer, Hold, Switch call; • Media control: Play, Pause, Continue, Stop, Fast forward, Rewind; • Browseable list for navigation: Next, Previous, Details; • Editing commands: Edit, Delete, Save, Reply, Forward, Add, Send, Move, Record, Play, Pause, Continue, Cancel, Redo; • Terminal settings: Choose network, Volume up, Louder, Volume down, Quieter, Sound off, Sound on, Speaker off, Speaker on, Mike on, Mike off, Vibrate on, Vibrate off, Status, Profile; • Word spotting mode: Wake-up.
R 9.7.3.d	It is strongly recommended to extend the coverage of ES 202 076 [4] to cover all 28 official European languages, certain European minority languages, non-European language versions used in Europe and US English.
R 9.7.3.e	In addition, it is recommended to extend the coverage of ES 202 076 [4] to additional non-European (e.g. Indonesian) and country-specific (e.g. Brazilian Portuguese) languages, supported by ICT products and services in the global market.
9.8 Users' data privacy, security and access control	
9.8.2 Control of privacy	
R 9.8.2.a	Mechanisms that respect user's personal preferences with respect to the privacy of their personal information should be used. At this time, mechanisms that are based upon the W3C's [73], should be used for web-based services.
R 9.8.2.b	Users should be provided with feedback on whether their privacy preferences are being respected. Users should be given positive indications that their privacy preference are being met. Where their privacy preferences cannot be met, users should be informed and offered an option that ensures that their privacy preferences will not be violated.
R 9.8.2.c	Users should be provided a mechanism to request details of any information stored about or relating to them.
9.8.3 Control of security	
R 9.8.3.a	The security level of a data connection session should be indicated to users. The use of a padlock icon is a recommended mechanism for visually conveying a secure data connection session to users.
R 9.8.3.b	For communications services where multiple levels of security can be achieved, the user should be given an indication of which level of security is in place. This indication should be given in a form that is meaningful to a user (e.g. "insecure", "normal security", "high security").
R 9.8.3.c	Where the providers of the applications, updates or information have security certificates, users should be informed of the existence of these certificates in such a way that it is clear to users what the certificate means; why it is valuable to check the certificate's validity and how to do so.
R 9.8.3.d	Where the system determines that a certificate associated with the provider of applications, updates or information may be invalid, this should be pointed out to users in a way that makes the nature of the potential invalidity clear, and gives possible reasons why it may be a threat as well as why it might not be. Finally, the user should be provided with a means to accept or reject the application, update or information that is to be downloaded.
R 9.8.3.e	Users should be given options that allow them to specify the degree of control they wish to have over security related applications/services such as virus protection, spam detection and firewalls. Users should be given options to determine: how much ongoing activity they wish to be informed of (e.g. notification of virus detection/removal) and how much control they wish to have over the application/service's ability to manage its own effectiveness (e.g. to automatically upload new virus detection/removal updates).

Recommendation number	Recommendation area and recommendation
9.8.4 Access control	
R 9.8.4.a	The methods of access control provided should be appropriate to the context in which it is used. Thus it would be inappropriate to require a very difficult and secure access procedure if no valuable or personal information is potentially under threat.
R.9.8.4.b	Where a terminal, service or application has distinct sub-applications within it, different access control mechanisms should be considered for some or all of the sub-applications as well as for the terminal, service or application itself (e.g. a user should be free to choose to use the access control procedure provided for their contact information but not to use the access control for all terminal data).
R.9.8.4.c	Mechanisms that require explicit user presence or intervention but that do not rely heavily on user memory should be considered for use when important security validations are required.
R 9.8.4.d	Avoid increasing the number of elements that a user has to enter in an access control procedure (e.g. username, password plus one of a number of personal secrets) and putting constraints on the format of these elements (e.g. insisting that a password has a defined mixture of letters and digits).
R 9.8.4.e	Replacing elements of access control procedures that rely on human memory with other methods such as smartcards or biometric methods will reduce the risk of users compromising security by writing down security information.
R 9.8.4.f	Where there is a possibility for a password to be stored on a user's terminal, users should be asked whether they wish to enter the password every time or whether they wish to have the terminal remember it for future usage. Where such an option is presented, the user should be warned of the ability of other users of the terminal gaining access to the service or application.
R 9.8.4.g	Any requirements or limitations of a password (e.g. on the content and/or length) should be clearly indicated to the user when the user is first asked to generate the password.
9.9 Telephone number format and handling	
9.9.4 Ideal number format for retrieval from storage	
R 9.9.4.a R 9.9.4.b	Numbers in terminals should be stored in full international form whenever that version is available. The full international form should include the standard international access code (see clause 9.1) where support for this code is available. Where the standard international access code is not supported, the national prefix for international calls should be used.
R 9.9.4.c R 9.9.4.d	All terminals should support storage of the standard international access code (see clause 9.1). All terminals should support translation of the standard international access code to the numeric national code unless network support for this translation will always be available to the terminal.
9.9.5 Assisting the user to handle telephone numbers	
R 9.9.5.a	The fact that numbers are internally stored in a standardized international format does not mean that service and product designers are obliged to present similarly formatted numbers to users. Users should be able to specify the way in which they wish numbers to be displayed to them (e.g. always in international format, in national or international format dependent on context, divided into multi-digit "chunks" separated by spaces).
R 9.9.5.b	Users should be offered dialogues that help them to ensure that the numbers entered in their terminals can be converted into international form and stored. As it is impossible to guarantee that the process used is 100 % reliable, users should be given the option to manually edit or to reject the suggested changes.
9.9.6 Intelligent handling of numbers	
R 9.9.6.a	All networks, i.e. mobile, fixed and IP, should handle internationally formatted numbers that include the standard international prefix irrespective of whether the intended destination is in another country or in the caller's own locality.
R 9.9.6.b	In dual-mode (fixed and mobile) terminals, the user should not need to be involved in ensuring that numbers are dialled correctly and that appropriate charging rates are applied to all calls dialled (this will require the storage of numbers in international (or at least national) format and the correct routing and charging of these numbers when dialled on any fixed networks).
R 9.9.c	When numbers are transferred between terminals, intelligent dialogues will be required to support the user in ensuring the correct translation of numbers stored in local formats into an international format when these numbers are moved to terminals that do not support the dialling of local format numbers (see also clauses 9.9.2 and 9.9.5).
9.9.7 Retrieval of numbers dialled with no international prefix	
R 9.9.7.a	Numbers in incoming and outgoing call lists should be stored in full international format whenever it is possible for the terminal or application to determine what that format is.
R 9.9.7.b	If a roaming user attempts to dial a number that is not in international format from an outgoing or incoming call list then either a) warn the user that the call may not be successfully connected because it is not in international format or b) when a call is not successfully connected, give the user a message that explains that connection failure may be due to the fact that the number was not in international format.

Recommendation number	Recommendation area and recommendation
9.9.8 Retrieval of numbers dialled from the phone book	
R 9.9.8.a	Where numbers are dialled from the phone book, they should be stored in full international form in the outgoing call list irrespective of what digits were actually dialled to complete the call. NOTE: This can only be guaranteed if the number in the phone book is stored in its full international version.
9.10 Universal addressing in converging networks	
9.10.3 Address book issues	
R 9.10.3.a	An identifier that is permanently associated with a person and all of their services (e.g. UCI or an ENUM number) should be used wherever possible. Such identifiers eliminate the dual problems of a large number of identifiers per person in an address book and identifiers in address books that cease to be valid as people change services and service providers.
9.10.5 Solutions for converging networks	
R 9.10.5.a	Try to minimize the number of addresses for the user. Any options that associate more than one service with a single identifier should be used in preference to options where each different service from each supplier has its own identifier.
R 9.10.5.b	The use of addresses that will be remain the same as users change service providers is recommended. This implies that addressing options that are not permanently linked to a single communications service provider should be used in preference to those that are.
R.9.10.5.c	Addressing options that enable the person or organization making the communication to be reliably identified should be used in preference to addressing options that either do not allow the person or organization to be identified or options that allow false identities to be passed off as true identities.
9.11 Synchronization and back-up	
9.11.1 Synchronization	
R 9.11.1.a	The most recent version of OMA Data Sync (SyncML) specification [70], with corresponding UI elements, is the recommended, generic technical solution for multi-platform and multi-terminal synchronization.
R 9.11.1.b	When synchronizing multiple terminals, a secure "mother" database somewhere in the network should be considered as a robust solution.
R 9.11.1.c	Clearly indicate to the user which terminal is the master and which is the slave if such a distinction exists.
9.11.1.1 First time usage and set-up	
R 9.11.1.1.a	The user should clearly be advised of the connection procedure between terminals on initial synchronization.
R 9.11.1.1.b	When first setting the synchronization, users should be presented with a dialog/wizard where they can select which applications and what kind of attributes they want to be synchronized (or can be synchronized) e.g. calendar, contact information, etc., and their respective mappings.
R 9.11.1.1.c	Users need to be informed with a dialog when some of the attributes of different terminals do not match, to ensure that they are aware of potential differences, and preferably be given the chance to select alternative mappings. There should be an option to turn off the information dialogue if users are aware of these differences. This option should be possible to reset by the users.
R 9.11.1.1.d	Terminals should be able to remember previously synchronized terminals and configurations so that the user is not required to perform setup operations every time.
R 9.11.1.1.e	All the settings of the synchronization should be changeable by the user.
R 9.11.1.1.f	Different profiles for synchronization should be supported.
9.11.1.2 Continuous usage	
R 9.11.1.2.a	Provide the user with different types of synchronization possibilities.
R 9.11.1.2.b	Users need to be indicated that the synchronization process is in progress once it has been started.
R 9.11.1.2.c	Users need to be informed with an easily understandable dialog that indicates the time remaining until the operation is expected to end (e.g. percentage bar, time counter).
R 9.11.1.2.d	If automatic synchronization is used, the operation should be clearly indicated to the user after it has started e.g. via a symbol and the user should be allowed to easily cancel the operation without loosing any data.
R 9.11.1.2.e	Failed or interrupted synchronization processes should be clearly and understandably indicated on the terminals.
R 9.11.1.2.f	Synchronization of more than two terminals should by done automatically as far as possible. In case of contradictions, users should be informed of the conflict in an understandable way and be offered a mechanism to select the required solution.
R 9.11.1.2.g	If a data conflict appears during synchronization, the system should ask the user how to proceed.
R 9.11.1.2.h	Provide the user with a choice whether an occurrence/item should only be deleted from the memory of one terminal or it should also involve the other terminals.
R 9.11.1.2.i	Unwanted data loss should be prevented in redundant ways.

Recommendation number	Recommendation area and recommendation
9.11.1.3 Issues relating to specific data types
R 9.11.1.3.a	The use of widely accepted standards for the transfer of data is recommended. The most recent versions of OMA Data Synchronization protocols and mechanisms [70], with corresponding UI elements, are the recommended.
R 9.11.1.3.b	Where data is stored differently in different terminals, users should, as part of the synchronization process, be offered a dialog that enables them to specify the way in which they wish the data to be mapped from one form of data storage to another.
R 9.11.1.3.c	In the area of sorting orders, the solutions proposed in ES 202 130 [6] for mobile terminals should be universally adopted.
9.11.2 Back-up
R 9.11.2.a	Users should have the option to back up the information in their terminals.
R 9.11.2.b	When synchronizing for the first time(s), users should be adviced to back up their data (together with reject, remind and accept options).
R 9.11.2.c	The synchronization system should remind users to back up their selected data on a single-event basis (with the possibility to include settings) or offer the possibility to perform an automatic, scheduled back-up sequence.
R 9.11.2.d	When storing the back-up data, users should be informed of where the data is backed up, how it can be recovered and how and where the next back-up will be stored.
R 9.11.2.e	Users should be offered the options to save a specific back-up version in addition to or instead of previous back-ups.
10 Service and application specific UI elements
10.1 Emergency call services
R 10.1.a	Each mobile terminal should allow for Emergency-calling functionality in any of the following states: idle mode, keypad-locked, no SIM, before PIN-entry, no registration with a network.
R 10.1.b	In each of the following terminal states typing the key-sequence "112<send>" should result in an emergency call set-up: idle mode, keypad-locked, no SIM, before PIN-entry, no registration with a network.
R 10.1.c	A dialogue should ensure that emergency calls are not dialled inadvertently.
R 10.1.d	There should be a set-up-procedure for emergency calling which uses no soft keys and no voice prompts during the confirmation dialogue to support both users with special needs and users not being able to understand the terminal language.
R 10.1.e	TS 122 101 [26] should be followed for the definition and handling of emergency telephone numbers and their mapping defined in the SIM-card. Country-specific emergency numbers will be provided via the home service provider on the SIM card.
10.2 Voice call services
R 10.2.a	The generic recommendations in table 7 should be followed.
R 10.2.b	The handling of additional user procedures should integrate well with the requirements presented in table 7, without negative impacts on the user interaction.
10.3 Video call services
R 10.3.a	It should be possible to pre-select video or voice call mode as a default and change it on a single-event basis by both parties, before establishing the call and during a call (without the necessity to terminate the call).
R 10.3.b	In addition, camera on/off key and camera freeze/video pause functionality should be provided.
R 10.3.c	An indication should be provided to the users if video mode is not supported by the network on the A- or B-party side.
R 10.3.d	User data privacy and security recommendations presented in clause 9.8 should be followed.
R 10.3.e	A self-view function should be provided.
R 10.3.f	Screen adjustability functionality should be provided.
R 10.3.g	Recording requests and ongoing recording should be clearly indicated to both parties.
R 10.3.h	An acceptable level of voice quality, including a high-enough volume, should be provided through handsfree equipment.
R 10.3.i	Dedicated attention should be paid to the design of video call services addressing disabled, young and elderly users.
R 10.3.j	For further detailed recommendations, see ETR 297 [10] and ES 201 275 [27].

Recommendation number	Recommendation area and recommendation
10.4 Mobile browsing and Internet services	
R 10.4.a	No additional terminal or network configuration should be necessary to access the mobile Internet and its applications.
R 10.4.b	If additional configuration is required, it should be provided to the user, e.g. sent to the terminal as an OTA message, preferably including all necessary access information and follow the guidance provided in clause 8.
R 10.4.c	Additional log-on for Internet access should not be required, once a mobile terminal is switched on and functional.
R 10.4.d	Error messages should provide user-oriented information.
R 10.4.e	In addition, error messages may provide technical status information, error handling guidance, operator-configurable information and other specific error messages (see recommendation 8.3.g and clause 8.4 for details).
R 10.4.f	For further guidance on error handling, see clause 8.4.
R 10.4.g	Terminology, symbols and auditory signals should follow the recommendations in clause 7.
R 10.4.h	Necessary navigation functions should be provided by the browser and the terminal, allowing for simple and direct information access and navigation.
10.5 Positioning-related services	
10.5.2 Tracking services	
R 10.5.2.a	Users need to be informed who is tracking them. This should occur both when tracking is activated and also continuously e.g. as a static list that the user can access when he so wants.
R 10.5.2.b	The user (both ends; the user and the one tracking the user) needs to get information when the service is down because of technical failure (network/server/out of range, etc.).
R 10.5.2.c	Activation and de-activation of tracking should be possible via simple pre-defined messaging so that all mobile terminals can execute this.
R 10.5.2.d	When a user turns off tracking, the indication of this should be shown at the other end.
R 10.5.2.e	A symbol that represents positioning and/or tracking should be displayed so that users are reminded when tracking and/or positioning is taking place.
10.5.3 Map and way finding services	
R 10.5.3.a	Information should be presented so that the user easily understands it (presentation in the user's language, sequential guiding information for driving or walking, automatic position update on maps).
R 10.5.3.b	The service provider should receive information on terminal capabilities so that the navigational information can be presented to the user in an appropriate format without any user action.
R 10.5.3.c	Optimal necessary accuracy for successfully achieving a specific task should be presented to the user.
10.5.4 Location based push services	
R 10.5.4.a	Support automatic time settings with the push messages so that they can be automatically deleted if the user does not want to save them for further actions.
R 10.5.4.b	Support personalization of which types of message are wanted and which are not.
R 10.5.4.c	Supply a symbol for reminding the user that push messages are enabled.
R 10.5.4.d	Users should have control if push services (location-based or independent) have access to their.
10.6 Service and content presence, availability and connectivity	
R 10.6.a	The availability and choices of communication infrastructure and offered services should be presented to the user in a non-intrusive way.
R 10.6.b	The connectivity options as well as the charging and security attributes should be clearly indicated to the user.
R 10.6.c	Indication and corresponding attributes for blocked media distribution (DRM) should be provided, preferably together with payment-related options.
R 10.6.d	Streaming start-up times should be kept reasonably short (not more than 10 seconds recommended).
R 10.6.e	Streaming playback should be provided without interruptions (even if a longer start-up time is required).
R 10.6.f	For communication services consisting of several levels and/or modalities (e.g. video calls implying voice and image), users should be able to pre-define or actively select the desired level or modality (e.g. voice-only instead of video calls).
R 10.6.g	The safety and security of the terminal and the included user data should be well protected and only disclosed and shared upon the owner's desire and approval (for details, see clause 9.8).
R 10.6.h	Terminology, visual and audio indications should follow the recommendations provided in clause 7.
R 10.6.i	Setup and configuration should follow the recommendations provided in clause 8.

Recommendation number	Recommendation area and recommendation
10.7 Payments, cost of services and content	
R 10.7.a	Available connections should be indicated (automatically or upon user request), together with associated total costs (including possible commission fees and additional charges) on a comparable format. All cost information should be indicated to the users, before they decide to use the service or not.
R 10.7.b	User selectable and optional communication connections and modalities should be indicated to the user when available or upon request, preferably together with the related cost indicators.
R 10.7.c	Premium service charges should be indicated to the user, before they are accessed by the user.
R 10.7.d	The cost of payments should be included in the service and be free of additional charges.
R 10.7.e	Confirmation and a receipt should be provided, upon request or as a general procedure.
R 10.7.f	The level of security should be indicated to the user, as recommended in clause 9.2, while a non-telephony related payment is being made.
R 10.7.g	Alternative payment options should be offered and information about their availability provided, if possible.
10.8 Messaging services	
10.8.1 Text and data messaging	
10.8.1.2 Media types and interoperability	
R 10.8.1.a	Provide a generic messaging application to the user where all the different message types and message actions can be found so that users have access to all messaging features. This application need not be the sole application from which messages can be sent.
R 10.8.1.b	Provide easy selection of message type and indication on how the selection can be done.
R 10.8.1.c	Restrictions on format and size that are based on the users' terminal or the available service should be clearly indicated to the user.
R 10.8.1.d	If any such restrictions apply, the message editor should inform the user about unusable functions if necessary.
R 10.8.1.e	Clearly indicate to users the different fields of a message.
R 10.8.1.f	Provide easy ways to insert recipients and offer only relevant formats.
R 10.8.1.g	Provide easy access to the relevant user actions in the different states of messaging e.g. easy access to send when the user is in message composition state.
R 10.8.1.h	Clearly indicate the different messaging states (e.g. when a new message has been received) to the user.
R 10.8.1.i	Provide status messages, if the user requests them.
R 10.8.1.j	Clearly indicate to the user the existence of unread messages in the folder of incoming messages.
R 10.8.1.k	Provide the user with a way to store messages in different states (sent, received, etc.).
R 10.8.1.l	Messages containing unsupported data formats should be automatically forwarded to an address/terminal that will be able to show the whole message if the user has such an address/terminal. Notification of such forwarding to the receiver should then be generated and delivered to the recipient of the original message.
R 10.8.1.m	Users need to be informed if their terminal cannot present the data formats of an arriving message.
R 10.8.1.n	Cost indicators should be made available for messaging.
R 10.8.1.o	Premium services with a special charge should be indicated.
R 10.8.1.p	Stored messages should have a validation stamp (possibly with default "none") for deletion or other means for deleting messages without user action should be provided (e.g. push messages could have a time period after which they are deleted automatically). If no such validation stamp exists the terminal should create an appropriate time stamp which may be modified by the user.
R10.8.1.q	A separate mechanism which uses different rules than those used for deleting ordinary messages may be required to handle the deletion of push messages.
10.8.2 Voice-mail (voice messaging)	
R 10.8.2.a	The user should be immediately informed of a received voice-mail either via a text message or a call from the voice-mail.
R 10.8.2.b	A short-cut to accessing the voice-mail system by using a long press on the "1" key should be implemented.
R 10.8.2.c	The voice-mail symbol proposed in clause 7.2 should be on or associated with the "1" key.

Recommendation number	Recommendation area and recommendation
10.9 Instant mobile messaging services	
10.9.1 Text-based mobile instant messaging (mobile chat)	
R 10.9.1.a	One or several simultaneous point-to-point and/or group sessions should be supported, from the same terminal.
R 10.9.1.b	Users should have access to and control over both group and point-to-point sessions via the same application.
R 10.9.1.c	It should be possible to easily select, block and unblock one or several conversation parties, based on the indication of their identities.
R 10.9.1.d	The conversation history should be easy to access, navigate and save.
R 10.9.1.e	The presentation speed of a conversation flow should be a user setting.
R 10.9.1.f	It should be possible to set up public or private chat rooms.
R 10.9.1.g	The use of smileys (emoticons) in conversations should be supported.
R 10.9.1.h	The presence/availability of buddies/friends should be clearly indicated.
R 10.9.1.i	System status messages should be provided upon request.
R 10.9.1.k	New instant messages and chat invitations should be provided and indicated, just like for other message types (unless the user is in an active conversation view), as specified in clause 7.
10.9.2 Voice-based mobile instant messaging (push-to-talk (over cellular))	
R 10.9.2.a	Applicable recommendations provided in previous clauses, applicable to configuration and setup (clause 8) and terminology, symbols and auditory signals (clause 7) should be followed.
R 10.9.2.b	The terminal should have a dedicated key for activation of and interaction with PoC.
R 10.9.2.c	Connection to the communication infrastructure should be established in a similar time as for voice calls or data connections.
R 10.9.2.d	Single login (entering activation and authentication data only once, in one place) should be supported.
R 10.9.2.e	Messages should be delivered to the other party without noticeable delays.
R 10.9.2.f	Quality of speech should be provided on acceptable levels.
R 10.9.2.g	Service availability and unavailability should be clearly indicated, also when roaming.
R 10.9.2.h	It should be possible to look up available users in the address book and choose one or several receivers (even groups) to address.
R 10.9.2.i	Both point-to-point and broadcast communication modes should be accessed via the same application.

History

Document history		
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