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ETSI Guide

Human Factors (HF);
User Interfaces;
Setup procedure design guidelines
for mobile terminals and services

ETSI

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Foreword

This ETSI Guide (EG) has been produced by ETSI Technical Committee Human Factors (HF).

Intended users of the present document are user experience and interaction design professionals, developers of mobile terminals, services and applications, product managers, mobile network and system providers, terminal approvers and standard writers and developers. Other stakeholders who may benefit from its use include service and application providers, virtual operators and others.

The focus of the guidelines provided in the present document is on public mobile network terminals and services but they are mostly also applicable to other technologies, e.g. cordless or IP-based telephony and Wi-Fi.

Introduction

Mobile terminals and services play an increasingly important role in the daily activities of many people [14], [15] and Sinkkonen I. et al. (see bibliography). The mobile telephone, as an example, is a highly successful device, which meets a natural human need to communicate. However, new mobile applications and services are increasingly used to perform not just basic communication, but a variety of tasks such as commerce, life management, care services, browsing and entertainment. Moreover, with technical developments offering seamless and more continuous access to broadband networks, the vision of a world where ICT resources around us improve the quality of our lives is more realistic than ever.

Connectivity and interoperability between telecommunications networks and other information technology systems, personal computing, the Internet, and ever-smarter mobile terminals and services offer enormous potentials for improving life, if used as intended and used by *all*. However, there is concern about whether these new products, services and their content will be fully accessible to all people, including children, the ageing population, older and disabled users [13]. Furthermore, these difficulties will persist and increase in complexity with the advent of public services increasingly relying upon ubiquitous environments (e.g. Wi-Fi based home automation and control systems).

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 and setup of their terminals and achieve a satisfactory configuration of new services and integrated (or additionally offered) applications and services, may be perpetually excluded from the *e*Society. Ensuring access to mobile communication for all is a common goal of vendors, operators, service providers, user associations, as well as politicians, often talking about the creation of the *e*-inclusive Information Society.

In the past, the question of the "digital divide" defined the "haves" and "have-nots" mainly in economic terms, dividing those who could afford new technology from those who could not. As technological progress in network and infrastructure deployment and manufacturing and economy-of-scale effects in household availability and service provision make access to services affordable to the largest proportion of the European society, a new facet of a possible "digital divide" becomes visible, namely the one that is related to the comprehension of how to set up, configure and use new terminals and services. This latter aspect of the "digital divide" has direct economic and societal consequences as the uptake of mobile services will only be at a satisfactory level if the new terminals and services can actually be accessed, set up and used by all citizens.

Many users of mobile services experience serious difficulties trying to set up, configure, and access data services like e-mail, Internet or various messaging services (SMS, MMS, chat and voicemail) through their mobile terminals. Users lack the expertise necessary to configure and set up their terminals, services and applications appropriately. Furthermore, even the configuration of terminal properties to the desired behaviour is often beyond the users' abilities.

Many settings can be stored on the SIM (or the USIM) card of the mobile terminal, or in a future, managed by the communication system as part of user profiles. Even so, problems are abundant when new services are introduced, when moving from one network provider to another, when moving from one product to another, when SIM or USIM cards reach a certain age and the stored information becomes outdated, or when a user changes service providers.

While many settings may be achieved through plain, stand-alone "Over-The-Air" (OTA) or "Over-The-Line" (OTL) configuration or via more integrated approaches, Ericsson's active terminal management, (see bibliography), there is still a problem of individualization and personalization and, moreover, the problem of inadvertent resetting of individual parameters through OTA or OTL procedures. Other open issues are privacy and security, e.g. if the service provider is able to control specific parameters how does affect user privacy.

As the hurdle to using mobile services is the highest for first-time users, there is a need to simplify first access to services as much as possible, and provide clear guidance on configuration and use. This includes help to cope with problem situations, as well as to provide a clear description of service features, their capabilities and limitations and possible evolution.

Understandable setup procedures and the availability of educational material become very important. Good setup guidelines can help to improve the service/ terminal upgrade process, a considerable barrier to efficient use of services and the available infrastructure. In combination with efficient user guidance [9], providing information on the availability and functionality of new, upgraded releases can show beneficial to the user, terminal manufacturer, and the operator.

The major goal of the present document is to provide clear guidance on the design, implementation and provision of setup procedures for terminals and *services* such that they can be set up and used by the largest possible range of users, with a continuity of access and use. The guidelines provided in the present document have a strong practical focus on the most common difficulties and problems faced by users of mobile terminals and services.

Improved setup procedures help end users to access and make use of new and existing services. Consequently, this also benefits service and network operators through increased service uptake and continuity of use. In addition, this also benefits society as a whole, by ensuring improved access to mobile information and communications technologies (ICT) for consumers who might otherwise be excluded (e.g. elderly users or users with impairment hearing).

The present document introduces setup procedures and in the perspective of selected use cases, it provides guidelines applicable to the design, development, deployment and maintenance of setup procedures for terminals and services, providing generic and terminal- and service specific setup guidelines throughout the product lifecycle. A set of guidelines is provided in order to maximize the accessibility of setup procedures. The use cases applied to generate these, as well as reference work in the area are provided in informative annexes B and C. In the normative annex A, all guidelines presented in previous clauses of the present document are collected and listed.

The guidelines provided in the present document should be regarded as a minimum, common, basic set of guidelines. If considered during a holistic, user-centred approach and supported in designs, specifications and implementations, they have the potential to considerably improve the user experience of setup procedures.

1 Scope

The present document provides user interface design guidelines for setup procedures, applicable to mobile terminals and services throughout the product life-cycle. The design guidelines address the design, specification, implementation, deployment and maintenance of mobile terminals and services and are equally applicable to consumer use as well as to professional use.

For the purpose of the present document, it is assumed that access to mobile services is primarily achieved through handheld terminals, typically characterized by a limited screen size, a 12 key-keypad and possibly, additional function keys and/or a stylus and/or a touch screen. The guidelines provided in the present document focus on public mobile network terminals and services, but they are also applicable to other technologies (e.g. cordless or IP-based telephony and Wi-Fi).

Wherever possible, an integrated design-for-all approach has been adopted, taking needs and abilities of children, older users and users with physical, cognitive, or sensory impairments into account. When appropriate, specific guidelines for the optimization of the accessibility of setup procedures are presented and existing guideline documents are referenced for further details.

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.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

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3   Definitions and abbreviations

3.1   Definitions

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

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

end user: See **user**.

e-**service:** See service.

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

ICT terminals and services: terminals 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)

out-of-box readiness: state of a system being easy to use for a person who is using a new product, application, or service for the first time

out-of-the-box experience: initial experience a user has in taking a new product out of the box and setting it up, in preparation for use

product replacement: activity when a user changes from one product to another, including the associated activities necessary to transfer user data to the new device and its setup for use

service: ICT service that provides the complete capability, including terminal equipment functions, for communication between users, systems and applications, according to agreed protocols

setup (procedure): end-user/system activity which sets a parameter in the service/terminal/network that allows for the satisfactory completion of the end-user tasks

terminal: physical terminal 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.

usability: effectiveness, efficiency and satisfaction with which specified users can achieve specified goals (tasks) in a specified context and particular environments

> 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.

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:

CDMA	Code Division Multiple Access
DRM	Digital Rights Management
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile telecommunication
ICT	Information and Communication Technologies
ITU-T	International Telecommunications Union - Telecommunication standardization sector
MM	Mobile (Multimedia) Messaging
MMC	Multimedia Memory Card
MMI	Man-Machine Interface
MMS	Multimedia Message Service
M-Services	Mobile data Services
OBR	Out of Box Readiness
OMA	Open Mobile Alliance
OOBE	Out of the Box Experience
OTA	Over-The-Air configuration
OTL	Over-The-Line configuration
PIN	Personal Identity Number
SIM	Subscriber Identity Module
SMS	Short Message Service
UI	User Interface
UMTS	Universal Mobile Telecommunication System
USIM	Universal Subscriber Identity Module
WAP	Wireless Application Protocol
WCDMA	Wideband Code Division Multiple Access
Wi-Fi	Wireless-Fidelity (ISO/IEC local area network standard family 802.11, also known as WLAN)

4   Background

4.1   The importance of setup procedures in a mobile environment

The world of mobile communication and computing is characterized by continuous environmental changes. Services available in one environment may not be available in another environment, or the user might be required to modify terminal or network settings for required services to function properly.

A number of different reasons can be identified why the configuration of terminals and services become increasingly important in today's computational and communication environment.

- The average lifetime and usage time of terminals has decreased dramatically. While some years ago a communication terminal was installed by a service provider at one location and was expected to be used for at least a decade, today's users switch from one communication terminal to the next (generation) terminal, often within less than one year. These new terminals offer new functionality whilst known functionality may be presented differently or controlled by other means. Using known services may become impossible if users have to modify the configuration of their terminal.

- With the advent of true competition among service providers and terminal distributors, the frequency of provider changes has raised dramatically among mobile communication customers. Services offered by different providers may need different configurations. A terminal properly configured for one service provider may not allow access to the same service from another provider or distributor.

- The automatic change of service providers while roaming creates uncertainty about the availability and cost of services. Service availability might change in roaming situations and may even require a different setup, while roaming abroad.

- The competition among already established and newly-emerging service providers is a main reason for the evolution of existing services, development of new services and the availability of these services through different access channels (e.g. packet based vs. circuit based switches (GPRS/HSCSD); both these new services and the different protocols require different setups.

- The offering of services and service technologies is expanding. Services are based on telecommunication technologies, Internet technologies, Wi-Fi, terrestrial broadcasting (TV, radio), satellite broadcasting (TV, GPS), etc.

- There is increased diversity in how mobile experiences are provided to users. The core UI of mobile devices is often augmented by network based data/voice services, services provided via the mobile Internet and now, more frequently, third-party applications downloaded to the device. Often these services and applications are provided outside of the operator's control. Ensuring consistency and usability of setup procedures will become increasingly important for all parties in the mobile value-chain in order to ensure service uptake.

Setup procedures may differ widely for voice-based services and non-voice-based services. While for voice-based services quite often setup procedures can be found which are based on voice output to the user and tone signalling or voice-input to the service/ terminal, the setup interface for non-voice services may require that the user has detailed knowledge about computer and service usage.

Unusable setup procedures are a major obstacle to the initial uptake and the continued usage of services. Users are, as a rule, unforgiving when a service fails to consistently meet expectations. Even if there are good technical reasons for service failure, the usage of these services will be discontinued if several of these failures occur. For many of the situations described above it is extremely important that service re-configuration occurs transparently, i.e. if no cost implications are involved, the user does not need to be aware of changes which are performed in the terminal or in the service.

Another problem that needs to be addressed is the supply of necessary information to the user during setup activities. Generally, mobile terminal users have no access to user guides or reference manuals as the need to reconfigure may arise while they are on the move [9]. Necessary information must therefore be stored on the terminal or be delivered through the service interface. In the case of basic services not being configured properly, the latter approach may prove to be unfeasible. In these situations, the option of automated setup of services becomes extremely important.

Automated initial setup procedures and the effective adaptation to changes in environmental requirements may be a major factor for the uptake of new services and of users' continuous usage of these services.

4.2   Defining setup activities

For the purpose of the present work, a setup procedure is defined as:

"An end-user/system activity which sets one or more parameters or properties in the service/ terminal/network that allows the satisfactory completion of end-user tasks."

Given the problems in current setup interactions, we develop a framework to better explore the range mobile setup activities in figure 1. This framework highlights three key orthogonal elements (context of usage, setup Lifecycle and user activity) which should be considered. These elements are explored in more detail in the following clauses.
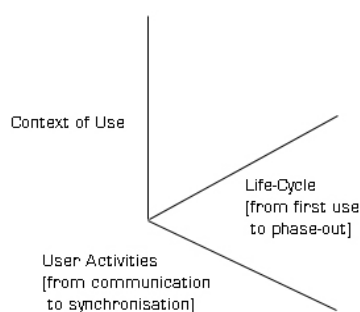

Figure 1: Key dimensions of setup interactions

4.2.1   Lifecycle

Setup activities may be required during several phases in the terminal lifecycle. Therefore, it is important to categorize key phases in the life of a mobile terminal, from initial purchase through to phase-out:

- **Initial setup of a terminal /service:**

    - when a terminal/service is first purchased or used, e.g. set up of MMS;

    - a preloaded setting is re-parameterized, e.g. change of the instant messaging nickname.

- **Terminal /service needs to be re-parameterized during normal use:**

    - identified by the user, e.g. the user wants to select a lower cost version of service, or to change the home page;

    - identified by the system, e.g. tell the user to activate the GPS unit before being able to use location based services;

    - the service is not available in the user's current location.

- **Terminal /service is phased out or upgraded:**

    - the termination/transfer to a new terminal of data or a service, e.g. the user changes phone, or cancels service subscription;

    - terminal functionality is extended, or a new service is taken into use, e.g. download a new application that requires access and connectivity.

4.2.2   Context of use

Context of use is an essential component of mobile interactions. Context can be defined as "…any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves" [3].

It is important to note that this definition includes a description of the user themselves as part of the context, e.g. age, sex, or special needs [4].

Based on this definition, we identify the following important physical contexts:

- **At home:** the user can focus on the setup without distraction. Help is accessible through the phone or the Internet. It is possible to configure a service through a PC application or over the Internet as well. Typical lifecycle phase: Initial setup.

- **At the office:** the user can focus on the setup with possible distraction. Help and support is accessible through the phone, Internet or colleagues. Typical lifecycle phase: Initial setup, Product is updated.

- **On the move:** the user can perform simple configuration, or request it over-the air. No user guidance is available and support is very limited. Typical lifecycle phase: New services become available, Product is updated.

- **At sales points:** the user has full support for product configuration, with dedicated experts at hand (no support at all may be the case for some sales points).Typical lifecycle phase: Initial setup, Phase out (product replacement).

- **Travelling:** the user needs to contact support centre or the operator to make a service functional, due to operator limitations. All communication is more expensive than usual. Typical lifecycle phase: new services become available, product is updated.

4.2.3   User activities

Mobile activities are highly varied but may require similar setup procedures. For example, the correct setup of MMS or on-line access and connectivity will be needed for many communication and m-commerce activities. Where possible, such "low-level" setup activities should be automated.

The activity categories below are referred to by the use cases defined in clause 5.5 and expanded upon in clause B.1.3.

User activities are related to high-level goals. We can distinguish between several categories of user activities which may require setup procedures to be performed successfully:

- **Communication** can occur in a number of different settings:

    - person to person, e.g. send a message, make a call;

    - person to community, e.g. write a blog comment, make a push-to-talk call;

    - person to service, e.g. uploading images to printing service or image bank;

    - service to person, e.g. push email.

- **Filling "Grey-time"/Fun** (non-communication): contains some of the activities that are considered to be applications of major importance for UMTS networks:

    - playing of interactive or local games;

    - mobile TV, streaming video, music.

- **Browsing/M-Commerce:** mobile commerce applications are activities which deal very much with communication issues person to service and service to person. They have particular requirements with respect to safety and data integrity:

    - data gathering (including content);

    - information searching;

    - e-Commerce;

    - mobile electronic banking, paying bills in an online bank.

- **Personalization:** deals with the look and feel of a terminal or a service which is accessed through the terminal interface:

    - change skin;

    - change date/time format, time-zone;

    - setting of avatars in communication;

    - setting of text input behaviour of a terminal.

- **Upgrade, Partner terminal configuration, Synchronization:** deal with activities related to the work environment of the user (PC) and its interrelation with the mobile terminal:

    - communication - person to PC. E.g. setting up the PC software for data backup, organizer synchronization;

    - communication terminal to PC or accessory, e.g. using Bluetooth headset;

    - communication terminal to service to terminal (e.g. automatic updates, OTA configuration).

- Underlying all of these high-level activities, the following **low-level setup activities** may be required:

    - Setup related to the network/bearer, e.g. GSM, UMTS, GPRS, CDMA, Mobile TV, Bluetooth, GPS;

    - Setup related to the application server, e.g. MMS, SMS, IM, blog, email, WAP or HTTP.

4.3   Bridging the digital divide

The design of setup procedures for mobile terminals and services has to take into account the different abilities and the technical know-how of different users groups. They should not be designed assuming or requiring specific technical knowledge, thereby increasing the divide between those with the relevant know-how and the majority of users who do not have the interest, or the ability to acquire this knowledge. Furthermore, it is important for designers to be aware of specific requirements of various user groups, in order to make services available to all [9].

Basic mobile services should be accessible with minimal effort. While this will benefit all users of mobile services, even technically skilled people, it is of primary importance to novice users and people with limited technical skills and literacy. For users with limited technical knowledge, it is important to make setup procedures as automatic and "forgiving" as possible, trying to automatically correct erroneous user input and automating the configuration process as far as possible. This seems to be the preferred way of preventing the user from getting frustrated through mobile devices and services which do not work on first try.

In addition, young, older and disabled users may experience considerable difficulties performing the necessary setup activities required to configure their mobile terminals and services. While user interface design guidelines are available for numerous application areas, setup activities have not been specifically addressed before but are necessary to activate and configure mobile terminals and services.

Wherever possible, an integrated design-for-all approach has been adopted throughout the present document, taking needs and abilities of children, older users and users with physical, cognitive, or sensory impairments into account. When appropriate, specific guidelines for these groups are presented, and existing guideline documents are referenced for further details.

In clause 9, specific guidelines for the development of accessible setup procedures are provided, covering seven important areas throughout the mobile product lifecycle, including data entry and setup activation, power-on and network connection, configuration of service parameters and personalization, first use of a service, use of the service, extension and updating of the terminal/service and product replacement activities.

5   Use cases for setup activities

5.1   Employing use cases

Use cases provide a common non-technical language for investigating user activities and their relation to system behaviours. By focusing on a "functional view" of the user-system interaction they allow special focus on situations where "ideal" or "happy days" interaction breaks down. By focusing on such non-ideal cases, guidelines can be extrapolated from the use cases to avoid interaction problems and improve the design of setup interactions- the approach taken in the present document.

Setup activities can form part of many different mobile activities and are rarely an end in themselves (in the rare cases where setup is the main task, e.g. configuring a new service, automated set up is preferred making the use case very simple). Therefore for the purposes of this report, in order to ensure that key mobile end-user goals are considered, use cases define high-level goals which give some motivation for a setup activity.

Use case example: "Martin wishes to send a photograph he has taken with his mobile phone to his friend Peter (peer to peer communication). However, upon sending the message, he receives an error message (motivation for setup activity)".

For examples of high-level vs. low-level use cases, see clause B.1.1.

5.2   A template for cataloguing use cases

A number of task-based use case templates have been proposed [15]. The selected template was defined by Cockburn [20] and [21]. A number of benefits of this template were identified:

- **Simplicity:** the use case can be tabulated or written in prose form;

- **Error handling:** provides a straightforward way to define error cases;

- **Industry acceptance:** the method has been used with success by industrial user interface design teams.

Cockburn's template (for a full description and example use case, see clause B.1) defines the following key parts of each use case:

- **Use case:** high-level goal which is often not connected with a setup activity, e.g. "Bob wants to send an MMS", not "Bob wants to setup MMS";

- **Goal in context/preconditions:** here we can define when the setup issue occurs (initial, normal use, end of life), user location/motion, as well as the state of the user/ terminal/system and user persona (special needs, etc.);

- **Description:** the ideal flow in sufficient detail to identify "jump-off" points for exceptions/sub flows;

- **Exceptions/sub flows:** here we can define different kinds of problems that can occur related to setup.

5.3 Ensuring use case coverage

Given that high-level use cases will be considered, the next step is to ensure that the choice of use cases gives the coverage necessary to capture the most important setup problems that are experienced by users. To ensure coverage, we employ the framework we developed:

- the Lifecycle of terminal usage;

- types of user activities;

- the context of usage.

Use cases should widely populate this space. For example, the use case "Martin has taken a picture and wants to send it to his friend" can be positioned on the "user activity" axis as "communication person to person". In addition, the use case could be a "first use" or "normal use" case, in either mobile or stationary context.

The Context clause of the use case can be used to place the use case on the other axis. For example, the context description we might say: "Martin has recently purchased a new telephone and SIM card (first use). Travelling, sitting on a train (context of use)". Finally, the characteristics of Martin including any special cognitive or physical needs can be described in the use case context. "Martin, who is visually impaired**,** has recently purchased a new telephone and SIM card (first use). Travelling, sitting on a train (context of use)".

5.4 From use cases to guidelines: a process

The generation of use cases and resulting guidelines was an iterative task based on expert knowledge, data sources and industry-expert feedback. The process followed is shown in figure 2.
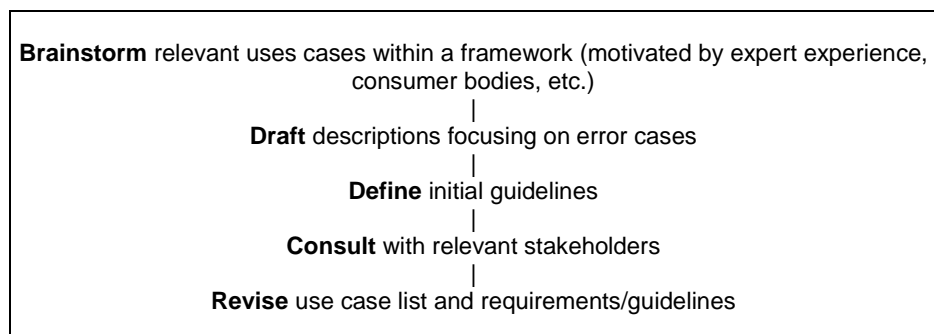

Brainstorm relevant uses cases within a framework (motivated by expert experience, consumer bodies, etc.)
|
Draft descriptions focusing on error cases
|
Define initial guidelines
|
Consult with relevant stakeholders
|
Revise use case list and requirements/guidelines

Figure 2: From initial use cases to guidelines

From the description of specific use cases it is possible to generate guidelines for the design of setup processes. The use cases were therefore a discussion platform to more easily present findings to other experts and user representatives. In consecutive iterations with these groups, the feedback generated was integrated into the list of design guidelines.

5.5   Target use cases

An initial brainstorming within the use case framework produced the use cases shown in clause B.1.3. Seven use cases were chosen to explore in detail. The use cases were chosen to given coverage across key usage contexts, users, activities and stages in the setup lifecycle.

Table 1: Sample use cases (further described in clause B.2)

Target use case	Life Cycle	Activity	Context	Reference
#1: Data transfer between phones	Phase-out	Upgrade	65 years old male, at home with PC	Clause B.2.1
#2: Configuration of MMS service	Initial use	Communication person to person	16 years old female, on the move	Clause B.2.2
#3: Lost phone	Phase-out	Replace	32 years old male, at home	Clause B.2.3
#4: Configuration of credit card details	Normal use	M-commerce	32 years old, mobile	Clause B.2.4
#5: Activation of lower-tariff roaming service	Normal use	Communication person to person	37 years old, mobile	Clause B.2.5
#6: Service discovery and network selection when roaming	Normal use	Communication service to person	44 years old female, mobile	Clause B.2.6
#7: Obtaining DRM rights	Normal use	Filling grey time	27 years old male, mobile	Clause B.2.7

5.6   Reference terminal characteristics

The guidelines presented in the following clauses are based on a reference mobile terminal with the characteristics outlined in table 2.

Table 2: Terminal characteristics of the reference terminal

Software features	Receiving and making voice calls Handling common message types (text message, multimedia message, email) Browser with security (supporting the use of cookies) Manual configuration, PC-based configuration, over-the-air configuration JAVA capability
Physical UI	Min. ITU-T keypad (12 keys) Camera with capture hard key Display
Additional peripherals	Removable memory card Mini USB Connector for PC connectivity
Connectivity	GSM, GPRS, WCDMA, Bluetooth

Table 2 describes a typical GSM/GPRS or UMTS/3G mobile handset. In order to make the design guidelines useful and to ensure a level of abstraction which renders them applicable during the interaction design process it is necessary to clearly characterize the terminal assumed for our setup processes. We have therefore decided to exclude certain types of terminals (e.g. terminals with large screens and QWERTY keyboards or terminals without a display).

NOTE: Many of the guidelines listed below will be applicable to terminals outside the scope of the present document, even if developed specifically for the reference terminal described here.

6   Generic guidelines for setup procedures

We have identified a number of important design **principles** on which the guidelines are based. Principles are more closely related to human characteristics and behaviour, such as human error, memory limitations, or individual differences. These behaviours do not change and therefore the principles are unlikely to change. The guidelines outlined under each principle are, however, more related to specific technologies and how the principles are applied to a product or service.

Firstly, the **main principles** are introduced and then guidelines are listed under each principle in dedicated clauses below. It should be noted that specific guidelines may be relevant to several main principles and may therefore appear in several clauses.

The following 13 main design principles are introduced and addressed:

1) **Leave the control with the user.**

2) **Automate as far as possible.**

3) **Provide a consistent setup process, assisted by wizards.**

4) **Keep configuration at a minimum number of logical steps.**

5) **Provide consistent customer support information.**

6) **Provide all necessary information to the user.**

7) **Provide all necessary feedback to the user.**

8) **Provide all configuration information in the user's native or other preferred language.**

9) **Provide all configuration information in the user's vocabulary.**

10) **Anticipate human error and provide recovery options.**

11) **Apply existing standards and guidelines.**

12) **Design for differing user abilities and functional limitations.**

13) **Apply the guidelines within a user-centred design process.**

6.1   Leave the control with the user

Users should never feel that their activities are controlled by the service or terminal. Except in the case of automated setup procedures the user should retain control over all relevant configuration steps. Also, if personal data are to be entered into a system, the user should always be able to allow or prevent such data entry.

Leave the control with the user

Guideline 6.1.a.   Define a process, provide a starting point and a logical (preferably, single) point of entry.

Guideline 6.1.b.   Always allow for interrupts from the user (e.g. through the Cancel key).

Guideline 6.1.c.   Leave the control with the user but minimize the need to exercise it.

Guideline 6.1.d.   Setup procedures should ask for user confirmation prior to initiating changes. Unconfirmed changes should be the exception and limited to parameters which do not affect system behaviour.

Guideline 6.1.e.   Provide "back", "next", "cancel", and "finish" as well as "help" navigation controls.

Guideline 6.1.f.   Indicate the progress of the configuration procedure to the user.

Guideline 6.1.g.   Make actions reversible.

Guideline 6.1.h.   Navigation should be under user control throughout the configuration procedure.

Guideline 6.1.i.   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.

Guideline 6.1.j.   Success or failure for each setup step should be communicated to the user. Steps to correct any failure should be communicated as well.

Guideline 6.1.k.   If the setup process blocks important device or service features the user must be informed and be given the option to interrupt/block the related setup procedures.

Guideline 6.1.l.   During the transfer of setup information from one terminal to another, non-optimal transfer should require confirmation by the user.

Guideline 6.1.m.   Transfer of setup information from one terminal to a second terminal should not modify the contents on the first terminal. Any modification on the source terminal should be accepted and confirmed by the user (e.g. DRM settings and license handling may need dedicated attention).

Guideline 6.1.n.   The user should be able to set his preferences for automated setup and reconfiguration processes, detailed or short feedback, wizards and other guided procedures. Setup procedures should adhere to these preferences.

Guideline 6.1.o.   If a setup procedure is interrupted the user should have the possibility to continue the setup process from the point of interrupt.

6.2   Automate as far as possible

Since setting up a terminal or a service is not an action which the user wants to perform but rather a necessary activity in order to achieve another goal, all unnecessary complexity should be concealed from the user. Automation is important both in terms of steps to be performed and information that has to be entered into a system. Automated setup procedures save the user from remembering irrelevant parameter settings and from entering erroneous information.

Automate as far as possible

Guideline 6.2.a.   Provide appropriate default entries for settings, if available.

Guideline 6.2.b.   Pre-configuration is the preferred solution for configuration of terminal and service access.

Guideline 6.2.c.   If pre-configuration cannot be achieved, some means of guided configuration should be provided, taking into consideration the needs of all users (especially the young, elderly or those with special needs).

Guideline 6.2.d.   Require only steps that involve instructions, selection or feedback relevant to the configuration procedure (all other steps are redundant).

Guideline 6.2.e.   If a service recognises that it is not configured properly, it should inform the user and initiate the setup process, if confirmed by the user.

Guideline 6.2.f.   Subsequent updates of settings, e.g. OTA, should provide the default entries for terminal or service resets.

Guideline 6.2.g.   It should be possible to return to an interrupted setup procedure, without loss of earlier input.

Guideline 6.2.h.   Provide auto-completion where appropriate; allow disabling of this feature under user-control.

Guideline 6.2.i.   A service/terminal should be usable with minimum setup and preferably be delivered to the user with default settings (e.g. placeholder values such as "Greeting message").

Guideline 6.2.j.   A service should be able to control/correct its configuration on the user's terminal without user intervention, as long as there is no cost implication.

Guideline 6.2.k.   Basic setup should be available OTA, e.g. by sending a short message to a service centre which automatically configures the service and the terminal settings.

Guideline 6.2.k   If an automated setup procedure has completed successfully, the user should be notified.

Guideline 6.2.l   Automatic setup procedures should preserve previous settings for later use.

Guideline 6.2.m   Service access and terminal profiles and user assigned access profile names should be supported.

6.3 Provide consistent setup processes, assisted by wizards

As setup processes are, as a rule, not in the focus of the users" attention, it is important that the requirement to learn new processes for different features or services is kept at a minimum. This can be achieved by striving for consistency across different services and by offering guided setup dialogues, so-called "setup wizards" or "wizards".

Provide consistent setup processes, assisted by wizards

Guideline 6.3.a.   Where the same application or service is offered over different channels such as WAP, PC or the Web, there should be consistency in terms of language, features and interaction flow.

Guideline 6.3.b.   Consistent command terms, behaviours and graphical elements should be used throughout the services/device user interface.

Guideline 6.3.c.   Wizards should be used for guided setup procedures wherever appropriate.

Guideline 6.3.d.   Where templates or wizards are used for setting up devices or services, these should be consistent between services in terms of their high-level configuration steps and graphical elements.

Guideline 6.3.e.   Provide and support the use of templates and user profiles, if possible, to simplify access setup, configuration, and use in a networked environment.

Guideline 6.3.f.   There should be consistency between terminal, bearer (e.g. MMS), and service (e.g. "ticketing") setup procedures.

6.4 Keep configuration to a minimum number of logical steps

This principle relates to the need to reduce complexity during the configuration stage. It is also related to the guidelines in clause 6.2. In both these sets of guidelines, the intention is to make it as easy as possible for the user to configure a product or service.

Keep configuration to a minimum number of logical steps

Guideline 6.4.a   Do not ask for unnecessary confirmations.

Guideline 6.4.b   Do not provide extraneous information during the setup process.

Guideline 6.4.c   Avoid interruptions during setup, wherever possible.

Guideline 6.4.d   Provide auto-completion, where appropriate; allow disabling of this feature under user-control.

Guideline 6.4.e   Present optional parameters of a setup procedure in a way that does not increase the minimum number of steps necessary to perform the configuration.

Guideline 6.4.f   When a setting can be carried out more easily through other channels, e.g. Web, the user should be notified and offered this option.

6.5   Provide consistent customer support information

Many setup procedures are performed only once or repeated seldomly. Consequently, the information users" need to carry them out is unlikely to be remembered easily. Therefore, access to addresses and data the user needs to proceed with setup should be made easily available.

Provide consistent customer support information

Guideline 6.5.a.   Provide easy access to all necessary setup information such that access to customer support services, although always available, should be a last resort.

Guideline 6.5.b.   Hyperlinks and information should be kept up-to-date.

Guideline 6.5.c.   Relevant information on how to deal with worst-case scenarios (e.g. an inaccessible (lost, stolen or damaged) phone) should be made available and accessible (e.g. on the operator's Web site).

Guideline 6.5.d.   As a fallback solution, a customer support phone number should be readily available, through which the configuration can be initiated.

Guideline 6.5.e.   Each service provider should provide a manual, personal channel to modify sensitive data details in the event of failure of the automated process.

Guideline 6.5.f.   Operator-specific service information should be provided directly in the terminal, including the means to control the service.

Guideline 6.5.g.   Customer support information should include a description of the type of service available, e.g. automatic or agent-based.

6.6   Provide all necessary defaults and information to the user

Users should be presented with all necessary defaults and have simple access to all the information they need to achieve their goals during configuration.

Provide all necessary defaults and information to the user

Guideline 6.6.a.   Access to the main menu of the terminal should be possible during setup procedures to allow the user to access required device information.

Guideline 6.6.b.   The user should have access to terminal information pertinent to setup processes for services, including but not limited to:
(i)   Device model and serial number;
(ii)   Username/Password;
(iii)   IMEI number;
(iv)   Software version;
(v)   Hardware version:
(vi)   Subscription details (services subscribed).

Guideline 6.6.c.   Provide a clear description of what equipment and information the user needs to have accessible during the configuration procedure, and how to obtain it.

Guideline 6.6.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.

Guideline 6.6.e.   Provide clear indication and differentiation of what the setting is and what the actual entry of the setting is.

Guideline 6.6.f.   Provide clear instructions and illustrative examples on what type of information is required at each step of the configuration procedure. For further guidelines, see [10].

Guideline 6.6.g.   Provide examples of the correct format for required setting entries and support for handling the formats.

Guideline 6.6.h.   Provide information to the user on which settings are pre-configured.

Guideline 6.6.i.   Provide a clear overview of the steps of the configuration sequence.

Guideline 6.6.j.   Provide a logical and consistent order to the configuration procedure.

Guideline 6.6.k.   Provide information on how to change settings at a later phase.

Guideline 6.6.l.   Users should have easy access to all features that may need to be configured, through an easily identifiable entry point.

Guideline 6.6.m.   Cost implications should be indicated to the user. See also clause 8.1 and [1].

Guideline 6.6.n.   The user interface should communicate if the configuration is related to a remote or a terminal-based feature.

Guideline 6.6.o.   Where common setup services are provided through other means such as the Web or a PC, these services should be indicated to the user.

Guideline 6.6.p.   If a service can be activated and deactivated through several channels, the result should be the same (and the information channels should interoperate), see also clause 8.4.

Guideline 6.6.q.   Changes impacting the service should be indicated to the user; if they necessitate reconfiguration.

Guideline 6.6.r.   During setup, the user should not have to abort the setup procedure in order to access information for its completion.

6.7   Provide all necessary feedback to the user

The user needs clear and unambiguous information about the progress of the setup procedure, both in the case of successful setup and in the case of failure.

Provide all necessary feedback to the user

Guideline 6.7.a.   Indicate the progress of the configuration procedure to the user.

Guideline 6.7.b.   Success or failure for each setup step should be communicated to the user as well as the steps necessary to correct the failure.

Guideline 6.7.c.   Provide clear feedback when the configuration procedure ends.

Guideline 6.7.d.   During the transfer of setup information/contents from one terminal to another, steps that cannot be completed or are completed in a non-optimal way need to be indicated to the user.

Guideline 6.7.e.   Pending automated registration should be communicated to the user.

Guideline 6.7.f.   If a service is unavailable due to the unavailability of underlying network infrastructure, this should be clearly indicated to the user to prevent frustrating configuration attempts or un-intended reconfiguration of the requested service.

Guideline 6.7.g.   Reasons for unavailability of services should be clearly indicated.

Guideline 6.7.h.   If a setup-action has not been successful, the terminal should inform the user as to why the action has not been carried out. The status of the system should be clearly communicated to the user.

Guideline 6.7.i.   The result of setting variables during an automatic setup process should be made accessible to the user.

6.8   Provide all configuration information in the user's native or other preferred language

Provide all configuration information in the user's native or other preferred language

Guideline 6.8.a.   Users should be prompted to select their preferred language when using a new terminal.

Guideline 6.8.b.   The language selection in the terminal should be the default for the service setup and activation language. (Note: the information on the language chosen can also be used for selecting and activating service-specific languages, e.g. for Cell Broadcast services).

Guideline 6.8.c.   An option to explicitly select a preferred language should be part of every setup process.

Guideline 6.8.d.   Information on the Web or other interactive media should be available in the same languages as on the device.

Guideline 6.8.e.   The default language offered for Web access should be the same as the one already selected as device language.

Guideline 6.8.f.   If the default language of the terminal is not available for a service, alternative language options should be offered to the user.

Guideline 6.8.g.   A procedure for reversing an unwanted language selection should be available which does not require knowledge on the language currently set. Information on this procedure should also be available through other channels, e.g. on the Web.

Guideline 6.8.h.   For additional guidelines, see [6].

6.9   Provide all configuration information in simple, non-technical language

Users require simple, non-technical language throughout the user interaction, providing only the information necessary to accomplish a task.

Provide all configuration information in simple, non-technical language

Guideline 6.9.a.   Provide consistent use of language and terminology across all sources of configuration information.

Guideline 6.9.b.   As far as possible, hide technical concepts that the user does not need to understand during configuration.

Guideline 6.9.c.   Where necessary, provide explanations of concepts that need to be understood by the
                    user during configuration.

Guideline 6.9.d.   Display technical error messages only on request.

Guideline 6.9.e.   Avoid giving unnecessary information to the user.

Guideline 6.9.f.   Help information should be provided for each entry in the mobile service configuration
                    (e.g. MMS configuration), as parameters are not always self-explanatory.

6.10   Anticipate human error and provide recovery options

Any terminal or service should take into account the possibility of human error by taking steps to prevent these errors
and provide information on how to correct them.

Anticipate human error and provide recovery options

Guideline 6.10.a   Where there are dependencies between settings, the user should be notified that a
                    change of setting entries may prevent access to other services.

Guideline 6.10.b.   If the user is permitted to change the settings, 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.

Guideline 6.10.c.   Before performing a master reset, users should be informed that they should back up
                    personal and other information, using one of the available options (e.g. to a PC or
                    through a Web-based service).

Guideline 6.10.d.   Error messages should include information on how to correct errors.

6.11   Apply existing standards and guidelines

There are a number of applicable ETSI and other standards, guidelines and recommendations (e.g. from OMA, OMTP,
W3C, 3GPP, ISO/IEC, ITU-T). As standards and guidelines addressing human behaviour are unlikely to go out of date,
it is important to apply the guidelines relevant to a product or service.

Apply existing standards and guidelines

Guideline 6.11.a.   The most recent versions of device management protocols and mechanisms, as specified
                    in OMA working documents and reference specifications [31], [41], with corresponding UI
                    elements, are the recommended, generic technical solution for configuration for terminal
                    and service access.

Guideline 6.11.b.   Follow the specific guidelines provided by the operator or service provider.

Guideline 6.11.c.   For guidelines for changing modalities/ use of applicable modalities, see [13].

Guideline 6.11.d.   Setup dialogs are user-machine interactions: if style guides exist in the environment, use
                    them.

Guideline 6.11.e.   For multi-cultural ICT issues, refer to [6].

6.12   Design for differing user abilities and functional limitations

Mass market terminals and services should be designed for all, especially the young, the elderly, and those with special needs.

Design for differing user abilities and functional limitations

Guideline 6.12.a.   Multimodal interaction should be supported to the largest possible extent, (e.g. through customer services).

Guideline 6.12.b.   Reminders with easy access to a setup dialog are helpful for first-time users of a service.

Guideline 6.12.c.   An option to use a large font should be provided.

Guideline 6.12.d.   The user preference for detailed or short feedback, wizards and other guided procedures should be considered (even if setup is automated the activities carried out in each automated setup may be required by the user).

Guideline 6.12.e.   Feedback to the user should be delivered to the user in the preferred way.

Guideline 6.12.f.   Automatic timeouts should be avoided, where possible. If required, they should be set with different user abilities and the context of use in mind.

6.13   Apply the guidelines within a user-centred design process

All design guidelines should be used within a user-centred design process, see clause 10.

Use guidelines within a user-centred design process

Guideline 6.13.a   Target users should be interviewed to understand their difficulties with the current setup procedures and take their proposals for improvements into account.

Guideline 6.13.b   Where possible, observation and/or logging of current setup interactions should be studied prior to designing new setup interactions.

Guideline 6.13.c   All setup procedure UI designs should be tested with target end users at an early stage in the design process.

Guideline 6.13.d   Following the implementation of a setup procedure, it should be tested, applying quantitative usability methods.

7   Specific guidelines for the setup of backup and recovery services

The mobility of terminals implies that users need an easy, efficient and reliable method to backup and restore personal data. The need for restore emerges often unexpectedly, for example in situations when the terminal is lost, broken or needs to be repaired or upgraded. In this case the original data, such as the phonebook, is needed in the new terminal. There can be no restoration without a previous backup. In the mobile context, such as when travelling, there is more need for remote backup/restore methods than in the office context.

Specific guidelines for the setup of backup and recovery services

Guideline 7.1.a.   Easy-to-use backup and restore methods should always be made available to the user.

Guideline 7.1.b.   The reason and importance of backup should be clearly explained to the user, e.g. in the user guide. For further guidelines, see [9]. Users should be encouraged and prompted to make periodic backups.

Guideline 7.1.c.   Comprehensive guidance and support for the first backup and recovery should be made available to the user.

Guideline 7.1.d.   The user should be notified if basic backup setup is not complete on the terminal.

Guideline 7.1.e.   Prompts reminding users to backup should be unobtrusive and not interrupt other tasks (unless a backup has not been made for a long (user/operator defined) time).

Guideline 7.1.f.   If approved by the user, the backup process should be automatic based on pre-configuration or user configuration. See also clause 6.2.

Guideline 7.1.g.   Support should be offered for solving problems related to data handling and phone incompatibilities.

Guideline 7.1.h.   A backup/restore status summary and history should be made available to the user. This should include information about where the data is, what was backed-up/recovered and when (time stamp).

Guideline 7.1.i.   The user should be able to view the backup summary on the terminal without being connected to the network.

Guideline 7.1.j.   The result of the backup/recovery procedure should be confirmed to the user.

Guideline 7.1.k.   If a backup process is interrupted by an external event or the user, some indication should remain in the user interface that back is still in progress or that it has terminated with failure.

Guideline 7.1.l.   Prior to the backup process, users should be allowed to modify the available locations for backup, e.g. PC, network, external memory card.

Guideline 7.1.m.   Instructions on recovery of backups should be available at time of backup and should be associated with content that may be backed up (rather than being in a sync or backup menu).

Guideline 7.1.n.   The first step in the recovery/setup process should be to inform the user if their device and the formats it supports (e.g. calendar and contacts structures) is compatible with the backed-up data. In addition, the data elements which can and cannot be backed-up should be represented and explained.

Guideline 7.1.o.   User should have easy-to-find and easy-to-access guidance for actions in a situation where they can no longer access their device (lost or inoperable device). For example, online support via Internet should provide guidance for backup and restore operations.

Guideline 7.1.p.   A wireless method for protecting the content of an inaccessible device should be available.

Guideline 7.1.q.   A wireless method for backing-up the content of an inaccessible device should be available.

8   Specific guidelines for the setup of services

Data-based revenue are considered a key growth area for the mobile sector. Consequently, increasing attention is being paid to the deployment of mobile services accessed via the terminal's browser, application download, through other channels such as SMS/MMS or WAP push. The most common services currently being deployed are related to music, local information, navigation, TV broadcasting and other entertainment-related services.

The biggest barriers to an increased use of services are complexity of setup, unclear pricing structures including roaming and poor upgrade paths.

Trust plays an important role in service uptake, especially in m-Commerce services. If services are provided/branded by an operator, then billing and accountability is straightforward. Services may also be offered by third parties not associated with the operator. In these cases, users must build trust with a service provider in terms of the security and privacy they offer.

Our guidelines are aimed at both kinds of service providers, operators and those who offer services through the operator's portal, and those who offer their services off-portal.

8.1   Service cost and upgrade paths

Transparency of service cost is a very important component in encouraging the use of services and the willingness of users to upgrade to new services. The service-setup phase as an ideal moment to communicate costs associated with services and possible upgrade paths.

Guideline 8.1.a.   The user should be informed at an appropriate level of detail and through appropriate channels (Web, mobile, customer care or mail shot) of the costs associated with the service that they are about to configure messages.

Guideline 8.1.b.   Cost information should be presented in units meaningful to the user. Where possible, typical usage/cost scenarios should be presented, e.g. light vs. heavy use.

Guideline 8.1.c.   If costs that are outside of the responsibility of the service provider (e.g. cost of payments) are applicable, this should be communicated to the user. For further details, see [1].

Guideline 8.1.d.   When configuring a new service, possible cost savings available to the user should be indicated (e.g. inclusion of the service in flat-tariff packages, free minutes, and bonus for heavy usage).

Guideline 8.1.e.   If operational service costs or the coverage of a service changes during the lifetime of a service, the changes should be communicated to the user by appropriate channels.

Guideline 8.1.f.   If previously used upgrade paths are available, they should be made available to the user during the setup procedure.

Guideline 8.1.g.   Alternative payment options should be offered and information about their availability provided to the user, if possible.

8.2 Service credentials

To increase end user trust, it is essential that service providers show that they are *bona fide*. Users particularly need to be reassured when they move outside the services provided by their operator. In this case billing and accountability may become less clear.

Communication of service credentials

Guideline 8.2.a.   The user should be informed of the service providers' name, their security and privacy certifications, and professional affiliations.

Guideline 8.2.b.   If the mobile operator is not responsible for a service, this should be clearly communicated to the user by a disclaimer during the setup phase.

Guideline 8.2.c.   Any contractual conditions should be communicated prior to, and made available after, the completion of the setup procedure.

8.3 Service discovery and termination

Service discovery and termination

Guideline 8.3.a.   If a new service becomes available within a defined geographic location, it should notify its presence in a way that does not interrupt the user's current task.

Guideline 8.3.b.   Where several service options are available in a given location, they should be organised into meaningful categories before being presented to the user.

Guideline 8.3.c.   New services should indicate their capabilities to the user in a way which helps users understand their value.

Guideline 8.3.d.   New services should always indicate the cost associated to their use in a meaningful way.

Guideline 8.3.e.   There should be no automatic configuration of new services, unless pre-agreed with the user.

Guideline 8.3.f.   Trial periods should be offered to users during which cost is reduced (or the service is free).

Guideline 8.3.g.   Within contractual obligations, the user should have a rapid way to end or disable a service.

Guideline 8.3.h.   All cost implications associated with service termination should be communicated to the user prior to the completion of termination.

Guideline 8.3.i.   A service history should be provided, allowing the user to manage their active, disabled and terminated services and associated costs.

Guideline 8.3.j.   The information provided about new services should be as up-to-date, complete and accurate as possible. A "last updated" field should be provided on service information.

8.4 Service configuration and reconfiguration

Managing service configuration and reconfiguration

Guideline 8.4.a.   When configuring a new service, the dependencies (cost, function) on other services should be indicated and explained to the user.

Guideline 8.4.b.   If different versions of a service implementation are available, the version number should always be easily accessible.

Guideline 8.4.c.   There should be no automatic reconfiguration without confirmation if a cost is associated with the reconfiguration activity.

Guideline 8.4.d.   In all communications, the means by which the setting entries will be delivered to the terminal (e.g. via SMS), and how they should be acted upon (e.g. saved to WAP settings), should be communicated to the user.

Guideline 8.4.e.   If a terminal is not properly configured (e.g. missing service provider phone number) the service should inform the user or try to reconfigure automatically, before attempting to access the service.

Guideline 8.4.f.   Each service provider should provide an option through which the user can select OTA rather than manual configuration, for all services.

Guideline 8.4.g.   Service providers should offer an SMS short number which can be used to initiate re-configuration processes. This number should be stored on the SIM card, where possible.

Guideline 8.4.h.   Changes impacting a service should be communicated to the user.

Guideline 8.4.i.   If the service configuration changes due to programmed upgrade or maintenance should be communicated to the user ahead of time. Any requirement on the user to input new configuration information should also be communicated along with the means by which to do it.

Guideline 8.4.j.   If the service configuration changes due to upgrade or maintenance, the reasons for such changes should be communicated to the user if the upgrade impacts the service functionality or cost.

Guideline 8.4.k.   If an action has not been successful and cannot be completed by the user the service provider should be informed and action should be taken to contact the user.

8.5 Other channels for service configuration

It is likely that service providers will employ other channels such as the Web to configure mobile services. It is essential that the Web and mobile channels share common information and processes.

Using other channels for service configuration

Guideline 8.5.a.   Additional methods (e.g. via Web or PC) should be provided for complex setup activities. The URL address should be communicated in the mobile user interface.

Guideline 8.5.b.   The UI of the Web channel should have a design style similar to the mobile UI, including navigation elements.

Guideline 8.5.c.   For remote configuration via a Web site, a "Send" control should be provided with
                      instructions to confirm that the target mobile terminal is switched on.

Guideline 8.5.d.   Examples of the mobile setup user interface should be provided for some of the most
                      common terminals. These examples should be used to illustrate the setup process.

8.6   Handling of personal information

To increase end-user trust, personal information (e.g. name, address, credit card number, etc.) must be treated in a
transparent and secure way by service providers.

Handling of personal information

Guideline 8.6.a.   For personal "critical" information, if a modification action attempted by the user has not
                      been successful, the user should be informed immediately. The previous value should be
                      restored and communicated to the user.

Guideline 8.6.b.   Users should be made aware of where their personal details are stored on their terminal
                      or on the network and should be able to manage these personal details.

Guideline 8.6.c.   The transmission of any personal information to 3rd parties should be explicitly approved
                      by the user. The user should be allowed at any time to withdraw this permission.

Guideline 8.6.d.   The lifetime of user information should be communicated when the information is first
                      entered and at regular intervals thereafter, e.g. password life-time. The user should be
                      given the opportunity to update or reconfigure this information prior to expiry.

Guideline 8.6.e.   Authorization information should be delivered to the user through electronic means, if so
                      requested.

9   Specific guidelines for maximizing the accessibility of setup procedures

Young, older and other people with functional limitations and impairments are often challenged when using ICT
terminals and services, even if their requirements are increasingly taken into consideration by a maturing ICT industry,
increasingly often applying design-for-all principles in product development. Even so, fully accessible terminals and
services are rare and difficult to achieve [18], [19] and "The Swedish Consumers' Association" (see bibliography).

If the situation during the use cycle of terminals and services seems to be somewhat difficult, it is even more worrying
during the setup and configuration phase of these ICT products, when users start using a new terminal, system or
service for the very first time, or they want to replace an existing terminal with a new one. It is unusual to focus
design-for-all efforts on these steps, necessary to activate and configure mobile terminals and services.

Attributes of these user segments are not detailed here, as they have already been studied in detail in [4], [7], [8] and
[13]. These documents also provide guidelines. Furthermore, issues associated with user education and user guides are
addressed in [9]. Generic terminal and service guidelines, applicable to ensure good terminal and service accessibility
are not dealt with in the present document but assumed to be available. The current clause provides setup procedure
design recommendations applicable to young and older users and users with physical or cognitive functional limitations.

For the purpose of the guidelines presented, it is assumed that users who in other circumstances would use assistive
terminals (e.g. correcting their vision and hearing) will continue to wear and use these devices during the setup of
mobile terminals and services.

1) **Data entry and setup activation:** before the setup can take place, the user must have the necessary data and information available. In the case of mobile terminals, this information may include a phone number, model, user names/passwords, the IMEI code, the SW version, the HW version and details about the service plan.

2) **Power-on and network connection:** the main and critical indication of a successful power-on and setup is the attachment to service networks, indicated with a signal strength bar. If the power-on fails, the terminal will not be connected to the service network. If there are problems at this stage, they are typically caused by troubles with the operator subscription or availability of the network, and not by the terminal.

3) **Service parameters and personalization:** mobile terminals must work before the services are ready to be used. The most commonly reported usability problems are setup and initial configuration topics, network failures and wireless hardware issues. Configuring a mobile terminal is one of the most difficult tasks the user faces [32] Many settings are operator-specific and can be adjusted when the cellular operator is known.

4) **First use of a service:** the first-use experience is important for the user's product acceptance. Users may have difficulties even in understanding what the product or service can or cannot do- capabilities that should be clearly indicated, as specified in [9].

5) **Use of the service:** this area has been studied in high details and there are many recommendations available, e.g. [1], [2], [4], [7] and [12]. It is also outside the scope of the present document and no guidelines are provided.

6) **Extension and updating of the terminal/service:** terminal or service functionality can be updated to more recent software and firmware releases or expanded with various ways, such as plugging in a GPS module or activating new service elements. For an introduction to currently available technologies, see the informative clause C.4.

7) **Product replacement:** when the user is concerned about being able to continue work practices as already established, the transfer of personal data from the old terminal to the new one, compatibility of applications, accessories and services are important issues.

In the perspective of the above, the following guidelines are provided:

Specific guidelines for maximizing the accessibility of setup procedures

Guideline 9.1.a.   Terminal and service features, capabilities and attributes that may be useful to specific user groups should be clearly indicated, including their limitations. For further, detailed guidelines, see [9].

Guideline 9.1.b.   Provide a quick reference setup guide on multiple, accessible formats. For further, detailed guidelines, see [9].

Guideline 9.1.c.   Make the setup of terminals and services automatic, over the air to the largest possible extent (e.g. by applying factory or point-of-sales setup) supporting the input of necessary data through multiple modalities.

Guideline 9.1.d.   Make the data necessary for setup available and accessible in multiple modalities, prior to configuration.

Guideline 9.1.e.   Re-use as much already available information as possible.

Guideline 9.1.f.   Provide multimodal support for solving power-on and network connection issues users may encounter.

Guideline 9.1.g.   Provide multimodal help, assistance and information. For further details, see [5] and [13].

Guideline 9.1.h.   Provide human-assisted help to users who are unlikely to understand error messages.

Guideline 9.1.i.   Provide instructions and support for the adult carers assisting people, as they may not be ICT literate.

Guideline 9.1.j.   Provide immediate and precise feedback in multiple, redundant modalities, including options for assistance. See also [4], [7] and [13].

Guideline 9.1.k.   Provide dedicated support for the setup of assistive terminals in the mobile use scenario (e.g. Universal Text communication, hearing aid equipment, etc.).

Guideline 9.1.l.   Assistive product or service extensions should integrate well with and not disrupt already existing functionality.

Guideline 9.1.m.   Maintain accessory compatibility, including compatibility with assistive terminals, to the largest possible extent.

Guideline 9.1.n.   Adapt the necessary information, modalities and formats provided to children's developing abilities and perceptual attributes, segmented by their age.

Guideline 9.1.o.   Make the setup instructions and dialogues available in the user's preferred language, to ensure understandability.

Guideline 9.1.p.   Use a simple, non-technical vocabulary, free, of abbreviations, appropriate for the target age group to ensure understandability.

Guideline 9.1.q.   Use recognised sets of symbols for accessibility features and accessories.

Guideline 9.1.r.   Ensure that users are explained the emergency service functionality of their terminals and services when used together with assistive terminals.

Guideline 9.1.s.   For the setup of Web-based information and services, follow the applicable usability and accessibility recommendations as specified by the W3C Web Accessibility Initiative (WAI) [16] and Mobile Web Best Practices [17].

Guideline 9.1.t.   Ensure that only parents and/or carers have access to complex and critical setup configuration options for children.

Guideline 9.1.u.   Ensure that terminals owned by a 3rd party but used by children, clearly indicate their ownership.

10   Development and usability evaluation guidance

It is important to realize that the adoption of the guidelines outlined in clauses 6 to 9 will not guarantee good usability per se, but must be applied within a user-centred design process. All setup procedures assume they will be used for a specific task, by a particular person, in a given context to a greater or lesser degree of effectiveness, efficiency, and satisfaction. Given that these usability components will be different for every setup procedure, guidelines can only be general in nature. Therefore, to ensure optimal usability, testing should be carried out following the application of the guidelines.

10.1   Use of the design guidelines

In order to be effective in a product development or usability assessment, we have endeavoured to ensure that the guidelines meet the following criteria.

a) Cover key user activities and contexts:

- we have tried to achieve this using our framework and use cases - see clause 5.3. The framework addresses the key aspects of user, context and activity.

- our user descriptions are clearly simplified when compared to other more focused studies. However, it was intended that by stressing the need to consider key user differences such as age, familiarity with technology and mobility, that our guidelines would be sensitive to different user needs.

b) Integrate well into design processes:

The guidelines can be used at various points during the ICT research, design, development and test processes:

- in the expert analysis of existing user interfaces - alongside generic guidelines for mobile interactions.

- in the user research phase as way to focus research on particular user needs related to setup, e.g. need for human back-up.

- in the prototyping phase of new device/service in order to guide the prototype design.

- in the design phase of new device/service in to critique the design.

- in the creation of usability test scripts allowing a focus on setup interactions.

c) Understandable, accessible and easily applicable

- the guidelines are written in a generic style to allow accessibility and relevance to as many design situations as possible.

- they do not use technical language so are accessible to marketing, design and field engineering personnel.

- they do not specify specific flows, layouts or visual designs. This allows the designer to exercise their own creativity whilst still following the guidelines.

- the present document provides a full listing of all guidelines by the area they address in annex A (normative). annex A or a subset of it (depending on the area covered) can be used as a check-list.

d) Remain relevant:

- we consider the guidelines presented in the present document as "living guidelines". This means, the guidelines will need to be revisited, as new services and technologies reach the mass-market. For example, location-based services, video call and ID tags.

- as new products and services emerge, new use cases will become common. These should also be investigated.

- whilst new guidelines may be required, we feel that our categories, being drawn from generic "design for use" literature, will remain unchanged.

The actions and steps presented in figure 3 should be applied:

User research	Guidelines can aid prototyping by providing initial design directions, e.g. Web and mobile set up information should be self-referential.
Requirements definition	Requirements analysis can use the Guidelines as a check-list of setup related areas that may be relevant to the target user group.
Prototyping	Prototypes can be critiqued using the Guidelines.
Interaction and Visual design	Interaction design flows and layout design should follow the guidelines in order to provide sufficient setup information and feedback. The Guidelines could be used to create "Design Patterns" ([42] and van Welie, M., see bibliography) which are examples of good setup related interactions.
Implementation and Usability testing	Usability testing can use the guidelines as a test list, e.g. can the user synchronize correctly? Are setup error messages understood? Are setup tasks completed successfully?

Figure 3: Development flow

10.2   Improve setup interaction design by evaluation

Clause 10.1 shows how the guidelines can be used in design and evaluation. However, it is important to realize that adoption of these guidelines will not guarantee usability per se. All setup procedures assume they will be used for a specific task, by a particular person, in a given context to a greater of lesser degree of effectiveness, efficiency, and satisfaction. Given that these components of usability will be different for every setup procedure, these guidelines can only be general. Therefore, to ensure optimal usability, testing should be carried out.

The aim of any usability evaluation activity is to ensure a minimum or previously defined level of usability of a product or service. Usability evaluation methods include expert walkthrough, focus groups, experiments, field observation, heuristic evaluation, input logging, logging of issues raised in customer care centres, surveys, interviews, and performance measures. A comprehensive overview of usability evaluation methods for the design of telecommunications systems, services and terminals is given in [11]. For usability testing, a distinction is being made between formative and summative usability testing.

Formative usability testing supports the development of the design itself. The tests have the general objectives of obtaining evaluations and feedback on the usability of the overall product or individual features. A summative approach is used at a later stage in product development to measure the (overall) usability of the product or of individual features against an a-priory set criterion (e.g. 80 % of users who have never used the product before successfully perform a number of defined tasks).

In product development, formative usability is more important as it helps to identify usability problems that can still be solved at an early enough stage.

The necessity of testing a product or service arises from the aim of providing the users with everything they need in order to be able to have a successful interaction and consequently a positive user experience during setup off a service. At the same time, pressures for cost savings raises the question of what is the minimum amount of usability that has to be provided in order to meet this aim.

The most widely recognised definition of usability is based on ISO 9241-11 [44], where usability is defined as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use". The three components of usability are defined as follows:

- effectiveness;

- efficiency;

- satisfaction.

These are explained in more detail in table 3.

Table 3: Usability criteria

	Definition	Examples
Effectiveness	The accuracy and completeness with which the users achieve a specified goal when using a product	The accuracy and completeness with which the users change their credit card details on a particular service.
Efficiency	The resources expended in relation to the accuracy and completeness with which users achieve goals when using a product.	How many attempts and how much time were required to make a call using the "Missed Calls List" feature of a mobile phone.
Satisfaction	The comfort and acceptability of product use, e.g. expressed in a questionnaire.	The comfort and acceptability of transferring personal details from one phone to another, e.g. expressed on a 5-point satisfaction scale in a questionnaire.

It is important to measure each component of usability. It may be that a user can use a service very effectively but does not find the process very pleasing. Alternatively, they may like a service or a product but find the interaction rather time consuming and make lots of errors.

However, it must be stressed here that evaluating for usability in industry does not mean we have to perform a comprehensive context using complex metrics; this would be neither cost-effective nor practical. Sometimes a quick and dirty test can be carried out providing a general indication of the overall level of usability compared to other services or previous designs. This provides the simplicity and speed required where time to market is an important consideration.

A summary of recommended evaluation methods can be found in many textbooks, such as [43] and [11].

10.3   Usability evaluation with children

It is not the purpose of this clause to provide a comprehensive review of usability evaluation with children. However, it is important to note the usability findings for adults cannot always be generalized to children, e.g.:

- animation and sound effects are perceived as positive design elements for children, while often a nuisance or obstacle for adult users;

- children rarely scroll pages and interact mainly with information that is visible without scrolling up or down;

- children are considerably more willing to read instructions, than adult users.

Given the above, it is worth mentioning some of the techniques which can be effective in evaluating a product or service with children, see [39] and [22]. It is worth noting that these techniques can also be used on adults.

One technique is called co-operative inquiry, where children and adults work together as research and design partners. Both the adults and the children act as observers, take notes and interact with the child test subjects. Children are involved from the beginning of the design, not after adults have come up with the initial ideas. Although this is specifically about design, this method can also be used in evaluation in combination with simple user testing and walkthroughs. In general it has been found that this technique is most appropriate children over 7. Children under this age have problems expressing themselves. This can be a useful technique, but is very labour intensive.

There are many different techniques which encourage the test participant to talk about what they are doing or thinking during the test session. The techniques can also explore the source of the usability problems. The variations of the techniques include:

- **Thinking aloud**, where the subject has to think aloud during the whole session. Children may need prompting to think aloud if they go quiet during the session. This can have a distorting influence on the outcome.

- **Active intervention** is similar to think aloud but the experimenter asks the subject questions during the interaction.

- **Retrospection** consists of undertaking a standard usability evaluation while recording it on video. The test subject then watches the video with the tester and questions are asked during the play back. The disadvantage of this technique is that the test becomes at least twice as long and may be a problem for children who have limited attention spans. The question of legal issues in the use of video with young children needs to be addressed.

- It has been suggested that **Co-discovery**, where two child users work collaboratively on the tasks set by the experimenter, can overcome the problem of evaluator intervention. The assumption here is that the children will behave more naturally with another child than with the experimenter being present. Richer data will be gathered about the opinions and expectations of the children. The disadvantage of this technique is that it uses twice as many test subjects.

- A further technique is **Peer tutoring** where one child tutors another child. The second child then tutors a third child and so on. The main problem with this technique is that the child who is tutoring can take over the task, and competition can get in the way of co-operation. When considering any co-operation test situation it should be remembered that the way children play changes from parallel to co-operative between the ages of 2 and 5. This also depends upon when the child starts school.

Development and usability evaluation guidance for setup procedure user interfaces

Guideline 10.a   The guidance presented in clause 10, applicable to the development and usability evaluation of setup procedure user interfaces, should be considered.

Annex A (normative):
Guideline listing

In annex A, all guidelines presented in previous clauses of the present document are collected and listed (no new guidelines are introduced), in order to assist the use of the present document as a checklist. The guidelines carry an indication about the clause they can be found in, for further details.

The present document provides user interface design guidelines for setup procedures, applicable to mobile terminals and services throughout the product Lifecycle. The design guidelines address the design, specification, implementation, deployment and maintenance of mobile terminals and services and are equally applicable to consumer use as well as to professional use.

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, standard writers, product managers and developers. Other stakeholders who may benefit from its use include service and application providers, virtual operators and others.

For the purpose of the present document, it is assumed that access to mobile services is primarily achieved through handheld terminals, typically characterized by a limited screen size, a 12 key-keypad and possibly, additional function keys and/or a stylus and/or a touch screen. The focus of the guidelines provided in the present document is on public mobile network terminals and services, but they are mostly also applicable to other technologies (e.g. cordless or IP-based telephony and Wi-Fi).

Wherever possible, an integrated design-for-all approach has been adopted, taking needs and abilities of children, older users and users with physical, cognitive, or sensory impairments into account. When appropriate, specific guidelines for the optimization of the accessibility of setup procedures are presented and existing guideline documents are referenced for further details.

The guidelines provided have been developed by experts and have been discussed and agreed with key players of the ICT industry in a consensus-oriented way. They have also been presented at various conferences and dedicated requirement collection and consensus building workshops.

The application of these guidelines during the development process of setup procedures will improve the user experience of the setup, if considered and supported in designs, specifications and implementations. However, it should be noted that the guidelines provided in the present document should only be regarded as enabling, not guaranteeing, the creation of setup procedures and belonging user interfaces that meet all the above discussed goals.

Annex B (informative):
Use cases

B.1 The role of use cases in the development of the design guidelines

Use cases provide a common non-technical language for investigating user activities and their relation to system behaviours. By focusing on a "functional view" of the user-system interaction, they allow special dedicated focus on situations where "ideal" or "happy days" interaction breaks down. By focusing on such non-ideal cases, guidelines can be extrapolated from the use cases to avoid interaction problems and improve the design of setup interactions. In this way, use cases clearly present the motivation behind the guidelines presented in this report.

Use cases rely on a "functional" view of users and systems. As a rule, user interface design addresses the following issues:

1) **Information architecture**: the underlying information constructs controlled by the user and system. The schematic of information in the visual, auditory or haptic media;

2) **Interaction design**: the dynamic aspect of the user system dialogue. In particular the interaction elements handled by the user and system (menus, points, dialogues, etc.), the task sequence and allocation of tasks to user, terminal or network;

3) **Presentation design**: the "rendering" of the user interface in the visual, auditory and haptic media.

Use cases provide guidance predominantly in area 1 and 2 but have little to say about area 3. They can, however, be used as a guidance for the selection/development of respective UI design guidelines.

B.1.1 High-level versus low-level use cases

Table B.1 shows two levels of sample use case descriptions. High-level use case descriptions focus on user activities whilst low level use case descriptions focus on specific sequences of actions related to setting up terminals, services and network functions.

Each low-level use case shown in table B.1 is likely to form part of the resolution of many high-level tasks. Also, one high-level use case may cover several low-level action sequences. The detailed analysis of a selected number of high-level use cases can therefore lead to a broad coverage of the relevant user interface design issues.

Table B.1: Differences between high-level and low-level use cases

Example: High-level use cases	Low-level use cases and categories
Martin has taken a picture and wants to send it to his friend.	Setup steps related to setting network/bearer properties, e.g. GSM, UMTS, GPRS, CDMA, Mobile TV, Bluetooth, GPS - data-rate - name - accuracy - cost thresholds - band
Simon wants to retrieve an MMS a friend has sent to him.	Setup related to User Profiles - skin - credit card number/payment method - physical address - likes/dislikes - image - email - location - home page - permissions/ certificates/ contracts
Jane wants to post to her daily blog. Her posting includes text images and audio. She is mobile.	Setup related to services - user authentication - cost requirement - quality of service requirement
Sophie wants to "chat" with her best friend.	Setup related to Server, e.g. MMS, SMS, IM, blog, Email, WAP, HTTP - user name - password - nickname - server name/address - address - community name
Cinzia wants to update the address on her E-book service.	Setup related to user data - contacts - multimedia

B.1.2   A template for defining use cases

The following template is a slightly modified version of a use case description designed by Cockburn (1997). We use this template to describe a small number of our use cases in more detail to explain the way we derived the design guidelines listed in annex A.

USE CASE 1		
Goal in context		
Scope and level		
Preconditions		
Success end condition		
Failed end condition		
Primary, secondary actors		
Trigger		
DESCRIPTION	**Step**	**Action**
(Main success scenario)	1	
	2	
	3	
Extensions in user actions	Step	Branching action. These are also potential problem and error cases
(Potential problem and error cases)	1	
	2	
	3	
Variations in the phone states and behaviour		Branching action. These are also potential problem and error cases
	1	
	2	
	3	

Figure B.1: Cockburn's use case template, see [20] and [21]

B.1.3　List of use cases based on different user activities

During the initial start of our work we identified a considerable number of use cases based on different user activities (see the listing provided below). These activities considered are by no means comprehensive. A number of setup activities have not been analyzed in detail. We assume, however, that an extended list of use cases would not lead to a more complete list of user interface design guidelines. Areas which we have not analysed in detail include: configuration of interacting terminals, and synchronization processes, both between terminals and between databases and terminals.

a) Communication - person to person:

- SMS/multimedia messages:

   - use case: Martin has taken a picture and wants to send it to his friend (Normal use/Mobile, no PC, Adult).

- Single message vs. IM/chat:

   - use case: Sophie wants to "chat" with her best friend. (Normal use/mobile, no PC, child).

- Local networking, e.g. via Bluetooth/ Wi-Fi:

   - use case: Simon wants to retrieve an MMS a friend has sent to him (Normal use/mobile, no PC, young adult).

b) Communication - person to group:

- SMS/multimedia messages:

   - use case: While commuting to school, Lea wants to send a multimedia message and cannot send the message.

   - use case: Peter wants to share the details of a new bar in a chat session with his friends who might be interested.

   - use case: Marco wants to find out where his friends are.

c) **Communication - person to service (blog):**

- SMS/multimedia messages

  - use case: Jane wants to post to her daily blog. Her posting includes text images and audio. She is mobile.

  - use case: Cinzia wants to update the address on her e-book service.

d) **Communication - service to person:**

- message alert;

- email delivery:

  - use case: David wants to receive news headlines every day for his specialist field.

e) **Filling "Grey-time"/Fun (non communication):**

- playing games:

  - use case: Fabio is riding on the subway on the way home. He wants to play a game that a friend has sent to him.

- browsing:

  - use case: Stephanie wants to browse the Internet for the first time.

- listen to music;

- watch TV.

f) **Free content gathering, e.g. games, apps, news, ring tones, music, services:**

- browse:

  - use case: Whilst travelling, Simona wants to find the latest news headlines in her home country.

- select:

  - use case: Peter is looking for information on an mp3 player he would like to buy.

  - use case: Thibault wants to find and download a sample from a new album.

  - use case: Dirk is making an mms of video and audio to send to a vjaying competition but he does not have "rights" to use the content on his phone.

g) **Moving data between phones:**

- data exchange:

  - use case: Peter wants to get the same settings (skins, music, ringer tones etc.) as on his old phone after buying a new phone in Spain.

  - use case: Arnold wants to backup his data on his service provider's network.

h) **M-Commerce (including content):**

- mobile banking;

- mobile shopping:

  - use case: Archibald wants to buy a book he has heard about.

  - use case: Jürgen would like to change his credit card details on an m-Commerce site.

- browse;

- select;

- identify;

- pay.

i) Personalizing (can be done partly without network connection):

- terminal:

    - use case: Lothar wants to set the ring tone of his phone.

    - use case: Mike wants to share a contact via Bluetooth.

- services:

    - use case: Daniela wants to change her network voicemail greeting.

    - use case: Maria, a 44 year old accountant travels frequently to visit clients all over Europe. When she arrives in a new country she is often unsure of how to choose between the networks on offer. She knows that her home operator has preferred networks.

j) Upgrade and replacement activities:

- use case: Jane wants to change to a new phone and goes to the store to buy and configure a new terminal.

- use case: Peter has lost his phone and needs to recover his personal information onto a new terminal.

- use case: Peter has lost his phone and wants to protect his information on the lost phone.

- use case: Frank has mislaid his phone and called his service provider to disable the phone. He then finds it again and wants to re-enable the terminal.

- use case: Bruno, a 37 year old frequent business traveller, wants to switch to a more favourable roaming tariff.

B.2   Selected use cases in detail

After collecting the use cases listed in clause B.1, we identified 7 use cases which we analysed in further detail. In the following we describe these uses cases, comment on their peculiarities, and finally list topics which could be derived from these use cases. These topics are cross-referenced to the collection of guidelines in clauses 6 to 8 of the present document.

B.2.1   Use case #1: Data transfer between phones abroad

Peter wants to get the same settings (skins, music, ringer tones, etc.) as on his old phone after buying a new phone in Spain.

B.2.1.1   Scenario

Peter, 65 years old retired office clerk has recently moved to Spain. He decided to keep the same network operator in his new country but to change phones. His new phone is a new high-spec model with a large colour screen. The phone is already preconfigured for Internet access and MMS. The terminal has removable memory.

Guidelines

The use case uncovered requirements in the area of:

- backup management (WAP vs. local applications);

- presentation of backup status/completeness;

- roaming services;

- integration between Web/WAP;

- backup interruption.

B.2.1.2   Use case

Table B.2: Use case #1

USE CASE	Data transfer between phones in second country.	
Goal in context	**Using our framework terms:** **Lifecycle:** Initial use **Activity:** Synchronization: Copy content from old phone to new phone provided by an operator in another country for initial use. **Context:** User is 65 years old with slight visual impairment. User is at home seated in living room. PC access is possible. Prefers guided instructions.	
Scope and level	Terminal configuration for initial use.	
Preconditions	User has access to old phone. User has backed-up data on his home network due to reminders from UI avatar in his old phone. User is aware that backup is possible.	
Success end condition	All required data is copied onto the new phone.	
Failed end condition	No (or partial) data is copied onto new phone.	
Primary, Secondary actors	User, new phone, old phone, PC.	
Trigger	New phone has been bought in Spain.	
DESCRIPTION	**Step**	**Action**
(Main success scenario)	1	User accesses Spanish operator WAP portal using new phone.
	2	User enters user name and password in backup page.
	3	User navigates to last backup that they made on the network.
	4	User activates backup from network to new phone.
	5	All content appears on new phone.
EXTENSIONS in user actions		**Branching action: These are also potential problem and error cases**
(Potential problem and error cases)	1	**Alternative:** Rather than WAP, user activates preloaded backup management application. The application access the network.
	1	User does backup with local method (PC, memory card etc).
	1	User does backup over Bluetooth or Wi-Fi.
	1.1	User does not know WAP address for operator portal.
	2.1	User has forgotten user name and/or password.
	2.2	User advised he incorrectly entered name/password.
	3.1	User has trouble navigating due to small text and ambiguous labelling.
VARIATIONS in the phone states and behaviour		**Branching action: These are also potential problem and error cases.**
	1.0	**The terminal is set to Spanish language.**
	1.1	WAP is not configured correctly and connection to network server is refused.
	1.2	User uses PC to navigate to operator portal.
	2.1	User account is not recognized (because it is in the UK) and user is asked to re-enter password.
	3.1	Latest backup is not shown
	4.0.	New phone is not compatible with backed-up data.
	4.1	Phone battery is spent during backup.
	4.2	User receives a call during backup.
	4.3	Phone loses coverage during backup as peter walks in the garden.
	5.0	Backup is partially completed.

B.2.1.3 Guideline topics derived from the use case

Backup UI: Presentation

- The backup summary/history displayed in the user interface should indicate where the backed up data is and exactly what was backed-up (those elements that could not be backed-up should be shown) up.

- The time since the last backup should be indicated in the user interface.

- Objects that can be backed up, e.g. images/music should have "last backed-up" and "location" information associated with them. This could be presented in text form (Date), iconic form (location) or by using other display characteristics such as colour (to show age).

- If a backup process is interrupted by an external event or the user, some indication should remain in the user interface that back is still in progress or that it has terminated with failure.

- Prompts reminding users to backup should be unobtrusive and not interrupt task flow (unless a backup has not been made for a long (user/operator defined) time).

- The user should be able to view a backup history and location on their terminal without being connected to the network up.

Backup UI: Behaviour

- If basic Internet setup is not complete on the terminal, the user should be notified as soon as possible. In order to complete backup the user should be directed to Web, IVR or human customer service agents.

- Users should be prompted to make periodic backups to network, PC, memory card, etc.

- If approved by the user, the backup process should be automatic based on pre-configuration / user configuration.

- The first step in the backup process should be to inform the user if their phone is compatible with the backup-d data. In addition, the data elements which can and cannot be backed up should be represented. Where possible reasons should be given for those elements which cannot be backed-up.

- Instructions on recovery of backups should be available at time of backup and should be associated with content that may be backed up (rather than being in a sync or backup menu) up.

- During the backup process, users should be allowed to modify the available locations for backup, e.g. PC, network, external memory card.

General: Presentation

- Error messages should include information on how to correct the error, e.g. for back up service access "You may have entered an incorrect password or you not be able to access your account when roaming. Please contact customer service through the Web at…or on the following telephone number: …".

- An option to use a large font should be provided.

- Labelling of menu items should clearly describe their contents (pre-design labelling studies may be required for abstract functions such as synchronization/backup).

- Where common services are provided on Web/WAP these services should be indicated (space permitting).

- User guides should make clear which services are available across country boundaries and how to access them, e.g. network backup.

General: Behaviour

- The user preference for detailed or short feedback, wizards and other guided procedures should be considered (even if setup is automated the reasons for each automated setup may be required by the user).

- Users should be promoted to select their ideal language when using a new terminal.

B.2.2 Use case #2: Configuration of multimedia message service

While commuting to school, Lea wants to send a multimedia message and cannot send the message.

B.2.2.1 Scenario

Lea, a 16 years old high-school student, is on her way to school. She wants to send a message to her friend containing photos and a recorded music excerpt from a concert which she attended the evening before. It is her first try to send a multimedia message.

Notes

- The use case clearly indicates that configuration of MM services is far too complex (e.g. up to 21 different settings on a Siemens M65, with only 17 having default values) for the average user and requires OTA support. Users will not be able to memorize all settings even after a successful first configuration attempt. If the terminal has no information about where to retrieve the necessary setup information from it will be impossible to reconfigure the service if the configuration information gets corrupted. One solution to this would be a service number provided by the service provider to which the terminal could send an SMS. As a consequence the service provider could reconfigure all necessary settings in the terminal.

- The meaning of the different settings is unclear to the vast majority of users. This makes it even harder to memorize the setting of the different parameters.

- The terminal/service needs the ability to distinguish between failure due to wrong configuration and failure due to service unavailability.

- Additional complexity arises from the fact that many different components required for successful message delivery may fail or may be unavailable: GPRS, MMS server, terminal, network access, etc.

- Currently the information required to configure MMS settings can lonely be found in the Internet pages of the service providers. Without access to the Internet it becomes very difficult to configure the terminal properly. As a consequence, (re-)configuration on the move becomes virtually impossible.

Guidelines

The use case uncovered requirements in the area of:

- presentation of system status (failure description);

- presentation/provision of required information;

- roaming and service subscription;

- interrupted configuration: user receives a call, power low, etc.

B.2.2.2 Use case

Table B.3: Use case #2

USE CASE	First-time sending MM message	
Goal in context	**Using our framework terms:** **Lifecycle:** Initial use **Activity:** Message composition - message delivery - service (re-) configuration after failure notification. **Context:** User is 16 years old, on the move. Has MMS-enabled terminal, service has not been used before.	
Scope and level	Terminal configuration for initial use.	
Preconditions	User has MMS-enabled phone.	
Success end condition	MM message delivered to receiver.	
Failed end condition	MM message delivery fails.	
Primary, Secondary actors	User, phone, service provider.	
Trigger	First attempt to send a multimedia message.	
DESCRIPTION	**Step**	**Action**
(Main success scenario)	1	User composes MM message using the phone's MMS editor.
	2	User enters receiver name or phone number and sends composed message.
	3	User receives failure notification.
	4	User configures MM service over the air from the service provider.
	5	User resends MM message and receives delivery notification.
EXTENSIONS in user actions		**Branching action: These are also potential problem and error cases**
(Potential problem and error cases)	**1**	**Service provider does not offer OTA service setup; manual configuration necessary**
	1.1	User does not know MMS settings: IP addresses, URLs, etc.
	1.2	User has forgotten MMS settings.
	1.3	User does not know where MMS configuration has to be done in the phone.
	2	**MMS service is not subscribed**
	2.1	User cannot configure MMS service.
	3	**MMS service is currently not available**
	3.1	User tries to configure (OTA or manually) but fails due to service unavailability.
VARIATIONS in the phone states and behaviour		**Branching action: These are also potential problem and error cases**
	1.1	MMS is configured properly but service is not available.
	2.1	User receives a call during configuration.

B.2.2.3 Guideline topics derived from the use case

Message delivery and Service setup: user information

- If a service is not properly configured (e.g. missing service provider phone number) the terminal should inform the user or try to reconfigure before attempting to access the service (cost savings).

- A service should be able to control/correct its configuration on the user's terminal without user intervention.

- If a service is unavailable due to other reasons (e.g. network not available, service not configured for roaming while user is abroad) the user should get a correct indication of the reason for failure.

- All terminal internal settings should be preset by the terminal manufacturer (with the option of modification by the service provider).

- Each service provider should provide an interface through which the user can select OTA configuration for all subscribed services.

Configuration UI: Behaviour

- Basic setup should be available OTA e.g. by sending a short message to a service centre which automatically configures the service and the terminal settings.

- Guided configuration should be available if fully automated setup is not possible.

- While the initial configuration over a Web site using a PC may be the preferred option it must be possible to initiate a configuration attempt from the terminal itself.

- As a fallback solution a service phone number should be available through which the configuration can be initiated from a call centre.

General: Presentation

- Error messages should include information on how to correct errors, e.g. in case of server unavailability: "Please control the server setting on you terminal by sending an empty SMS to phone number xxxx. Follow the instructions after the receipt of the return SMS. If your settings are correct please retry to send you message. If this fails again the server may unavailable. Please retry after 15 minutes or call xxx for further support".

- Help information is required for each entry in the MMS configuration as most parameters are not self-explaining.

- If a service us unavailable due to the unavailability of underlying network services this should be clearly indicated to the user to prevent frustrating configuration attempts or un-intended reconfiguration of the requested service.

General: Configuration Provision

- Service providers should offer an SMS address which can be used to initiate re-configuration processes. This number should be stored on the SIM. The configuration server should be able to handle all necessary configuration processes required to make a service usable.

B.2.3   Use case #3: Lost phone

Peter has lost his phone and needs to recover his personal information into a new terminal. Also, he wants to protect his information on the lost phone.

B.2.3.1   Scenario

Peter, 32 years old sales agent, lost his phone yesterday, late in the Saturday evening, while spending time downtown. He is worried about the personal information (contacts, messages) getting into wrong hands, and also about the connectivity (email, etc.) configuration and passwords he has stored only in the phone, and can not recover easily from other sources.

He lends the phone from a friend, and tries to call to his lost phone. He notices that the phone is on, but nobody answers. Next day, some of his friends complained about phone calls made with his phone in the middle of the night between Saturday and Sunday.

At home he calls his operator 24/7 service number and asks them to close down the phone service. Operator wants to know several details (Name, birth, address, current phone number, phone number of the lost phone (SIM), SIM card's serial number, owner of the SIM and place where the phone was lost). The service phone number was available at the operator's Web portal. Service person asks Peter to contact also police and insurance company.

The phone was not found, and Peter has to get back to business as soon as possible. He needs to buy a new phone. Luckily, it is possible to re-activate the same phone number in the new SIM card. Although it was possible to inactivate the SIM card, he could not protect the content in the phone. Peter could recover some of the data from a PC backup file, but not any configuration such as email setup.

This use case is an instance which represents a number of other similar incidents: a phone is lost or stolen accidentally, and the event is unexpected. Alternatively, a phone may break and the user has no possibility to access the data on the broken phone. For many users it is critical to recover, i.e. continue communication and daily activities as soon as possible after the event. The role of manufacturers and service providers is important in providing mechanisms that help in being prepared to the event. Such mechanisms are for example simple backup processes, wireless protection features and support features.

Task analysis:

1) User calls to the lost phone.

2) User calls the operator and reports about the lost phone (and contacts police and insurance company).

3) Operator blocks the SIM card, and blacklists the phone.

4) User buys a new phone.

5) User restores personal data.

Explanations:

a. User may want to block the SIM card prior to someone else making phone calls.

b. User wants to prevent someone else from reading and using the content in the phone memory.

B.2.3.2   Use case

Table B.4: Use case #3

USE CASE	Lost phone	
Goal in context	Protect the phone from misuse and recover the content in the lost phone	
Scope and level	Phone inactivation, restore	
Preconditions	Phone is lost or stolen. Phone is on.	
Success end condition	Phone is blocked and content is restored to new phone. Content is protected.	
Failed end condition	Phone is not blocked and/or content is not restored. Content is not protected.	
Primary, Secondary actors	User, Operator, Thief, Own phone, Other phone	
Trigger		
DESCRIPTION	**Step**	**Action**
(Main success scenario)	1	User calls the lost phone.
	2	User calls the operator.
	3	Operator blocks the SIM card and blacklists the phone.
	4	User buys a new phone.
	5	User attempts data restore.
EXTENSIONS in user actions		**Branching action: These are also potential problem and error cases**
(Potential problem and error cases)	1.1	User does not remember own phone number.
	2.1	User does not find the operator's service number. Leads to delay in SIM block.
	2.2	Operator does not have service on weekends.
	3.1	Operator blocks the SIM only after long delay.
	4.1	User does not get a compatible new phone.
	4.2	User does not get the same phone number from operator.
	5.1	User does not have a backup from the content.
VARIATIONS in the phone states and behaviour		**Branching action: These are also potential problem and error cases**
	1.1	The phone is off. Cannot be contacted.
	2	-
	3	
	4	
	5.1	The backed up data is incompatible with the new phone

B.2.3.3   Guideline topics derived from the use case

Handling the lost-phone situation:

- The user should have easy-to-find and easy-to-access guidance for actions in lost-phone situation.

- The information that is needed in lost-phone situation should be available easily.

Support for backup:

- Easy backup methods should be available, and user should be encouraged backup phone data frequently.

- The result of backup should be confirmed.

- The reason and importance of backup should be explained to the user.

- Simple guidance and support for first backup should be available.

Support for restore:

- Simple guidance and support for restore should be available. Problem solving for handling data and phone incompatibilities should be addressed.

- The result of restore should be confirmed.

Service issues:

- A wireless method for protecting the content of a lost phone should be available.

- A wireless method for backing-up the content of a lost phone should be available.

B.2.4   Use case #4: Configuration of credit card details

Jürgen has a new credit card and wants to use it to purchase goods from an m-Commerce site using his Mobile. He also wants to delete the old credit card details from the site. The card details are stored on the m-Commerce site.

B.2.4.1   Scenario

The use case highlights the different ways in which the mobile can be used for online purchasing.

EXAMPLE: Card details can be stored on a mobile or the can be stored on-line, encrypted on the merchants site.

In addition, there exists the possibility of mobile terminals with a card swipe capability using a combined chip and PIN verification technology.

The use case uncovered requirements in the area of:

- interrupted configuration: user receives a call, power low, signal drops out, etc.;

- variability of standards and service from service providers;

- security variability according to the storage location of credit card details;

- trust issues and user configuration of user details.

B.2.4.2   Use case

Table B.5: Use case #4

USE CASE	Purchase from m-Commerce site using a new credit card	
Goal in context	**Using our framework terms:** **Lifecycle:** **Activity:** Updating personal details. **Context:** User is in his mid thirties with no physical impairments. User is on a train commuting. No PC access is possible.	
Scope and Level		
Preconditions	User had stored existing credit cards on m-Commerce site.	
Success end condition	User has stored new credit card details on ecommerce site.	
Failed end condition	User has not transferred new credit card details on the site and has not deleted the old ones.	
Primary, Secondary actors	User, phone, service provider Website.	
Trigger	Purchase using new credit card.	
DESCRIPTION	**Step**	**Action**
(Main success scenario)	1	User wants to purchase item from m-Commerce site.
	2	User goes to service provider, enters account name and password and selects item to purchase.
	3	User is asked to pay using existing credit or debit card. Details are stored on-line.
	4	User selects option to change credit card details.
	5	User enters new credit card details.
	6	User deletes old credit card details from Website.
EXTENSIONS in user actions		**Branching action: These are also potential problem and error cases**
(Potential problem and error cases)		Signal fails whilst travelling and inputting details.
		User enters incorrect credit card details.
VARIATIONS in the phone states and behaviour		**Branching action: These are also potential problem and error cases**
	1.1	**User has stored his card details on his handset**
	1.2	User changes the card details on his mobile phone.
	1.3	User access m-Commerce site, enters account name and password and selects item to purchase.
	1.4	User selects option on Website that accepts credit card details from handset.
	1.5	user is asked to insert his PIN.
	1.6	User inserts PIN.
	1.7	Website provides feedback when payment is accepted.
	2.1	**User has a phone which allows him to swipe his card and input his details**
	2.2	User access m-Commerce site, enters account name and password and selects item to purchase.
	2.3	User selects option on Website that reads the credit cars details.
	2.4	User inserts card to mobile phone and is asked to insert his PIN.
	2.5	User inserts PIN.
	2.6	Website provides feedback when payment is accepted.

B.2.4.3   Guideline topics derived from the use case

Service setup: user information:

- If an action has not been successful the terminal should inform the user as to why the action has not been carried out.

- If an action has not been successful the service provider should be informed and action should be taken to contact the user.

- Each service provider should provide a manual, face to face channel to modify credit card details in the event of automatic failure.

Configuration UI: Behaviour:

- Guided configuration should be available if fully automated setup is not possible.

- As a fallback solution a service phone number should be available through which the configuration can be initiated from a call centre.

- On-line merchants should provide all available ways to carry out this activity.

- Information should be provided on authentication and authorization.

General: Presentation:

- Error messages should include information on how to correct errors, e.g. if the credit card details have been wrongly entered.

- If a service us unavailable due to the unavailability of underlying network services this should be clearly indicated to the user to prevent frustrating configuration attempts or un-intended reconfiguration of the requested service.

B.2.5   Use case #5: Activation of a lower-tariff roaming service

Bruno, a 38 year old male and frequent business traveller wants to switch to a more favourable roaming tariff, considerably reducing his costs.

Background

In order to simplify the end user experience and under the threat of punitive fines from the European Commission for charging excessively high roaming rates (Global Mobile, Nov. 17, 2004 and June 1, 2005), a large operator, Operator X, announced the launch of new, simplified tariffs, designed to clarify and reduce costs and bring greater value to subscribers using their phones abroad, within the company's subsidiary and/or selected affiliate networks.

The reactions in the press and among users were positive: "There is a usage barrier from a customer perspective because of the fear of cost. Roaming tariffs are seen as reasonably opaque at the best of times. ServiceX (ed. is a commitment to value on roaming" (Global Mobile, Volume 12, Number 10, June 1, 2005).

For a one-off connection fee for each call, the subscribers of the service can make voice calls at domestic rates when travelling and using subsidiary and/or selected affiliate networks. The new service offers the same roaming services at a 5 times to 10 times lower airtime cost plus applicable fees, but needs to be activated through calling the operator's Customer Care Centre or by sending an SMS.

B.2.5.1   Scenario

Bruno, a 37 year old Lead user experience expert of his own company and a high-end user of mobile services spends 80 days to 100 days, travelling abroad in business. As the mobile phone is his main communication tool regardless of his location, the phone is used for voice calls and data services. His monthly average bill for the international voice calls is around €200 EUR, including a €20 EUR subscription cost for the previous international roaming service, offering somewhat cheaper international roaming costs.

The new, free service has just been announced and will reduce his monthly cost to approximately €50 EUR. Bruno would obviously like to activate it as soon as possible. However, he would like to find out more about certain details, including information about which countries and networks are included and excluded. In addition, Bruno would like to automatically receive updated information as changes occur (e.g. new counties are added).

This clause analyses the scenario and tries to capture the basic interaction that is needed to perform the task.

Steps:

1. Bruno is aware of the high cost of his international roaming calls that is confirmed every time he checks and pays his bills.

2. Bruno receives the first information about the new service, to be launched soon, when talking to the operator's customer care service centre.

3. A few days later, on the date of the announced launch, Bruno visits the operator's Web pages. He is a little surprised that the service cannot be activated through the Web (without logging in to the operator's portal that he would like to avoid, as he has forgotten his password) but is glad to see that the same result can be achieved in various ways, e.g. by sending an SMS (he prefers not to call the operator again, as the waiting times seem to be long in June 2005), information provided through the homepage in his preferred language.

4. Bruno sends an SMS with the text "SERVICE X" to the short number provided, as indicated and gets the delivery confirmed through an SMS.

5. Shortly thereafter, the following message arrives: "The command is invalid, please try again. /OperatorX)

6. Bruno tries again, a little irritated, as he precisely followed the instructions, he resends SERVICE X to the short number.

7. The following SMS arrives shortly thereafter: "An error occurred. Please contact Customer Services. Friendly regards OperatorX"). As Bruno will soon find out, activation is only possible beginning from the next day.

8. Bruno calls Customer Services, waits for 8 minutes before a call centre agent asks how she may help him. Bruno mentions he would like to activate ServiceX and cancel the previous ServiceY. This is confirmed by the agent and the call is finished.

9. The next day, another SMS arrives from the operator: "The OperatorX ServiceX is now activated. Friendly regards, OperatorX").

10. Three months later, Bruno is still a happy OperatorX customer and ServiceX user. The value of the service is confirmed through the mobile phone bills. However, Bruno is still uncertain about the costs of local calls in the foreign country. In addition, he would like a similar service to be made available for mobile data services, another high-cost service he is a frequent user of.

The use case uncovered requirements in the following areas:

- Accuracy of service information.

- Interworking of various information channels.

- Operator-specific information provided in the handset.

- Completeness of information provided.

- Relation between services.

B.2.5.2   Use case

Table B.6: Use case #5

DESCRIPTION	Step	Action
USE CASE TITLE		Activation of low-tariff roaming service.
Goal in context		Lower international voice call roaming fees by activating new service (ServiceX).
Scope and level		Service activation before use.
Preconditions		User has roaming-enabled subscription.
Success end condition		International roaming voice calls are charged at the same cost as national ones, with the addition of a one-time fee per call.
Failed end condition		International roaming voice calls are charged at the same cost as before (considerably higher).
Primary, Secondary actors		User, operator, system.
Trigger		Information about the launch of a new service.
DESCRIPTION	**Step**	**Action**
(Main success scenario)	1	The user is aware of the high cost of international roaming calls.
	2	The user receives the first information about the new service, to be launched soon.
	3	The user sends an SMS with the text "ServiceX" to the short number provided (exactly as indicated on the operator's homepage), as indicated and gets the delivery confirmed through an SMS.
	4	The next day, the service activation is confirmed by an SMS from the operator "The ServiceX service is now activated. Friendly regards, OperatorX").
EXTENSIONS in user actions	**Step**	**Branching action: These are also potential problem and error cases**
(Potential problem and error cases)	3.1	Shortly thereafter, the following message arrives: "The command is invalid, please try again. /OperatorX)
	3.2	The user tries again, a little irritated; as he precisely followed the instructions…he resends the ServiceX SMS request to the short number.
	3.3	The following SMS arrives shortly thereafter: "An error occurred. Please contact Customer Services. Friendly regards OperatorX"). As he will soon find out, activation is only possible beginning from the next day.
	3.4	The user calls Customer Services, waits for 8 minutes before a call centre agent asks how she may help him. Bruno mentions he would like to activate ServiceX and cancel the ServiceY. This is confirmed by the agent and the call is finished.
	4.1	Three months later, the user is still a happy OperatorX customer (although acquired by Operator Y, the service is still offered on the same terms) and ServiceX user (the value of the service is confirmed through the mobile phone bills). He also appreciates the notification nowadays provided through an SMS about the non-applicability of this service when visiting countries outside the special roaming plan. However, the user is still uncertain about the costs of local calls in a foreign country. In addition, he would like a similar service to be made available for mobile data services, another high-cost service he is a frequent user of.

B.2.5.3   Guideline topics derived from the use case

Accuracy of service information and control:

- The information provided about new services should be complete and accurate.

- The relation between services should be indicated and explained to the user, preferably in a personalized way.

- Changes impacting a service subscribed to by the user should be indicated to the user.

- If a service can be activated and deactivated through several channels, the result should be the same (and the information channels should interoperate).

- The result should be confirmed to the user in the preferred way.

- Operator-specific service information should be provided directly in the handset, including the means to control the service.

B.2.6　Use case #6: Choosing a network when roaming

Maria, a 44 year old accountant travels frequently to visit clients all over Europe. When she arrives in a new country she is often unsure of how to choose between the networks on offer. She knows that her home operator has preferred networks, possibly providing more favourable conditions at a lower cost.

B.2.6.1　Scenario

Maria, a 44 year old accountant travels frequently to visit clients all over Europe. When she arrives in a new country she is often unsure of how to choose between the networks on offer. She knows that her home operator has preferred networks.

B.2.6.2　Use case

Table B.7: Use case #6

USE CASE	Selection of network when roaming	
Goal in context	**Using our framework terms:** **Lifecycle:** Normal Use **Activity:** Communication: System to Person **Context:** User is 40 years old. She is mobile and outside her home country environment.	
Scope and level	terminal configuration for roaming use	
Preconditions	User is used to roaming and selecting networks.	
Success end condition	User has selected a network which meets here service and cost criteria.	
Failed end condition	User has selected a network (or had a network selected for her) which does not meet her service and cost criteria.	
Primary, Secondary actors	User, network services.	
Trigger	Arrival in the airport terminal.	
DESCRIPTION	**Step**	**Action**
(Main success scenario)	1	User switches on phone.
	2a	A connection to a network is made automatically.
	2b	Networks are presented in a list from which the user selects a network.
EXTENSIONS in user actions		**Branching action: These are also potential problem and error cases**
(Potential problem and error cases)	2a.a1	The user wants to change to a manual setting.
	2a.a2	The user cannot find network settings.
	2a.b1	The user wishes to view the capabilities of this network.
	2b.c1	The user wishes to compare networks based on cost and services.
VARIATIONS in the phone states and behaviour		**Branching action: These are also potential problem and error cases**
	2a.a1	The network changes automatically.

B.2.6.3　Guideline topics derived from the use case

- Before automatic or manual roaming network selection, the prices and services of each network should be shown to the user.

- During the network selection phase, the appropriate setting menu for network configuration should be indicated.

- Network IDs should not be shown to the user.

- During automatic network selection, it should be possible to view the criteria for this network selection, e.g. this is a partner network, this network offers GPRS, etc.

- Network selection should be automatic, where possible, based on user profile parameters (such as cost, home network and service requirements). The reasons for the selection should be easily viewable by the user.

- If network selection is manual, then the user should be able to navigate a list of networks with their associated parameters.

B.2.7 Use case #7: Obtaining DRM rights

Dirk (27) is making a multimedia message of video and audio to send to a vjaying (video disc jockey) competition but he does not have "rights" to use the content on his phone.

B.2.7.1 Scenario

Dirk needs to obtain the rights to play a specific video on his phone from a copyright holding company which uses a DRM system to protect its property. When trying to download the video the system informs him about required video usage rights. In order to pay for the usage rights Dirk wants to use a micro payment system. Only after having obtained those rights, Dirk is able to integrate the video clip into an MMS which he wants to send out.

B.2.7.2 Use case

Table B.8: Use case #7

USE CASE	Selection of network when roaming	
Goal in context	**Using our framework terms:** **Lifecycle:** Normal Use **Activity:** Grey-time **Context:** User is 27 years old, mobile.	
Scope and level		
Preconditions	User is used to roaming and selecting networks.	
Success end condition	User can edit the and forward the appropriate content.	
Failed end condition	Content cannot be used.	
Primary, Secondary actors	User, network services.	
Trigger	Start of long train journey.	
DESCRIPTION	**Step**	**Action**
(Main success scenario)	1	User creates MMS template.
	2	Use selects a video clip that was previously downloaded from the Internet to add to his presentation.
	3	User is directed to content owner WAP site to obtain rights.
	4	User pays for rights with micro-payment.
	5	The video is inserted.
EXTENSIONS in user actions		**Branching action: These are also potential problem and error cases**
	3	The user is surprised by this request.
(Potential problem and error cases)	4a.1	User does want to pay.
	4b.1	User cannot pay.
VARIATIONS in the phone states and behaviour		**Branching action: These are also potential problem and error cases**
	3a.1	User is not in coverage.
	3b.1	WAP is not configured.
	3c.1	WAP site is down.

B.2.7.3   Guideline topics derived from the use case

- All elements that have DRM protection should be marked by standard icons which described the operations that can be carried out.

- Detailed explanations of DRM rights should be available.

- Upon download of media item, DRM rights should be explained along with methods to upgrade these rights.

- Possible redirection to a Website should be indicated next to the link. If WAP setup is not available the user should be instructed on how to complete setup via other means.

- Redirection to DRM purchase sites should not be charged for even if no purchase is made.

- If the purchase mechanism is unavailable alternative methods should be presented to the user (e.g. free-phone number).

- DRM rights held by the user should be easily viewable.

Annex C (informative):
Reference work on setup procedures

C.1 Out-of-the-box experience (OOBE)

"The initial experience a user has in taking a new product out of the box and setting it up, in preparation for use, creates a lasting impression and constitutes an important aspect of the total user experience" [38].

Users face practical problems when they start using a new terminal, system or service for the very first time, or they want to replace an existing terminal with a new one.

The consumer terminal lifecycle is typically one to three years, while service lifecycle may be shorter. At the end of the lifecycle the terminal is normally replaced with a new one. We call this activity *product replacement*. The short lifecycle and high penetration of terminals leads to the situation where the user and the sales person must periodically cope with *first use* and product replacement. Positive user experience in these activities is critical for the success of a manufacturer or a service.

[35] identifies low usage as one consequence of system non-acceptance. Also other research [36] and [37] confirms that perceived ease of use is "an important factor influencing user acceptance and usage behaviour of information technologies". The first impression is important, and hence is the out-of-box experience. Manufacturers and service providers must consider OOBE since, for example:

- Most help desk calls occur during OOBE or first use when the user is unfamiliar with the product.

- The first-use experiences are shaping expectations for future interaction and use.

- The OOBE may be the user's first direct interaction with the company and the brand.

- Sales of products through retail and catalogue order channels are affected by how the product presents itself to users.

OOBE and set up activity can be broken down into typical steps [38].

Table C.1: Stages of a setup activity (IBM, 2006) addressed by the current document

Breakdown of setup activities	Focus for mobile setup activities (covered through use cases and guidelines)	Addressed in use case#:
Packaging and unpacking	No	
Hardware setup	No	
Power-on	No	
Configuration	Yes	1, 2, 3, 4, 6, 7
Initial use	Yes	1, 2, 3
Doing work	Yes	3, 4, 5, 6, 7
Further assistance	Yes	1, 2, 5, 6
Product extension	Yes	3, 4, 5
Product replacement	Yes	1, 3, 5

OOBE topics for mobile setup are further discussed in clause C.3.1.

C.2   Generic setup issues from related domains

It is useful to consider other information technology domains where setup procedures are important in order to understand generic issues that users may face when setting up mobile terminals or services. Within these domains, we focus particularly on generic problems that users are facing.

C.2.1   PC and network setup

PCs are the most complex consumer digital terminals which are widely used in a home environment. The user has a wide variety of customization setups that can be performed [23]. However, the flexibility and power of these terminals present particular challenges in setup activities:

- home PCs may have many different users within the family. Each user has personal configuration needs;

- upgrading PC requires the re-installation and re-configuration of software and software related to peripherals such as scanners and printers;

- new peripherals must be setup with correct software and without conflict with existing terminals;

- licensing agreements must be understood to avoid unnecessary expenses when upgrading or renewing PC hardware and software.

The explosion of **home networks** has occurred due to the popularity of both wireless and wired broadband connections. The number of broadband access lines deployed across the EU rose by over 72 % in the year to mid-2004, to 29,6 million, when the share of the EU population actually using broadband services was 6,5 % (7,6 % in the pre-accession EU 15 Member States) [24]. The increase in home networks has also been driven by the decrease in price of PC desktops/laptops and desktop equipment.

The majority of broadband solutions provided by telephone operators come complete with a modem/router/switch combo terminal preconfigured with the user's account information and service access parameters. However, problems occur when:

- the service provider changes the name of the service with or without notifying the user;

- a temporary service outage causes a user to make unnecessary but catastrophic changes to network configuration;

- the user resets the router/modem by accident and loses preconfigured account information;

- the user wishes to upgrade the modem or router;

- the user has a technical query and must identify the source of the problem, e.g. the operator network, router/modem, home network, PC hardware or PC software;

- users change firewall settings.

The interconnection of components in the home network can cause further problems for users. Networks based on Wi-Fi, Ethernet or USB are becoming increasingly widespread. Complex technologies, requiring IT professional's skills to install, manage and upgrade are being provided to consumers as the components of their home networks. The consequent gap between target user and actual end-user is proving to be a key barrier to broadband uptake [24]. Problems emerge when, for example:

- users wish to add components to the network, e.g. laptop;

- users wish to share components on the network, e.g. printers;

- users upgrade the Wi-Fi network, e.g. Wi-Fi 802.11b to 802.11g;

- the user tries to solve a problem, e.g. "No Internet, no signal". Where does the problem lie?

- users wish to remove/add/upgrade security features;

- instruction manuals use technical language that is not easily understood by users such as DNS, IP, bridge, WEP, router, switch, and modem.

The home PC can be placed at the centre of the **home multimedia** experience [25]. However, this development brings all of the problems of PC setup into the home entertainment domain.

- How to manage disc space?

- How to set audio quality?

- How to add new terminals (same issues as a PC)?

- How to ensure old terminals continue to work?

- How to ensure compatibility between components?

C.2.2 Complex home appliance and service setup

Video recorders and hard disk recorders are the classic case for poor usability but with very little study of successful solutions. However, latest terminals offer effective methods for setup, such as:

- channel tuning when the video recorder is first installed. This is accomplished by automatic "strongest" signal scanning and channel name transmission;

- setup of record start, end and channel. Accomplished by bar-code scanning directly from TV listings, "Show-View" or access to on-line programme guide;

- Hard-Disk recorders:

    - how to set and manage programme schedules;

    - how to setup disk configurations;

    - how to install hard-disk with other components, e.g. TV, DVD, Hi-Fi, and PC;

- TV/Cable/Hi-FI/DVD:

    [27] identifies a number of key problems when installing integrated home entertainment systems:

    - poor compatibility between components from different manufacturers;

    - poor user manuals for setup;

    - difficult configuration of multiple remote control terminals;

    - diverse and badly design on-screen user interfaces for setup procedures.

The transition from analogue to digital televisions services across Europe is changing the way the end-users interact with their televisions. According to [26], 20 % of EU users cannot setup digital TV services and very often the installation cannot be completed without help, Lehtola S. and Mokka S. (2002). The following issues relate mainly to the interaction between terminals:

- installation of digital decoder;

- interaction with television channel selection;

- interaction with video/hard disk recorder;

- setup of common remote control unit;

- incompatible antenna technology or configuration.

Personal health and care systems are developing with certain European markets. Some key issues in the setup of such systems are [28]:

- user identification;

- parameter threshold setting;

- alarm setting;

- polling frequency of parameters.

C.2.3 Telephone-based service setup

Voicemail systems rely predominantly on touch-tone (DTMF) input. Key setup issues are:

- how and when to set Greeting/Name setup;

- PIN code setup and what to do if PIN is lost;

- setting up voicemail behaviour, e.g. call back/SMS notification;

- error correction and "undo" in case of wrong input.

A limited number of video mail services have been launched in European markets. In addition, systems are available for use by hearing impaired users. These visual systems present particular challenges.

- Managing image quality.

Personal assistant services such as Wildfire (see bibliography) provide Personal Information Management features controlled via voice or touch-tone:

- setup of appointments;

- setup of greetings;

- setup of PIN codes and what to do if PIN is lost.

C.3 Other work on mobile setup procedures

A summary of previous work on mobile setup activities is provided below.

C.3.1 Mobile out-of-the box experience

A terminal needs to be configured prior the use of services. The following clauses will discuss some OOBE phases, and propose guidelines.

Mobile terminal and PC manufacturers face the same challenge: customers have hard times in making their smart terminals to connect locally, to Internet, or in enabling basic messaging functionality. The challenge is not made easier due to smaller user interface, manufacturer and operator specific setup (instead of common conventions or standards) and roaming limitations in cellular networks (including socio-technical elements, such as service provider policy).

C.3.1.1 Availability of setup information

Before the setup can take place, user must have the needed data and information. With mobile terminals this information may include, for example, Phone number, Phone model, User names/passwords, IMEI code, SW version, HW version, and business application software information, such as Service plan. Depending on the sales point affiliations, such as operator relationship, the SIM or other subscription method is in a separate package or part of the product package.

The service provider is advised to consider:

- which information the user may have, and which information should be delivered prior to configuration;

- re-using earlier/existing customer information.

The manufacturer is advised to consider the following:

- the essential setup information is easy to find and access;

- a quick-guide is provided for setup, instead of lengthy user guide.

C.3.1.2 Power-on

The main and critical indication of a successful power-on and setup is the attachment to service networks, indicated with a signal strength bar.

If the power-on fails the terminal does not attach to the service network. If there are problems at this stage, they are typically caused by troubles with the operator subscription or availability of the network, and not by the phone itself. The problems in network connection or service availability are often thought to be phone problems [29]. The user guide needs to give support in solving the typical power-on problems.

C.3.1.3 Configuration

Mobile terminals need work before the services are ready to be used. [34] shows that simply the insufficient understanding of different aspects of mobile communication may cause problems in the use and setup. The most commonly reported usability problems are setup and initial configuration topics, network failures and wireless hardware issues.

Mobile terminals have an increasing number of settings to be adjusted prior to first use, often related to Internet connectivity (browser, email) and messaging functionality (SMS, MMS). Configuring a mobile terminal is one of the most difficult tasks the user faces [32].

In mobile communication, many settings are operator-specific and can be adjusted when the cellular operator is known. Internet Email gives several challenges for the phone manufacturer and for the user since the manufacturer or operator is typically unaware of the user's email services, and hence cannot provide default setup. In the following we will review SMS, MMS and Internet email setup.

SMS is the most used and mature messaging function in mobile terminals. In order to use this function the operator specific *service center number (SCN)* must be configured. SCN is typically stored in SIM and the phone is capable to automatically take the number into use. The outcome is that SMS works in a new phone without user's effort.

MMS is more complex technology and not yet mature. While SMS requires only one data item to be configured, MMS requires 20 items (6 text strings, 14 selections). If the novice user is required to enter the required information manually it takes about > 30 minutes to complete, if succeeds at all. MMS setup data cannot be stored in current SIMs due to technical limitations, and hence different solutions are required:

- If the terminal is manufactured for a specific operator, the setup can be done in the factory (factory setup).

- If the terminal is sold by an operator, the setup can be done at the sales point.

- User can request the MMS settings. There are various ways to perform this, such as sending a SMS to a service number or fill in a form in a Web service. The setup data is received as configuration messages.

- User can manually configure the MMS service. The manual configuration can be helped with a software tool in a PC or in the phone.

Internet Email is globally probably the most used electronic messaging method. The two main methods for accessing Email service are using Email client and using Web browser. Several terminals today have an Email client, copied and downscaled from PC applications.

In the worst case, the user is required to configure manually Internet service (10 data items) and email (10 data items). The small terminal keypad with multi-tapping text entry is prone to typing errors. Email setup is one of the most common reasons to contact a service desk or sales point after product purchase.

The design of the configuration experience should provide:

- immediate feedback that set- up was successful (or unsuccessful);

- in case of difficulty guidance.

C.3.1.4   First use of a service

Competition drives the terminals to be smaller, have more functionality, provide latest technological inventions and still they should be more usable for the expanding user base. Very few customers are able to describe even the basic technological concepts, such as the SIM or mobile phone operator, Kasesniemi, E-L. and Rautiainen, P. (see bibliography). Even the expert users are not aware of all the terminal capabilities and are using only 2 to 3 applications in a weekly basis. It is certainly a challenge to tell the user what a new terminal can do.

In the first use the user is often in the situation where she is not able to understand what functionality is available, or which part of the functionality is provided by the terminal, service or operator. When problems are faced, the user has difficulties in understanding who should help her and what is the problem. Further, even the different parties in the service chain can not always decide who should be responsible for solving a technical or usability problem.

The first-use experience is important for the user's product acceptance. If the product is designed well and user-centred design is properly applied, the user may not experience first use problems, and there are no barriers for accepting the terminal.

Users may have difficulties even in understanding what the product or service can or cannot do [33] to [34]. The design of the First use experience should address:

- product/Service features and capabilities;

- product/Service limitations;

- sources of assistance;

- in case of difficulty guidance.

C.3.1.5   Use of device and service

When the terminal or service is taken into use, the user may perform old tasks in a familiar way, learn new ways to perform old tasks, learn new tasks, or stop doing old tasks. The question of being able to use old skills or learn new skills becomes interesting. The key elements in Doing work experience:

- help the user begin doing meaningful things they want to do;

- provide active assistance as the default;

- teach how to use supplied functionality in everyday tasks;

- provide easy and quick support in case of difficulty.

When a user starts to use a new terminal or service, she looks for familiar terms and analogies with earlier experiences, Sinkkonen I. et al. (see bibliography). If the analogical reasoning is not enough for learning, the user applies exploratory trial-and-error methods.

There are various channels for the user to get support, such as asking help from friends, contacting the sales point or calling to a service number which is indicated in the user guide.

C.3.1.6   Product and service extension

Terminal or service functionality can be expanded with in various ways, such as plugging in a GPS module or activating new service element. In many cases the existing system works well, but product and service extension leads to unexpected problems. It also shows that the problem may not be related to the system's user interface, but the system's *service or external interface [29]*.

Product extension experience should address:

- maintaining old functionality. The product or service extension must not disrupt existing work practice;

- enable easy attach *and* detach for the extension;

- prevent error possibilities;

- provide immediate feedback that extension was successful;

- in case of difficulty guidance.

[30] addresses the external interface of products, and gives a checklist for improving the setup and configuration of peripheral terminals and related software. It tries to provide guidelines that can be implemented immediately with current technologies, and increase the probability of user success with a terminal. The list can be used as informative aid when developing OOBE for mobile phone extensions.

C.3.1.7   Product replacement

In product replacement the user is concerned about being able to continue work practices she has already established.

Technical evolution of mobile terminals and services is fast and there are several operating systems in use. Product replacement challenges will emerge along the large-scale adoption of smart terminals with mass memories. The compatibility between terminal generations is difficult to build and maintain. It is not always the case that the user can transfer personal data from the old terminal to the new one, or continue using existing applications, accessories and services. Due to technical advances the terminals may provide different user interaction and data management capabilities.

We will shortly review some specific challenges. Table C.2 describes three examples where terminal replacement has impact on user's work. The example is based on replacing a mobile terminal.

Table C.2: Positive and negative terminal replacement experiences

Task	Possible positive experiences	Possible negative experiences
Change SIM to new terminal	Phonebook data is in the SIM. It is automatically copied to the memory of new terminal. No actions required from the user.	The phonebook field names are lost. The user does not know which numbers are mobile numbers.
Use browser	New terminal has default settings for the browser. Browsing can continue without configuration efforts.	Browser settings need to be configured in the new terminal prior to browsing.
Personal ringing tones	New terminal has new and exciting offering of ringing tones. User prefers to use those.	Personal ringing tones cannot be moved to the new terminal. Must be created or downloaded again.

The future of data intensive mobile terminals gives yet more issues to be solved. The following list describes some technical challenges related to personal data management:

- built-in memory: the memory capacity varies between terminals. The new terminal does not necessarily have more memory. Even if a software tool enables the transfer of data between terminals, it is not always the case that the product replacement succeeds due to memory limitations;

- memory extension: several smart terminals can use memory extensions, such as Multi Media Card (MMC). The supported sizes, technologies and capacities vary between terminals. An old memory terminal may not physically fit into the new terminal;

- data transfer: in order to transfer the data between terminals using wired or wireless connection both terminals need to be on. Most terminals cannot be powered on without SIM. In many cases the user has only one SIM;

- the user does may know what data can or should be transferred in product replacement, and the product developers should take this into account.

Product Replacement experience should address:

- maintain data: the product replacement must not disrupt the use of existing data content;

- maintain settings and applications: the product replacement must not disrupt existing work practice;

- maintain accessory compatibility: the product replacement must not disrupt the use of existing accessories without obvious reason;

- allow several replacement methods to cope with incompatible software and hardware;

- prevent error possibilities and loss of data;

- immediate feedback that product replacement was successful;

- guidance should always be provided [9].

C.3.1.8 OOBE testing and metrics

OOBE problems can be seen as system design errors. Design errors can be avoided and errors corrected only if they are found early enough, or not generated at all. OOBE design and testing should try to identify, prevent and eliminate the problems that could emerge in the first interaction between the user and product.

Can we measure out-of-box experience? Traditional product testing practices, for example functional software testing, are not suitable for capturing OOBE problems. Hence the testing methods and metrics should be sought from usability or interoperability testing practices.

The primary OOBE measure is the user's success in the task. Here we can apply perceptual measures, such as does the user succeed in taking the product into use. We can also apply more detailed metrics that are familiar from usability testing, for example:

- user performance metrics (time, errors, subjective satisfaction);

- system performance metrics (loss of data, error prevention, memorability, guessability, learnability);

- support performance (feedback time, problem solving capability).

C.3.2 Other applicable guidance

During the development of the present document, we have studied and reference the following:

- [1] provides some high-level guidelines, covering generic mobile setup activities;

- operator specific guidelines (e.g. Vodafone live! (see www.vodafone.co.uk));

- OMA addressing setup activities in discussion documents, e.g. in [31];

the GSMA addresses setup activities, GSM Association Homepage (see bibliography).

C.4   Solutions currently available in mobile networks

Over the Air (OTA) configuration was introduced in year 2000, mainly as a solution to overcome the complexity experienced with WAP configurations. On a user's request, a terminal-model specific configuration SMS message is sent to the terminal, which can also include username and password. It is installed after user acceptance. OTA is now standardized in OMA (Client Provisioning, see [41]) and supported by an increasing number of manufacturers and operators.

Over the Line (OTL) configuration is based on the principles behind OTA and was standardized by ETSI for fixed-line services, e.g. fixed-line SMS and MMS [40].

OMA has recently started work on Device Profile Evolution (DPE) with the aim to let terminals detect changing conditions, changes in available networks (fix, mobile) and to adapt to those conditions in a seamless way, see http://www.openmobilealliance.org/

Furthermore, manufacturers and service providers are developing methods for **Automatic Terminal (Device) Configuration (ATC or ADC),** Ericsson's active terminal management (see bibliography). The problems are typically related to interoperability, terminal upgrade or problem situations. Key benefits of ATC/ADC include first-use terminal discovery and immediate and up-to-date access provisioning and the possibility to use new services immediately without complex and error-prone interaction, Furthermore, ATC/ADC is network independent (works on GSM, GPRS and WCDMA networks) and leads to increased user satisfaction at lowered customer care costs.

The most recent offerings on the market can update software and firmware of mobile terminals already in users" hands, enabling mobile handset manufacturers and mobile network operators to create, install and manage firmware updates over-the-air. This is often standards-based software that works with any OMA Device Management-based server allowing operators to provide, support and update mobile terminals over the air.

Annex D (informative):
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