

**Human Factors (HF);  
User Interfaces;  
Generic user interface elements for 3G/UMTS  
mobile devices, services and applications**

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## Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Human Factors (HF).

Intended users of the present document include user experience, interface and interaction design professionals, developers of mobile devices, services and applications, mobile network and service providers, terminal approvers, standard writers and developers and others.

NOTE: Due to ever-evolving organizational and operational differences in professional responsibilities and roles, a stricter limitation of the intended users would be improper.

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## Introduction

ICT plays an increasingly important role in the daily activities of most people and promises a world where ICT resources improve further the quality of life. It is therefore increasingly important to ensure that ICT products are developed and designed in a usable and accessible manner, so that anyone, regardless of their abilities or age, can use and profit from them in the best possible way.

The global number of mobile subscriptions continues to grow and is now estimated to nearly 4 billion. According to the latest available subscriber data (sources: GSM Association, [http://www.gsmworld.com/newsroom/market-data/market\\_data\\_summary.htm](http://www.gsmworld.com/newsroom/market-data/market_data_summary.htm), the UMTS Forum, <http://www.umts-forum.org/>) and the CDMA Development Group, <http://www.cdg.org/>), the total number of global mobile subscribers by the end of 2008 is approximately 4 billion, with 3 billion GSM subscribers, 450 million 3G subscribers (and an additional 450 million CDMA2000 subscribers). GSM and W-CDMA stands for nearly 90 % market share of mobile communication subscriptions worldwide.

The mobile telephone has become the most successful and most widely spread personal ICT device. The user experience of mobile communication has become one of the decisive factors for the uptake and use and thus, the success of the service offering to a global user community. The capabilities offered by mobile solutions have evolved considerably during the past two decades, from basic telephony to video telephony to mass-market broadband access and services such as integrated, real-time data applications like navigational services or instant access to on-line, personalized media content and applications and have become a commodity of everyday life. "Consumers and business users are quickly getting used to megabit speeds on the move. And now the mobile broadband genie is out of the bottle...the new value chain we confidently predicted that 3G would create a decade ago is a flourishing reality" [i.28].

The "consumerisation" of ICT is increasingly driving ICT markets and development. This trend, strengthened by ever-increasing global penetration and the provision of access to information and communication services is leading to a continuous technology development and innovation to expand to all social spaces.

Connectivity and interoperability between telephony networks, personal computing, the Internet, and ever-smarter mobile devices and services offer a considerable potential for improving life. However, there is concern about whether these new products, services and their content will be fully accessible and efficiently usable to all people, including children, aging and disabled users. An effective *e*-society relies on the fact that as many citizens as possible are granted access. Users who i.e. cannot get over the hurdle of the first installation of their devices and services may perpetually be excluded from the *e*-society [i.23].

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# 1 Scope

The present document addresses the user interfaces of 3G/UMTS-enabled devices, services and applications from the end users' perspective, and provides generic design, development, deployment and evaluation recommendations.

The applicability of the present document expands beyond EG 202 132 [i.1] and TR 102 125 [i.2], by taking into consideration some important, although not always technically unique characteristics of the 3G/UMTS mobile communication ecosystem, as experienced by the end users during their interaction with the technology (e.g. device UI characteristics, seamless connectivity between different kinds of networks, quality and continuity of services and their provisioning and the data-intensive service and application offering).

The user requirements and rationale for generic UI elements provided in [i.1] and [i.2] remain applicable to the systems and services addressed in the present document, as also the technologies covered by [i.1] remain an integral part of the 3G mobile communication environment. Furthermore, the present document, in the same way as [i.1], does only provide recommendations for UI elements and does not address complete UI designs, nor their implementations.

The present document does by any means not intend to restrict the ability of market players to define, develop or differentiate their products, nor does it in any way intend to limit their options to trademark UI designs and implementations, UI blocks or position the user experience of any (e.g. brand-or service-specific) UI designs or implementations as a competitive edge.

Wherever possible, a Design-for-All philosophy and inclusive design principles have been applied, taking the need of all users, including young and older people and users with sensory and functional limitations into account.

The considerations listed in the present document are intended to contribute to further improvements of the user experience of the future mobile communication environment, by complementing specifications from 3GPP, ETSI, OMA and others, with the intention to be considered during current and future development and deployment processes.

The addressing of costs and tariffs is outside the scope of the present document. However, as these closely relate to the establishment of end user trust in the mobile ecosystem, enabling more use in cases where uncertainties may lead to undesired user behaviors (e.g. no use), some advisory considerations are listed.

Any recommendations provided in the present document should without any exception be superseded by 3GPP specifications, in the case of any uncertainties or possible conflicts with current mobile standards and specifications.

Ergonomic issues related to hardware design and machine-to-machine interfaces are outside the scope of the present document.

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# 2 References

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.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

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.

## 2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

Not applicable.

## 2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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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 adaption

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

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

**end user:** person who uses a telecommunications device 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 device. Also, the user may or may not be a person with impairments.

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

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

**Quality of Experience (QoE):** user perceived experience of what is being presented by a communication service or application user interface

**Quality of Service (QoS):** collective effect of service performance which determines the degree of satisfaction of a user of the service

NOTE: See ITU-T Recommendation E.800 [i.49].

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

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

NOTE 1: See ETR 095 [i.50] and ISO 9241-11 [i.51].

NOTE 2: 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 devices and the telecommunications system (see ETR 116 [i.52]).

**User Interface (UI):** physical and logical interface through which a user communicates with a telecommunications device or via a device 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, devices 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:

2G	2 <sup>nd</sup> generation, GSM-enabled mobile networks (see GSM)
2G+	evolved 2 <sup>nd</sup> generation, GSM-and GPRS and/or EDGE-enabled mobile networks
3G	3 <sup>rd</sup> generation mobile networks (see UMTS)
3G+	evolved 3 <sup>rd</sup> generation, HSPA-enabled 3G networks (see UMTS and HSPA)
EDGE	Enhanced Data rates for GSM Evolution (the final stage in the evolution of the GSM standard)
GPRS	General Packet Radio Service
GSM	Global System for Mobile telecommunication
HSPA	High-Speed Packet Access
HSDPA	High-Speed Downlink Packet Access
HSUPA	High-Speed Uplink Packet Access
ICT	Information and Communication Technologies
IMS	IP Multimedia Subsystem
IMT-2000	International Mobile Telecommunications-2000 (standard family)
ITU-T	International Telecommunications Union – Telecommunication standardization sector
LTE	Long-Term Evolution

NOTE: Of 3G/UMTS mobile networks; also known as 4G.

MSD	Minimum Set of Data
NFC	Near Field Communication
NGN	Next Generation Network
OMA	Open Mobile Alliance
QoE	Quality of Experience
QoS	Quality of Service
SIM	Subscriber Identity Module
SMS	Short Message Service
UCD	User Centered Development
UI	User Interface
UMTS	Universal Mobile Telecommunications System

NOTE: The European entrant for 3G; now subsumed into the IMT-2000 family as the WCDMA technology.

USIM Universal Subscriber Identity Module

NOTE: The 3G equivalent of the GSM SIM.

WCDMA Wideband Code Division Multiple Access  
WLAN Wireless Local Area Network

NOTE: Commercially known as Wi-Fi, ISO/IEC standard family 8802.11 [i.53] x.

WIMAX Worldwide Interoperability for Microwave Access

NOTE: IEEE 802.16 [i.54] and IMT-2000.

W3C World Wide Web Consortium  
W3C MWBP Mobile Web Best Practices Working Group of W3C

## 4 Approach and introduction to 3G-specific aspects

### 4.1 Development and innovation

The recommendations provided in the present document have been developed and structured with the following aspects in mind:

- 1) The properties and capabilities of devices evolve, as technological improvements and innovations come to the market, when transferring from 2G to 3G (and 3G+ and foreseeably, LTE).
- 2) Users may need to cope with new challenges when using increasingly complex ICT devices and services.
- 3) Services and applications become increasingly ubiquitous; for those features used, users need to understand the opportunities offered by and consequences of using these services in different environments and locations.
- 4) The interdependencies between services, applications, networks and devices become more prominent. Perceived quality at the point of consumption is no longer only dependent on the processing capabilities of individual devices but rather on the overall performance of a complex ICT system.
- 5) Technical capabilities and constraints are well defined and have a considerable impact on the end user's mobile ICT environment.

The major changes in the developing mobile communication market can be examined through the characteristics of services, devices, media and applications, access to the Internet, system performance aspects, configuration and costs and tariffs aspects. These are addressed in clauses 4.4 - 4.10, following an overview of user and operator aspects and requirements (provided in clauses 4.2 - 4.3).

### 4.2 User aspects and requirements

3G, as well as LTE maintains most telecommunication functions known from earlier generations of technologies (with some exceptions, e.g. data and fax services). The technology evolution gives further enablers and opportunities for the mobile device users to handle personal digital content in the device and content located in other places. There are several improvements that are not defined by 3G as such, but follow as consequence of the development. For example, the user can typically:

- Store larger amounts of content in the device, due to an increased availability of memory solutions at lowered costs;
- More easily transfer the content between different devices and services, due to the availability of connectivity standards, memory cards, fast connections, etc.;
- Purchase, view and enjoy various types of media content (e.g. text, files, pictures, videos, music, etc.), and extend these capabilities, due to typical 3G device platform software add-on flexibility;
- Process and manage the data in the device, due to better user interfaces and processing capabilities (Edit, organize, search, filter);
- Update and extend the device software easily or with low effort, in many cases.

Users are able to connect to the Internet at sufficient speed and bandwidth almost anytime and anywhere. The time needed for connection is typically measured in seconds, and the download/upload bandwidth is measured in megabytes per second.

Along the improving coverage of 3G networks, there are less connectivity barriers for the use of applications and services. In 3G environments, the user can, anywhere within the 3G coverage (and in fall-back situations, where GPRS or EDGE is available):

- Browse the Internet. Mobile Internet browsers can access any basic content. Typically there are some limitations related to specific data plug-ins, support for different versions of Java, Flash, etc.;
- Access dedicated Internet-based services either with the browser or with service specific applications;

- Upload and download content from online sources and even devices located in the user's environment, such as home computers and office servers;
- Conduct secure transactions, based on applications and standards already in use in the wire-line Internet domain and in 3G specifications;
- Conduct remote monitoring or remote control tasks (e.g. remote healthcare or building control).

However, the access to 3G services is not always guaranteed, and the quality of service may differ widely due to network set-up and attributes, roaming agreements etc. Due to the amount of data traffic it can sometimes be difficult to understand or predict the expected costs of using 3G services. Unpredictability of involved cost may become a major reason for the avoidance of 3G data services or a major slowdown for their uptake, and vice versa [i.23].

The applicable generic user (meta-) requirements on mobile communication have been examined and are reported in EG 202 132 [i.1]. These are considered still valid and remain applicable.

### 4.3 Mobile network operator aspects and requirements

In addition to the requirements reported in [i.1] and as mentioned in earlier clauses of this clause, designers of 3G applications and services should be aware that their products may be offered by different service providers with varying network capabilities. Interoperation of services and applications delivered over different networks to a multitude of devices on different software platforms may cause major usability problems and obstacles to the rapid uptake and acceptance of 3G services and applications. User interface designers need to be aware of the requirements and limitations imposed by networks and their operators.

A second aspect to be considered is the interest of network operators to express their brand identity through company-specific user interface design guidelines for services and applications. While these guidelines may help to enhance the ease of use of services in the general sense, mobile network operator-specific UIs should be designed to allow users to access services and applications in different network environments, or while roaming.

Interoperability across manufacturers, software platform providers and network operators is of significant importance and if full interoperability is overlooked, there may be a major obstacle to service acceptance and use.

### 4.4 Service aspects

3G networks are rapidly becoming main-stream, mass-market in a high variety of cultures and regions. Also the penetration of 3G devices is rapidly increasing accordingly.

According to the ITU IMT-2000 (3G) definition [i.39], 3G devices need to support:

- High bit rates and wideband connections;
- Services that require fixed bit rate and service that need to allow variations in the bit rates;
- Fluent transition between operator networks and countries (roaming);
- Geographical positioning of the device; and
- Multimedia services.

The main factors differentiating 3G from 2G services are:

- Higher bandwidth: Recommendations are provided on what might happen if the bandwidth is too low for a service.
- More transitions between different network types during usage; and
- The evolution of operator policies.

These factors have a considerable impact on the 3G user experiences and service adoption.

## 4.5 Device aspects

Typical 3G devices are often characterized by a large colour screen, a variety of input solutions (12-key, and/or a QWERTY keypads and/or touch user interfaces) and sufficient processing power and memory capabilities to perform basic and advanced multi-tasking computing and connectivity tasks, i.e. high interaction performance in a small and compact form factor. Simultaneously, the global competition is bringing the average retail device prices down.

The main factors differentiating recent evolutions in devices (including 2G to 3G development) are:

- The potential to deal with much larger amounts of data and information. Such devices should be able to organize efficiently and present this data in a way understandable to the user;
- Users may want to understand and control memory management and applications running in parallel, as well as the interdependencies between applications and data ("Lost in hyperspace");
- Blurring the separation of local and remote memory/applications: the user should be helped to understand where to modify preferences, etc.;
- Higher variability of device hardware: from PCs to embedded devices: users should be helped to understand how to transfer relevant, acquired usage know-how from one device type to another;
- Increased complexity leads to more possibilities to user errors: error recovery issues become much more important.

According to [i.29], 3G devices are characterized by:

- Higher processing power and more memory capacity;
- Larger and more powerful displays;
- Operating systems with multitasking abilities allowing for parallel user activities;
- Operating systems with the ability to handle several connections simultaneously.

These new or enhanced features allow for more complex application and software systems with new features as e.g. user-initiated or automated OTA software updates. These new functionalities may need to be understood and controlled by the user especially if they, as a consequence, are confronted with new icons or symbols which provide visual indications of system and application status; complex system and device messages which require attention or interaction; or messages caused by events in simultaneous connections or changing connection characteristics (QoS). Moreover, user interaction to set up features and understand and respond to errors may become much more complex than in the case of 2<sup>nd</sup> generation mobile devices.

Different 3G-enabled devices with the option of having multiple connections (cellular, WLAN, WIMAX, and NFC) require the user to be aware of and to control data and transmission security, privacy and data integrity issues which should be taken into account by UI designers developing these devices.

## 4.6 Media aspects

In the foreseeable future all media that can be digitized, will become digital. In fact, even today a major part of our activities and information is already in digital form. 3G is the environment where operators and service providers can distribute (in principle, at least) all digital media to customers, such as music, TV programs, games, advertisements, news, new applications and any digital documents. On the other hand, users are able to create and use interactive services, to upload and share content, and to create new behaviours based on mobility and communities.

Due to novelty of the 3G technology and mobile Internet services there are still limitations disabling the use of services and media, related to:

- Devices: interoperability with services and with other devices, varying capabilities, devices which are not fully optimized for the use of large and dynamic data content;
- (Internet) Services: availability, costs and tariffs, roaming limitations, accessibility, local vs. global availability;