

Design Guidelines for Setup Procedures of Mobile Terminals and e-Services

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Abstract

The ETSI Technical Committee Human Factors (TC HF) has initiated the development of guidelines for the design of setup procedures of mobile terminals and e-services. This work is performed under the e-Europe 2005 action plan, by and in close collaboration between major industry players and ETSI. The goal of this activity is the development of design guidelines for user interface and service developers based on specific use cases which help to understand the difficulties users are experiencing when configuring their devices or accessing the services.

We will present a selection of use cases and design guidelines developed from these use cases in order to receive feedback from the HFT-community on the relevance of the use cases on which our work is based, the validity of our approach and current set of draft guidelines.

Key words: ICT, Setup procedures, mobile devices, e-services, mobile computing.

1. Introduction

Mobile devices play a key role in the daily activities of many people. The mobile telephone, as an example, is a highly successful device which meets a deep human need to communicate. However, new mobile applications and services are increasingly used to perform, not just basis communication, but a variety of tasks such as commerce 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 information and communication services and ever-smarter mobile devices offer enormous potential for improving life, if used as intended and accessible by all users. 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, and disabled users.

An effective e-Society relies on the fact that all citizens are granted access. Users who cannot get over the hurdle of the first installation and set-up of their devices, configuration of services, and integrated or additionally offered applications may be permanently 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 financial terms, describing those who could afford new technology from those who could not. As technological progress in network and infrastructure deployment as well as 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 setup, configure and use new devices 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 successful level if the new devices and services can actually be accessed, setup 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 messaging (SMS, MMS, voicemail) through their mobile devices. Users lack the expertise necessary to configure and set up their devices, services and applications appropriately. Furthermore, even the configuration of device properties to the desired behavior is often beyond the users’ abilities.

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

While many settings may be achieved through “Over-The-Air” (OTA) or “Over-The-Line” (OTL) configuration, 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 the matters of privacy and security, e.g. if the service provider is able to control specific parameters and to which grade these should provide trusted and fully functional solutions for the end user.

It has to be recognized that many existing services (both broadband and narrowband) cannot be fully utilized by many users due to problems in either installing and configuring services on their devices or understanding the full potential of these services. These obstacles are even more emphasized by a number of developments in society:

- Changing population demographics: The number of elderly people and people with special needs is growing rapidly, requiring additional support and dedicated efforts for those unable to cope with every day’s technology;
- Population mobility: More people are accessing services from mobile devices offering limited user interface capabilities;
- Increasing user expectations: Users are becoming accustomed to plug-and-play systems with fully configured components. Therefore users will have similar expectations of mobile products and e-services;
- The deployment of advanced social services (e.g. telecare services): These will require a complex level of interaction between the user and the service over and above voice and text messages increasing the requirement for a high level of user interface design also involving a trusted relationship between service operator and customer;

- Access to services by all: There is an increasing accessibility gap between technology-aware and less skilled user groups;
- Increasing variability in the segmentation of customers: as mobile devices become mass market products, the diversity of users and their capabilities and limitations has increased. Children as young as 6 to senior aged over 80 now make up the customers base of the ICT market;
- Users' inability and lack of interest to cover important (but in a normal, user-centered, functionality-oriented scenario, less relevant) aspects of their communication such as security aspects;
- EU Policy: The eEurope 2005 Action plan aims to give everyone the opportunity to participate in the global information society.

All of the above dynamics in society mean that now, more than ever, there is a need to address the needs of all people when designing and developing mobile products and services. As the hurdle to using remote services is the highest for first-time users with limited capabilities, there is a need to simplify first access to services as much as possible, provide clear guidance on configuration and use, as well as providing a clear description of service features and the limitations of specific services.

Therefore, understandable set-up procedures and the availability of educational material become very important. Even with fully automated set-up procedures, user guides and quick reference guides will be necessary for day-to-day use, as fully self-explanatory user interfaces are far from becoming reality on today's devices with their user interface restrictions and limitations. Furthermore, human memory is far from perfect - users will always have a tendency to forget already learned usage procedures or specific subsets of them (e.g. passwords or commands) over time.

2. Our framework

Use cases provide a common non-technical language for investigating user activities and their relation to system behaviors [3]. By providing 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 set-up interactions. In this way, use-cases clearly present the motivation behind the guidelines which we develop during our work.

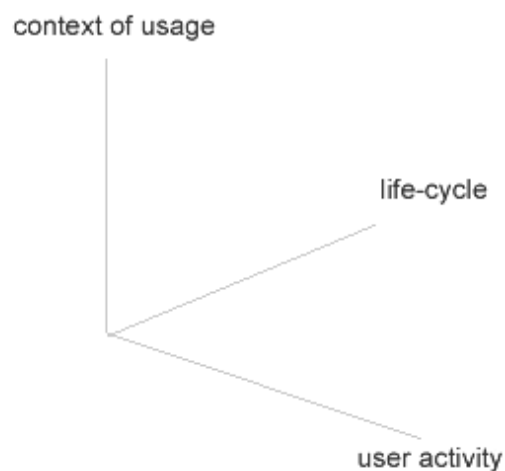
It is clear that low-level setup activities can form part of many different mobile activities and are rarely an end in themselves. (in the rare cases where set-up is the main task, e.g. configuring a new bearer such as GPRS, automated set up is preferred making the use case very simple). Therefore, for the purposes of this report, in order to ensure that key mobile end-user goals are considered, use cases are defined which have high-level goals rather than addressing low-level setup activities.

For example, "Set-up of MMS" is a low-level setup activity which would be necessary in many peer-to-peer and peer-to-service communication goals, e.g. "Martin wishes to send a photograph that he has taken with his mobile phone to his friend Peter".

To ensure that our use cases cover all relevant aspects of setup activities, we classify them using a three- dimensional framework:

- (a) The life-cycle of device/service usage: a setup activity can occur when a new service or device is first put into use, during standard usage or at the end of its lifetime when the device or service is replaced by a successor.
- (b) The types of user activities: high-level setup activities are considered for a number of activities including personalization, service activation, m-commerce, communication, synchronization and updates, filling “grey time” and service discovery.
- (c) The context of usage: Key aspects of context are
 - the user (personas can be used to address needs of special user groups);
 - mobility (walking or standing, static but in transit (e.g. in a train), static with/without laptop (e.g. in the kitchen)).

Figure 1: Key dimensions for setup activities



3. Use case examples

The use cases employed differ from standard use cases in that they contain an element which necessitates setup or reconfiguration of a device or service. Here are some of the use cases analyzed along with details of how they fit into our framework:

- **Personalization:** Peter wants to get the same settings (skins, music, ringer tones etc.) that he has on his old phone on a new phone bought in Spain. (Peter is a retired UK inhabitant, living in Spain, with PC available)
- **Service activation:** Bruno would like to activate a new service (cost-optimized GPRS-roaming) and disable the predecessor (Bruno is a deaf user).
- **M-Commerce:** Johanna (a female adult) wants to update credit card information at her favorite on-line store.
- **Communication:** While commuting to school Lea wants to send an mms but cannot send the message. (Lea is a high-school student).
- **Synchronization/update:** Peter (an adult) has lost his phone and needs to recover his personal information onto a new device. Also, he wants to protect his information on the lost phone.
- **Filling “grey time”:** Museum guide use case

- **Service discovery:** While traveling Alberto (a 45 year old manager) arrives in a foreign town and wants to find out which services are available to him including information on the cost of these services.

4. From case studies to UI guidelines – the process

The generation of use cases and resulting guidelines was an iterative task based on expert knowledge, data sources and industry-expert feedback. A high-level process is defined in Figure 2.

From the description of specific use cases, it is possible to infer both user requirements and the respective guidelines for the design of the setup processes. The use cases can then be used as a discussion platform to present findings to other experts and user representatives. In consecutive iterations with these groups the feedback generated can be integrated into a final list of design guidelines.

User interface design guidelines for the design of setup procedures can be categorized with respect to the purpose which they are supposed to fulfill. We have chosen a number of important design rules which we call main principles, and have collected those design guidelines which help to design procedures which adhere to these principles.

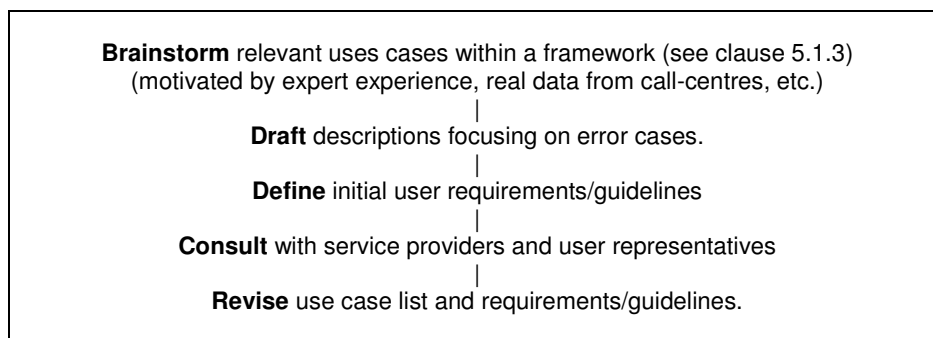


Figure 2: From initial use cases to requirements and guidelines

In the below, the main principles are introduced, and the respective guidelines are listed below. It should be noted that specific guidelines may be relevant to different main principles and appear therefore in several sets of guidelines. Where possible, we have cross-referenced these guidelines with multiple appearances.

The following 11 main design principles were identified:

1. Leave the control with the user;
2. Automate as far as possible;
3. Keep configuration at a minimum number of steps;
4. Keep necessary addresses for help/information;
5. Provide all necessary information to the user;
6. Provide all configuration information in the user's native or other preferred language;

7. Provide all configuration information in the user's vocabulary;
8. Allow for human error;
9. Allow access to setup-information during setup-procedures;
10. Use existing standards and guidelines; and
11. Design for differing user abilities.

5. Selected design guidelines

The guidelines presented below are the result of previous work [1, 2] as well as being based on use cases such as those described in section 3. A more complete list of guidelines will be presented at the conference:

- Do not display machine code error messages;
- Where necessary, provide explanations of concepts that need to be understood by the user during configuration;
- Provide consistent terminology across all sources of configuration information. In addition, supply relevant information when using different terms for the same topic (for example name server vs. DNS server);
- Avoid giving unnecessary information to the user;
- As far as possible, hide technical concepts that the user does not need to understand during configuration;
- Provide error handling to prevent a change of setting entries which would in turn prevent access to basic services;
- Provide help in problem situations.

6. Outlook and future work

The purpose of our paper is to initiate a discussion within the HFT community and to gain feedback on our approach and current set of recommendations. From the consultation process we expect valuable input for the finalization of our guide for user interface designers. We expect that all elements used in our process, the list of our use cases, the list of user requirements and the list of design guidelines will be subject to some modifications to arrive at the final version of our ETSI guideline.

We will present our approach to industry stakeholders and will use the results of these consultations to revise the initial list of use cases, user requirements and UI design guidelines. The expected audience of our final result, the ETSI Guide (to be published during the second half of 2006), comprises:

- Manufacturers, who will be motivated to provide good service setup procedures for user groups with different requirements;
- Operators, service and application providers who benefit from the guidance given in the document as many features that are under-used today may generate more revenues in the future, if better user instructions help users to discover, set up and use these features.;
- Operators and device manufacturers, who should experience a decline in the necessity for user support if the guidelines are applied appropriately.

The obvious benefits for all end users will be reflected by a reduced digital divide, opening up access to, and the use of, the potential of future systems and services in the information society for all.

There are a number of important issues to be considered which are beyond the scope of our ETSI guide and which deserve to be addressed in more detail. One topic is the question, how the guidelines can and will be applied by practitioners. While some of the guidelines are rather straightforward and easily put into practice, others are on a more abstract level and the possible effects on their application may depend heavily on the abilities of the individual user interface designer.

In other cases, guidelines might lead to contradictory design solutions and the decision which guideline to apply in a specific design situation is in the sole responsibility of the designer. The question of the relevance of an individual design guideline needs to be addressed. We assume that in-depth experience reports from designers using our guidelines should help us to fine-tune the set of guidelines as well as to identify contradictory guidelines which need to be reworked in order to become more applicable.

Besides questions of practical applicability we also identified a number of open topics which should be the topic of future research activities. The ETSI Guide under development is very much focused on the application of our guidelines to real devices and services, but it also directs to topics which need further research before reaching applicability.

The complexity of setup procedures for mobile services has its root cause in the complex relationship and the far-from-perfect cooperation of services, network infrastructure and devices. Each of these system components has its own setup procedures designed by an individual company or designer. The user interface complexity of the setup for such a complex system can only be minimized by automating large parts of the setup process thereby making it totally transparent to the individual user.¹

Every setup activity which goes beyond those fully automated setup procedures may still present a high degree complexity to the user. How to achieve this automation and transparency in a real-world system is a topic which should be addressed by the research community. For individual components of this system (i.e. devices or services) we see automated setup procedures to become state of practice in the very near future.

Another topic worth of future research is the setup of accessibility features for people with special requirements. How can a device or service be configured for use by blind people by a user who is unable to communicate with the device or service? The current procedure, to have another person do the necessary configuration, is clearly not an acceptable solution. Although a number of possible solutions can be imagined it is unclear which process would give the maximum control and flexibility to people with special needs.

Similar questions arise when we think about devices and services being used by very old or very young users, possibly unable to write or read. Is it sufficient to offer alternative interfaces or do we need to get external support into the configuration process?

¹ In the field of television the situation is quite similar. The interworking of network, content provider, TV-set and VCR makes the design of a truly easy-to-use VCR a very challenging task. Only by using the possibility of the different components to organize themselves without user intervention it becomes possible to define a VCR user interface that can be mastered by the majority of users.

The setup of services involving different users is another area where many open topics can be identified. In family settings where parents want to be able to both control the setup of their children's device and to have access to those devices and to their children through associated services the question of control over setup procedures and over the resulting configuration deserves some attention. Similar questions arise when several people are able to influence the setup of one service. Who will be the controlling party and how can modifications that are overwritten by other users be communicated?

It will be a worthwhile endeavor to test the design guidelines collected in our ETSI guide in real world applications. We believe, however, that it would be much more useful to test these guidelines prior to their publication. What is still lacking are test approaches which allow us to evaluate the value of guidelines before putting them into real use. It seems clear that even usability testing of resulting setup processes is a very time consuming and difficult task because setup processes are quite often not consecutive and may take place in different locations due to the mobile nature of the devices used. The knowledge base on how to test such design guidelines is far from sufficient and needs further elaboration.

Defining setup procedures for devices and services so far always has been a very technology-centered task with only limited applicability if the underlying technology changes. Finding truly user and usage centered guidelines which are independent from the underlying technology and open to developing usage areas is a task both challenging and promising. If successful, the resulting guidelines can be applied to services and devices currently being defined on the conceptual level.

7. Acknowledgements

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8. References

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