

Open Smart Card Infrastructure for Europe

V2



Volume 2: User Requirements

Part 1: Best Practice Manual

Authors: eESC TB8 User Requirements

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1. Scope

The scope of the User Requirements Best Practice manual is to provide ICT product designers, developers, and builders, as well as system integrators and purchasers with a high level, easy to read and use, entry point to the issues that need to be addressed when considering User Requirements of ICT products and systems. This manual deals with smart cards as access tokens to ICT based applications and services and the role played by smart cards in supporting User Requirements. The manual covers the following topic areas:

- Definition of the target audience
- Definition of Users as applicable to this manual
- Definition of User Requirements
- Areas of User interaction addressed
- The detailed subject matter to be addressed
- The target of evaluation and the approach to be taken

The scope of this manual is restricted to the elements of the “interface” between the User and the system, i.e. the smart card, some elements of the terminal, and the communication between the card and terminal. For example, the use of a contact smart card and various elements of the terminal, where the User takes command of the system in order to achieve his or her aims. The User will insert a smart card into a reader slot on the terminal, and facilitate a specific process or task involving interaction with the User and the provision of response output to the User.

2. Terms and Definitions

For the purposes of this document, the following terms and definitions apply

Abort	To abnormally terminate a process
ATM Terminal	Also known as a Cash Dispenser, an unattended financial services terminal with public access
Authentication	The validation of a process or claimed identity of a person
Icon	A pictorial place-marker
ICT Systems	Information & Communications Technologies based systems and services. usually taken to be the provision of electronic services to a person where the services may be online or off-line, attended or unattended. Also known as e-services
Inclusivity	Ensuring the inclusion of or taking into account the widest range of person types relating to social inclusion, physical or mental disabilities, ethnic and language differences
Pictogram	A picture replacing words to convey a process, procedure or action. Used to aid Inclusivity
PIN	A numeric security code known as a Personal Identification Number and used to access secure information or validate a secure transaction

3. Introduction

3.1. Purpose of the Manual

This manual is produced by the eEurope 2002 Smart Card Charter Trailblazer 8 - User Requirements group - as a Best Practice manual for the use of smart cards within the Information Society. It is aimed at categorising issues relating to Users capability and desire to interact with ICT systems such that system designers can give maximum consideration to User Requirements in order to ensure a design of system, interfaces and applications that will be most acceptable to Users.

It is recognised that there are many detailed level documents attempting to cover this subject and this manual does not set out to be “just another such manual” or to act as a compendium of existing works. Rather it takes a practical view of the subject in the hope that those interested in supporting User Requirements in their work can use this text as a definitive simple guide to those areas where some special thought and effort is required, as well as to list some pitfalls to avoid. Since most designers and implementers of systems and products cannot afford to spend too much time and effort on User Requirements, yet the subject of User Requirements appears to be one of the keys for the wide adoption of smart cards, it is hoped that this manual will provide some useful and easy-to-implement guidelines on the subject of Best Practice in satisfying User Requirements.

This manual has been achieved through the efforts of a number of expert and dedicated parties working within Trailblazer 8 of the eEurope smart card charter and it is based upon their knowledge and experience, inputs from the other Trailblazers within the eEurope 2002 smart card initiative, other inputs from relevant representative organisations and analysis of existing work already carried out in this area. As such, it represents a concise amalgam of many diverse inputs. However, in order to reduce the work done in the preparation of this manual to manageable proportions, most effort has been concentrated on User Requirements with respect to four key market segments:

- e-Government
- Financial transactions
- Public transportation
- Health

The Best Practice manual is intended to be a User oriented reference book, for purchasers, designers and developers of ICT systems. It aims to cover the spectrum from specifying and procuring a system to actually developing some of the elements within it.

The manual reviews basic procedures for User interaction with an ICT system such as getting started, aborting a transaction, repeating it, finding help, restarting a procedure, carrying out a security check on the system, signing an information object, updating data in the system (card and device), selecting the right level of privacy required by the User or more generally allowing the User to decide who is going to look at what among his or her private data. Other issues covered include memorising process sequences and providing short-cuts for repeated use.

While this manual is not prescriptive on the subject of User Requirements and it admittedly does little more than scratch the surface of the subject, its key purpose is to make the reader think about the subject. Indeed, it is hoped that the reader will be motivated to think clearly and laterally about User Requirements with respect to their product, system or service in such a way that taking User Requirements into account beneficially affects their work, increases end User take-up and results in a net financial gain for the reader's operation rather than incurring a cost in supporting User Requirements.

3.2. Layout of the Manual

The Best Practice manual is a “living” document in that it will reflect the changing nature of the ICT marketplace and the role of smart cards within it. Accordingly, it is the intention that this manual will be subject to regular update and revision as part of the European process for updating standards and associated items.

Each of the functions covered will be described and detailed at three levels. For this first edition of the manual every function listed will not be described fully at every level, but it is expected that all the missing elements will be covered in subsequent revisions. The levels under which each function is described are as follows:

- High Level Requirements
- Functional Specifications
- Recommended Technical Solutions

The High Level Requirements will satisfy the main intended readership of the manual, that is, those wishing quickly to identify the major User Requirements issues that should be addressed in the provision of equipment and systems. The prime objective of this first edition is to cover at least the high level User Requirements.

By way of example, the levels may be described as follows:

- Level one: High Level Requirements:

It might be stated only that something is to be achieved within a limited time, since delays within such a period are short enough not to be noticed by a User.

- Level two: Functional Specifications:

Here we would give values - in certain transactions the time taken should be less than half a second, in other transactions the time taken should be less than 3 seconds.

- Level three: Recommended Technical Solutions

For all problems and issues, the manual will attempt to add something that shows how specific issues may be addressed. For example, the use of contactless cards to assist those with fine motor control problems; the use of elliptic curve encryption technology to reduce the time a contactless smart card needs to be held in the receptor field.

At the lower levels this document will begin to overlap with the many existing detailed level documents on the subject. In many cases the amount of detail already available is so great that implementers are often put off of properly addressing the subject. This Best Practice manual, even at the lower levels, attempts to present information in a concise and readily understood manner. Its unique “Final User’s Perspective” will, on occasions, lead it to specifications different from what is already published. The Manual tries to speak “from the Users” and not “for the Users”.

The levels shown above are logically grouped under each function or topic. At all levels the manual tries to be both practical and thought provoking, while proposing a way to approach the functions at a generic level. It does not aim to provide a detailed technical blueprint for the achievement of the specified functions.

Annex 1 to this manual “Reference Material & Related Documents” lists the main documents that were reviewed and used as input, including existing and planned standards and other similar documents (e.g. CEN/ISSS Workshop Agreements). In general, this manual supports the referenced documents although as stated above, this document attempts to summarise the vast mass of available material into a digestible form.

3.3. The Target Audience

The Best Practice manual is intended to be an initial key issue primer for all those interested in User Requirements within the field of ICT where smart cards may be involved. In general, the smart card, as well as providing functionality to the system, will play a key role in supporting User Requirements. This is highlighted in Section 5.3 Basic Functions where the discussion focuses on “doing things with a smart card”, that is using the smart card to help you in your use of ICT based services; and “doing things to a smart card”, where the discussion concentrates on the information to be loaded onto a smart card and later reviewed/amended in order to support the smart card’s role in aiding User Requirements.

Although the principal target audience will be those implementing ICT systems or building devices that act as interfaces between ICT systems and the User, again with a smart card element, we will prevent no one from using it. Practice shows that a smart card provides a valuable easy-to-use and consistent interface for Users accessing ICT systems, making the smart card a valuable tool for those implementing multi-application, interoperable ICT systems. Further enhancements to supporting User Requirements can be achieved by including additional User profile information on the smart card; for example, User language preferences. For this reason this manual considers the smart card at two levels:

- Supporting an ICT environment through the smart card
- Ensuring the actual smart card-to-User interface is optimum

An example of this is where a cardholder has a hand tremor and cannot readily insert a smart card into a reader slot. In this case the card may hold a wealth of information supporting the User's requirements but if the card cannot be read, then they add up to nothing. On the other hand, if a contactless reader interface is specified, then the cardholder can readily place the card in the field and have it read. All the valuable card-held information, such as language preference, will then become effective in adapting the User interface.

Thus it will be seen that this manual will be of interest both to those involved with the implementation of ICT systems and interface equipment, as well as those concerned with the provision of the supporting smart card applications.

3.4. Who Are The Users

Users are the people who have to interact with the system. This manual takes a specifically biased approach towards refining this definition and introduces three restrictions.

- The manual only considers the General Public.
- The manual always takes an "Inclusive Design" approach
- The manual mainly addresses European issues related to the use of ICT systems by Users as defined above

3.5. Supporting Users With Special Requirements

Section 3.4 above indicates that this manual takes an inclusive approach and indeed, as far as is possible, the needs of Users with special requirements are considered and taken into account. However, there are two issues that have to be noted with respect to such Inclusivity:

- Different special requirements may conflict, for example a User requiring sound to augment poor sight capability and a User requiring enhanced graphics due to poor aural capability will require different facilities at the terminal interface. While the use of User Profiles held on the smart card will allow the terminal to adapt differently to different User requirements, this may not always be possible
- Some adaptations for special requirements may conflict with the requirements of the majority of Users. For example, a person in a wheelchair will require a terminal display and keyboard to be lower than for someone standing up. Some terminals may have two screens and keyboards while others may be on a motorised stand. However, in general the choice will be for one or the other.

For the above reasons, in this manual, Inclusivity is taken to mean adaptation to various special requirements as far as is reasonably possible in the environment and with respect to the design of the interface equipment.

3.6. What Are User Requirements

In reality, Users do not know or even wish to know their User Requirements. What they are interested in is solely the ability to successfully and without pain make use of ICT systems and to have trust in their interaction with such systems. This could mean it is equally as important for some Users to feel that no-one is

looking over their shoulder reading personal information from a screen as it is to ensure the system interaction is in their preferred language. Indeed, every use of a system, regardless of whether an action was successful or not, will have a cumulative impact on the User in terms of the system's desirability through its impact on their learning about the system and its usage, the consistency of interaction, as well as the "fun" and the comfort in using the system.

For these reasons, one cannot discuss User Requirements in isolation, rather one has to look at the context of User interaction with a system. In the environment covered in this manual, this implies interaction with ICT systems and the use of smart cards in supporting this interaction, as well as the User's interaction with the smart card itself.

Given an understanding of the context, the nature of User Requirements may readily be understood. However, even at this level there is still scope for variation in the specification of what is meant by User Requirements. The classical approach is to look at the situation subjectively; that is:

- What does the User expect in terms of privacy?
- What does the User expect in terms of security?
- How are the special physical requirements of the User taken into account?
- etc.

But this view pre-supposes that the User is concerned about User Requirements and as stated at the start of this section, they are not. The approach used in this manual is rather different, which is to say the issue is addressed from a User perspective:

- *Comfort*: Is the User comfortable interacting with the system
 - *Consistency*: For the same goal or outcome, does the same process apply
 - *Fun*: Can we say at least that the process is not boring or aggressive
 - *Fluidity*: Does the system lead the User through the process in a straight-forward manner
 - *End User Control*: Does the system allow the User to drive the system in the way they want (for example, menu driven or via short cuts)
- *Intuitive operation*: Is the use of the system obvious
 - *Learnability*: is the process easy to learn and enticing to do so
 - *Ease of use*: Is the system easy to use for all categories of User
- *Clarity*: What is not intuitive should be made clear to the User
 - *Simplicity*: The ultimate goal of complex system, but where an open User community is concerned, this must be the case from the outset
- *Enablement*: Does the system enable the User to interface properly with the system to carry out the required activities
 - *Inclusivity*: This must be true for as wide a User community as practicable
 - *Acceptance or rejection*: Does the system allow the User to accept or reject a flow of information (for example, to restrict the flow of personal information for this transaction at this terminal in order to keep the interaction anonymous).

Thus no attempt is made here to define specific User Requirements, rather what is done is to consider the circumstantial event sequences that involve the User in their interaction with ICT systems using smart cards as interface tokens and to highlight what is needed in order to permit all Users to readily carry out their desired processes. From the supplier or implementer's point of view, meeting User Requirements as properly determined from a User perspective will have a significantly more beneficial effect than taking a design based, outward-looking view which has been the case traditionally.

3.7. Areas Addressed

This manual considers Users' interactions with ICT systems or e-services as they are sometimes called. In general, this implies anything to do with the so-called "Information Society", which includes the present and future use of new technology to provide the public at large with access to services provided electronically, where these services may be in the form of electronic versions of traditional paper based services or where they may be entirely new. It should be noted that this does not apply solely to Internet provided services or even other online services, some off-line services will be included as part of the consideration which will demonstrate that the issues for the User are the same. Consider, for example, an e-purse system, a wall mounted off-line cash-to-card machine would be included within the scope of an ICT system.

This manual addresses the use of the smart card as an access and interface token to ICT systems supporting interface requirements, personal information requirements and User Requirements. It is this role of the smart card that enables detailed consideration to be given to the subject of User Requirements within ICT systems. Therefore, although this manual is specifically about smart cards, it is the wider context of ICT based services that is the scope of the area addressed.

3.8. Application Domains

While a Best Practice manual for the use of smart cards in ICT systems naturally transcends specific application scenarios, it is clear that different applications will raise specific issues, for example the manner of cash delivery in a financial services ATM terminal. In addition, although this manual is designed to be a living document with regular updates, this first edition is intended to have some significant "usefulness" to its target audience. Therefore, the manual has concentrated on carrying out its work in the context of the following application environments, which are those where smart cards are being used or planned for usage to the greatest extent today:

- e-Government
- Financial transactions (including Telcos)
- Public Transportation
- Health

This analysis follows a similar application concentration by the eEurope 2002 Smart Card Charter which has acted as the initiator and foundation for the work carried out in the creation of the User Requirements Best Practice manual. Wherever possible examples, wording and recommendations will relate to these four application domains.

3.9. Ongoing Development of the Manual

The development of the Best Practice manual is an ongoing task. It is a dynamic document which will be subject to formal Change Control procedures. This manual will be updated in terms of both breadth and depth; to take into account changes to User behaviours, User requirements and technology, as well as to expand the detail and value of the document. The process by which this will be carried out will follow the procedures set down for maintaining standards within Europe and it is hoped that this manual will be formally supported through the CEN/ISSS Workshop process.

4. Objectives

The objectives of this manual, for the use of smart cards in ICT systems are:

4.1. Awareness

To promote an awareness of User Requirements and User interface issues.

4.2. European Operability

To enable the User to interface with ICT systems in any part of the EU with consistency of transaction flow, including encouraging the maximum transparency to language and other local differences.

4.3. Consistency Between Devices

To provide a core framework of User interface guidelines to ensure that devices and applications supporting ICT systems are sufficiently consistent to allow the User to operate them easily and with confidence.

4.4. Intuitive Interface

To ensure that the User interface to ICT systems is as intuitive as possible for the widest range of Users recognising that what is intuitive for one class of use is not intuitive for another.

4.5. Compliance

To promote compliance with existing international, national or industry standards or recommendations where relevant and appropriate.

4.6. Local Autonomy

Consistent with the above objectives, to allow system developers, scheme operators, device and application developers the maximum autonomy in design.

4.7. Field Trials and Evaluation

Supporting early adopters. How to set up a proper field trial. Guidance on evaluation methodology. Testing "in the real world" by examining and building on experience from practical work already carried out such as the transport sector's use of smart cards.

4.8. Enablement

To help assist and enable the introduction of ICT systems by providing information that will be of value in reducing the time and cost of system development and to help ensure that such systems gain rapid acceptance by consumers.

4.9. End User Control

To offer the end User an instrument of empowerment to decide when and where and under what conditions information is transferred and a transaction is completed. The element of trust is a keyword in this perspective.

5. Approach and General Principles

5.1. Considerations

A key point to be made at the outset is that there are no pure or absolute User Requirements. There always are trade-offs for the User and a trade-off between the User and the provider. The trade-offs for Users are generally presented as being cost related, which is not necessarily what is perceived in the "real world". Users want everything necessary to achieve their requirements of systems and are not concerned about how the enterprise or other entities can offer that "everything". Taking the User's view is the so-called User-Centric approach. Nevertheless, experience shows that Users are in general sensible about their aspirations and requirements of a system.

The price or cost is generally one of the prime variables on which trade-offs are based. Users are not looking for maximum quality at a null price, but for something close to the best quality they can afford. This sense of trade-off goes much deeper than just looking for the best bargain. Users would, for example, as witnessed in the well cited case of the Video Tape Recorder, trade a lot of versatility for some degree of manageable control. In addition, Users obviously have no desire for functions they have never experienced or comprehended. So a 'Requirement' is the result of a socially informed trade-off of functionality and cost on the part of Users.

Rather than 'Requirement', one may instead consider the notion of Acceptance, i.e.- entities propose things and people accept them or reject them. However, the notion of Acceptance is in reality somewhat too passive to represent the whole of the User's case. A better way is to describe this notion in terms of Echo or, perhaps still better, in terms of Resonance. Enterprises launch products and services on to the market and for a certain period of time they get back a stronger or weaker Echo. Based on their objectives and supporting skills, enterprises will take initiatives that will generate a superior response.

In the approach this manual takes towards describing Users Requirements, the manual sets out to describe ideas that should lead to a strong positive Resonance from Users. To paraphrase a frequently quoted saying about communication, the emphasis is not on "what the cards do to the people," but on "what the people do to and with the cards".

Further considerations leading to the specification of Best Practice set down in this manual cover the following key issues:

- Should early adopters be the main target on the basis that they are in the vanguard of attempting to address the issue of User Requirements?
- Should we consider first the easy to use and easy to learn uses of smart cards within ICT systems?
- Should we stress ease of use, or beneficial and rewarding use?

This manual is heavily biased towards the General Public, easy to learn systems, and beneficial and rewarding usage. This may be summarised as the centre point of the take-off ramp in the product life cycle curve.

From the preceding sections it is evident that any recommendations set down in the Best Practice manual would be more effective if they were based on a concise model of User Behaviour or more probably several models. It would be helpful to focus not on the consequences (the recommendations) but on the reasons for them. It will also help the target audience for this manual to understand the methods used in developing the manual that may allow them to extrapolate the recommendations to suit their own particular environment.

The Best Practice manual is intended to be sufficiently action oriented to be able to take into account already published User Requirements recommendations, subject to review, evaluation and decision to accept or reject them. Where rejected, a new approach may be taken; for example, recommending the use of a contactless smart card rather than easy access, wide throat, motorised contact smart card readers for those with particular special requirements.

In order to achieve the above, the experts and specialists within the eEurope smart card charter Trailblazer 8 – User Requirements group have been instrumental in the production and editing of this Best Practice manual. Since these experts cover a wide range of technical knowledge, User issues knowledge and experience, as well as special needs and Inclusivity issues, this manual provides a high level balanced view of the subject encompassing all the issues that a system or product designer will have to take into account when designing to best support User Requirements. Of course, the level of detail is limited and consequently, the annex to this manual contains references to the wide range of narrowly focussed, specialist papers, reports and standards that cover specific areas of specific detail in the field of User Requirements.

In this context, it is to be noted that Ethics play an important role. In February 2001 a “Users Requirements” conference was held in London, England hosted by the then UK Department of the Environment, Transport, and the Regions. At this conference it was strongly suggested that in User Issues - ideology, hearsay, ego and laziness based half-truths - take too strong a position. Thus it is important to ensure that issues are addressed as perceived important by the readers of this manual such that the Best Practice manual will be considered legitimate by the ICT design community.

5.2. Model

For the above reasons the Best Practice manual incorporates a section herein describing a User Behaviour Model where all the elements in the Model are based on a single philosophy that forms a part of the detailed User Requirements specification set down in the Manual and which stems from the many years of experience of the editors of this manual

This basic model takes into account a learning curve that is influenced by two issues:

- A general understanding of what is to be done
- Repeated use

Where repeated use itself drives us towards two issues:

- No experience should ever result in outright rejection by the system
- Every experience should be rewarding

Fun and excitement are, with resulting success, two of the most rewarding influences.

The concept of laziness highlights the following issues:

- Consistency:
Why should Users learn something if it does not work like another device a few metres away? Every single function and if possible every component of a single function should always be controlled in the same way.
- Information Overload:
We should be trying to go the “intuitive design” route.
- What already exists:
If an “apprentice” can think “hey it works like...”, or our seasoned User is reminded how to use a peculiar function because it works like something he or she knows, then this can be regarded as a favourable situation.
- Natural Sequence:
When, for instance, you want to move something you first pick it up and then put it somewhere else, or when you have to download something first mark it and then mark where it is to go. This is the “obvious” approach.
- Do not mislead Users:

Users might well reject something because they think you are trying to make a fool of them. For example, if you have a normal hinged door you don't put on it a handle that looks like the handle of a sliding door which would mislead them. Another example could be if you provide a key pad alongside a screen, do not draw on the screen the exact image of the keypad, else people will try to use the image instead of the real pad.

Of course there are other consequences of the model:

- Providing “short cuts” for heavy Users in order not to bore them
- Always allowing for mistakes and providing recovery processes
- Attracting the attention of the User when something important is going to happen
- Not letting the User believe they have made a mistake when the machine is carrying out an internal process which does not include User interaction.

It has been one of the key tasks of the manual editors to explore all the consequences of this model.

5.3. Basic Functions

The diverse things that can be done by Users when interacting with devices and services will be broken down into a certain number of basic functions:

- access
- payment
- identification
- expressing one's will and or positive consent
- modifying the content of the card, etc.

Every real application will be a mix of these basic functions. This manual has concentrated on identifying and giving indications for a Best Practice design to deal with these basic functions and their integration into a complete system or application. In so doing, the natural processes that take place have been categorised such that they can be addressed point by point within the recommendations section of this manual. As such, the group of analysis points represents a filter on the totality of possible consideration in the otherwise unbounded subject of User Requirements concerned with the use of smart cards in ICT systems.

5.3.1 Doing Things With A Smart Card

- Following the progress of any operation
- Establishing contact between card and interface
- Understanding failures
- Ending, or aborting, the session with the card being returned to the User.
- Environmental conditions for the session
- Taking control of the interface
- Keeping control of the interface (including data flows), or retrieving it
- Personalising the interface
- Entering another card in the same session

- Identifying oneself to the system
- Authenticating oneself
- Willingly approving something - a document, or a transaction. This field is vast and covers everything from the tacit acceptance of being debited one unit when you access an Urban Transport ticketing and payment system, or going further in a process, including the use of a Digital Signature
- Describing the conditions for access to a system or process by a third party
- Coding something
- Getting access to some real or virtual (data, application) location
- Cost Transparency

5.3.2 Doing Things To A Smart Card

- Scoping the content
- Issuing a smart card
- Modifying some of it
- Loading something on a card
- Loading something of high value/risk
- Taking something out of a card
- Transferring elements between applications on the same card or from one card to an other

5.3.3 Common Elements To Create A Smart Card Environment

- Terminology (whatever the media or support), error messages, and re-entry procedures
- Phonyms (voice and other signals)
- Recommendations for the use of the symbols specified by CEN TC224 WG6.
- Recommendations on preferred ways to chain basic functions

Common elements relating to actions desired by the User:

- Access to information on the smart card
- Keeping, when wanted, personal information confidential
- Paying for a transaction
- Customising an interface
- Redressing provision
- Others based on combinations of the above

5.4. Comparison With Traditional Indicators

Most texts dealing with User Requirements approach the subject in a more function oriented manner. Therefore, the reader, when going beyond this first introduction to the subject of Best Practice in User Requirements and examining other documents of detail, will find the subject is approached in a different manner. The key function oriented issues are listed below by way of comparison. However, no direct cross-

reference is made to the more User-centred approach taken in this manual and it is left to the reader to carry out this exercise if they wish. Nevertheless, it will be found that all the issues below are addressed in one way or another in this Best Practice guide.

- Access to information on the smart card
- Cardholder authentication / verification
- Confidentiality of personal information
- Cost Transparency
- Customisable interface
- Effects of User age
- Error proneness
- Ethical issues
- Legal requirements
- Physical environment
- Contingency provisions
- Privacy
- Redress provision
- Security
- Trust

5.5. Evaluation

5.5.1 Approach to Evaluation

In the evaluation methodology used, the criteria used include those listed below among the most important aspects however, for each specific case of requirement, interaction and terminal there will be additional context specific evaluation criteria:

- Ease of use
- Consistency
- Ease of Understanding (representation and cognition)
- Learnability
- Fluidity of gestures
- Simplicity of gestures
- Usable by most
- Fun

5.5.2 Ranking

A simple list of criteria as listed in the previous section is not sufficient information for the development of a Best Practice specification; it is additionally necessary to rank the list. This ranking was carried by the expert editors based on their know-how, experience and observation.

The ranking selected was as follows:

- Learnability
- Consistency
- Simplicity
- Fun
- Degree to which User is comfortable using the interface(s)
- Ease of use
- Fluidity of Gesture
- Usability across widest User base

5.5.3 Evaluation Guidelines

Since the "Information Society" is a continuously developing area, the Best Practice guidelines set down in this manual are necessarily incomplete and as stated in the Introduction section, the manual will evolve with time as ICT systems and smart card usage develops. In addition, in this early version of the manual, not all topics have been dealt with to the same level of depth and detail. Nevertheless, it is believed that it addresses the key issues for system implementers and product builders including the smart card sub-system/application designers.

The Guidelines To Best Practice set down in chapter 6 below deals with and specifies the best practice guidelines developed using the above methodology. However, before finally delving into the detail of best practice it is first necessary to consider some aspects of the philosophy of best practice as perceived by Users, consciously or unconsciously, when making use of smart cards within ICT systems.

User Requirements may be categorised as having to do with one or more of the following:

- Body
- Mind
- Heart
- The value of an action

From the discussion below it will be seen that it is important to bear the above in mind when detailing and discussing User Requirements. Consider the following:

- The Body - hand (or other sensory and action devices):

Where is this stupid card hidden in my bag? Where shall I put it? On what side? How shall I handle it? Why can't I read it?

- The mind:

How does it work? Why is this stupid terminal not working like the ones I'm already used to?

- The heart:

"I don't like this" or "Wow! This is great"

- The value of an action:

What is this doing for me? Why am I doing this?

With the above in mind the rest of this chapter sets down Best Practice for the use of smart cards in ICT systems as determined initially by the eEurope 2002 smart card charter Trailblazer 8 – User Requirements and according to the item headings listed in Section 3.3 Basic Functions.

6. Guidelines To Best Practice

6.1. Introduction

The successful introduction of any smartcard scheme, large or small, mandated or optional for the User, depends on well-considered and appropriately disseminated promotional and explanatory material. Careful attention to promotion of the scheme will result in a well informed and enthusiastic User. The greater the aspirational value of the smart card, the greater the success of the card scheme. Understanding how the card works (in layman's terms), where and what the card can do is of paramount importance. The following sections provide advice to the software designer for the development of the interfacing software but no matter how comprehensively he or she can present information on the screen, the User experience will be significantly more satisfactory if the User approaches the terminal with a fundamental knowledge and awareness of the options they will encounter, i.e. the User knows (for certain) what he or she wants to do and expects to do it simply, quickly and without concern. Much of the information for Users about dealing with a smart card should therefore be provided in easily available, easily carried, easily understood printed literature of one sort or another, preferably at the time of issue.

carried, easily understood printed literature of one sort or another, preferably at the time of issue.

To follow through the theories of heart/mind/body discussed above in Section 5.5.3, the management of information to the User should convey interest, trust and convenience; for example:

Interest

- The card portfolio options and groupings must be relevant to the User
- Benefit must be perceived and then realised

Trust

- Use of pin numbers or passwords should be limited and kept simple. Other identification and authentication requirements should mirror the value of the application. The User should feel confident that the system is secure but access should not be over complex
- The User population is 'everybody', do not assume familiarity with this (or any other) technology
- If processing takes time, inform the User on screen during the delay
- Any change to data (for example card content) should be followed by the display of the new data to provide re-assurance that the change has taken place satisfactorily

Convenience

- Standard Pictograms should be used where possible
- It should be clear what functions can be performed at a particular terminal

6.2. Doing Things <<WITH>> a Smart Card

6.2.1 Following the Progress of Any Operation.

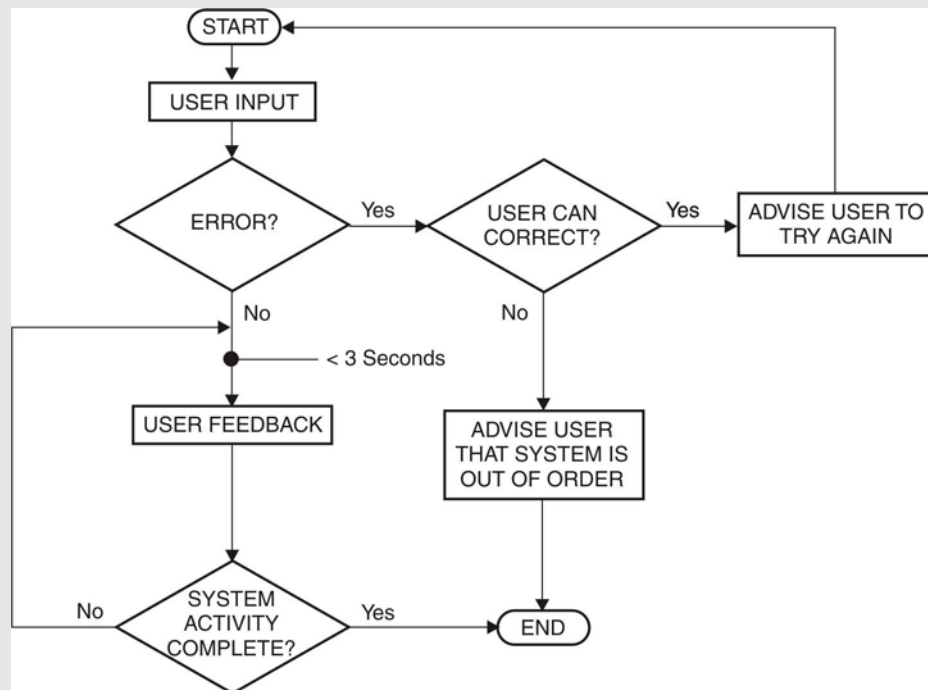
High Level Requirements

Some of the operations that can be performed with a terminal are complex. That is to say they include several sub tasks. Even what appears to be the most simple task such as drawing money out of an ATM or getting through a transport gate involves the system in performing several routines, locally or at a distant location.

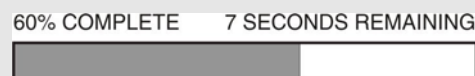
Thus the whole process can take a long time, or appear to do so, especially if there is no User feedback concerning the task performed, how long it has taken or how long it will last. If Users do not receive adequate feedback, they are less likely to become familiar with a process and the waiting and response times normally associated with it. Inadequate feedback during waiting time can also lead to boredom or stress if the User feels unable, or is unable, to intervene to control the system.

To fulfill the objectives of learning, having fun and being comfortable the following recommendations are made:

- No more than 1 to 3 seconds should elapse before the User receives either some information or an instruction.
- In all cases of transaction error, the User should be told immediately the error is detected. If the system is able to identify that the error may be corrected by user action, the transaction should be aborted, with advice to retry. If the system is able to identify that the error is not correctable by user action, it should advise the User that the system or relevant sub-system is out of service.



- In all error conditions, the User must be given the option to terminate the session and retrieve the card.
- If an operation has a significant duration a display should indicate that the operation is continuing and also show the elapsed and remaining time where possible (that is, a cumulative elapsed time display). This requirement increases in importance as known duration of an operation increases.



- The graphics used should be based on the well known precedents such as the ones used for similar tasks on PCs using industry standard operating systems.
- Fun should remain one of the main objectives and whenever possible simple animations should be offered alongside timing information.
- In order to show that the system is working a relevant Icon should be used (where possible according to the relevant standard).

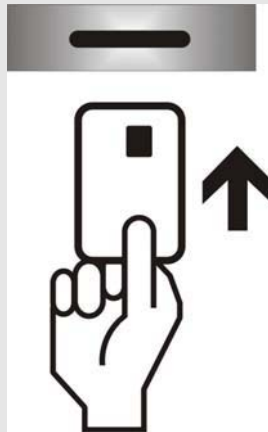
6.2.2 Establishing Contact Between the Card and the Interface

High Level Requirements

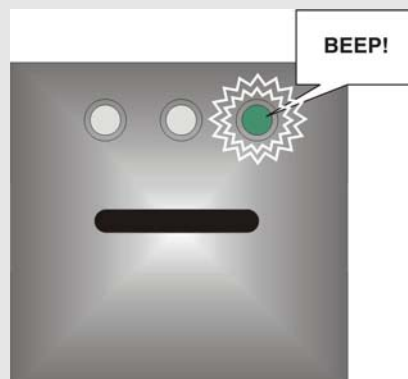
There are a number of factors to be taken into account in establishing a connection between a cardholder and a service obtained by use of smart cards.

Basic Interactions:

- The location for the card to be inserted or placed must be immediately identifiable and obvious.



- If several interface options are provided the corresponding card interface must be clearly recognisable,
- Users should be required to memorise as little as possible to successfully authenticate themselves.
- User input should be possible using a single hand especially where the terminal is sited in a public place as some people might not want to put down what they are carrying
- The outcome of any interaction should be fed back within 3 seconds,
- Feedback should be “multi sensory” – for example, visual and audible.



- The user should always have the option to retain direct access to his or her card, rather than be obliged to hand it over to a third party.

a) *Location:- (Public and Private)*

In the **public** domain we are considering public access terminals, kiosk/information terminals, Automated Teller Machines (ATM or cash points), ticket barriers, turnstiles etc. In these cases the environment and ambiance of the location is of prime importance. The cardholder needs to feel safe and with a degree of privacy relevant to the transaction. For example, for a cash transaction or account enquiry the cardholder would want a more secure area so that the PIN entry cannot be overseen by a “shoulder surfer”, free of distractions with a supportive ambiance. In a public place, the interaction between the machine and the User should be easily learned, simple and clear as some people will be unwilling to experiment or be seen to fail to operate the equipment in public. Reference is made to relevant standards covering this topic.

The **private** domain might include the Personal Computer (PC), interactive digital television (iDTV), the mobile phone etc.

A private device may however also be used in the public domain – for example, mobile phone or PDA (personal digital assistant) interface with ATMs or attended or unattended POS (Point of Sale) terminals.

b) *The User as an Individual*

The cardholder must always be regarded as a customer, that is, the User is someone who has a choice and is free to exercise that choice. For this reason the card use experience should be rewarding and not a burden. It must be recognised that Users are individuals and will have their own preferences. For example, in the physical domain this may range from language preferences through to facilities to assist people with disabilities. For example, people with a sight impairment may wish the display to be in large characters and suitably contrasting colours, wheelchair Users will need User controls to be a suitable height and properly visible.

In the physical domain the smart card can be of great assistance in personalising the service access to suit individual preferences. For example, the URI (CEN13987:2000) defines User specific data which may be suitably encoded, by the citizen or an agent on their behalf, to indicate these preferences.

The introduction of adaptive terminals will in due course, greatly enhance the use of terminals. Reference should be made to the following standards when designing card access points for public use:-

- EN1332-4
- CEN/ISSS WA 13987:2000 URI
- European Directive on disability discrimination
- The Disability Discrimination legislation of the host country
- Design for All guidelines

c) *Type of Card*

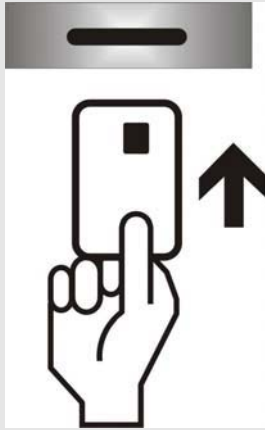
Contact Cards



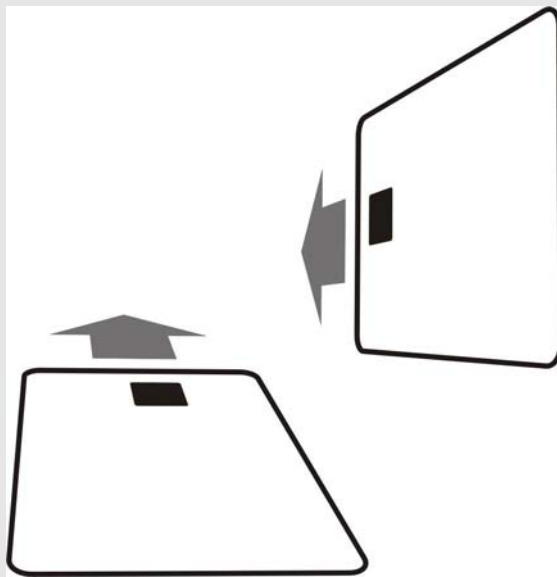
Currently the majority of smart cards in circulation in Europe are contact cards, that is, cards that make a physical electrical contact with the card reader. The readers thus have to have specific engineering characteristics – it is necessary to insert, or 'dip', the card into the reading device. Most people are familiar with bank ATMs, which use a motorised device to feed in the card, but increasingly (particularly in the retail point-of-sale and information kiosks) the User has to insert the card into a slot. A number of factors must be considered: -

Contact Card Recommendations:

- Increasingly Users are concerned about control of their card and so it is important that the Users can maintain contact with the card throughout the transaction, either physically or visually, and be able to interrupt the transaction at any time they feel concerned.
- The card slot should be easy to insert the card into; it should have a funnel-shaped mouth to guide the card into the correct position. Thus people who have an unsteady grip or poor eyesight are not disadvantaged.
- The orientation of the card in the slot should be obvious and visible indication of how the card should be inserted should be provided, for example, diagrammatically. This is of particular importance in a non-motorised reader where the reader can not return the card for re-insertion.



- Where possible, a device should eject a card that is inserted in an incorrect orientation, or a card that is not of a type that it can read.
- Card orientation for insertion should be standardised. For chip cards, the standards should be: Card inserted horizontally: chip up, chip first. Card inserted vertically: chip to the left, chip first.



- If the card is not inserted correctly, and the terminal is able to detect this, then the terminal should inform the User with a request to reinsert the card correctly. This message should be polite and supportive of the User. Ideally the messages should be audible as well as visual to assist the unsighted
- The card itself should conform to ISO standards and have tactile information to assist the unsighted User to orient the card (this may or may not also relate to embossing standards for banking sector cards).
- The above issue applies to sighted Users being able to identify different cards in their wallet in poor light conditions.

Contactless Cards What follows goes also for combi or hybrid cards when used in a contactless mode.



Contactless cards will operate within the close proximity or the near vicinity of the card reader which offers increased flexibility in usage. This is of particular importance in transport application where the speed of transit through a turnstile or ticket gate, and hence the speed of reading of the card, is of paramount importance. However, this convenience brings with it new concerns for the cardholders as they may be concerned that the card is now open to indiscriminate reading, and possible forgery, much As mobile phones were in the early days. They may be concerned that value held on an electronic purse may be stolen and private information open to the unscrupulous. It is important that the card service providers recognize the need for robust security features on contactless cards. With reference to this issue, precise instructions should be given on the way to handle contactless cards when not being specifically used by the card holder.

System operation should also be designed in such a way that no difficulties or unforeseen consequences are created when a transaction is aborted because the card has been moved and is no longer in the field of the reader. For transactions longer than at most 3 seconds, a reader slot or receptacle must be provided and used in order to avoid the possibility of the User moving the card out of the reader field. If a receptacle is provided it should be located in such a way that it is protected by the body of the user.

Another concern for the User is control over the transaction. Whereas for a contact card the User can, in the worst scenario, remove the card from the reader aborting the transaction, this is by no means as straightforward in the contactless environment. Measures need to be adopted by the system designers and the card scheme operators to address these issues.

Dual-interface cards – Combi cards



As the name suggests, Combi cards combine the features of the contact card with those of the contactless card. The intention is to increase the functionality and operability of the card. The Combi card links both the contact and contactless interface to a single integrated circuit chip.

While it is true that significant benefits can be achieved through the use of Combi-cards, it is also true that all the disadvantages apparent in both interfaces need to be addressed in any implementation. Combi-cards might also present the User with the dilemma of which interface he or she is expected to use in a given situation. It should be an aim of the system to minimise these issues at the point of usage and, ideally, make the choice entirely transparent and/or obvious

Dual-interface cards – Hybrid cards



Hybrid cards are also dual interface cards but in this case each interface is linked to a separate integrated circuit chip. This means that applications such as electronic purse or loyalty points cannot be shared across the interfaces. While the advantage of separation usually makes life easier for the implementer, and makes security easier to manage, from the User's point of view there could be significant confusion leading to disillusion.

d) *Attraction*

The terminal interface with the card User should be simple to use and the purpose and services that it provides should be obvious and understandable. This may be achieved in a number of ways depending on the capability and functionality of the terminal itself – and its display – and the furniture and environment into which it is fitted.

The surround of the terminal can be used by the service provider to indicate that they are prepared to offer services through this medium. This is most often done by displaying the logo or brand image of the service provider. For example, the Visa/Mastercard symbols are familiar to all. The number and placing of logos and potential distractions caused by other visual material, such as advertisements, should be carefully controlled to avoid confusion to the User.

The display itself, particularly if it a colour visual display, can be very helpful in firstly attracting the User to the terminal and secondly explaining clearly how to use the equipment. However, care must be taken to ensure maximum impact on all, including those with specific visual impairments.

6.2.3 Retrieving a Card

High Level Requirements

Particularly for cards supporting financial or multiple applications, the consequences of card loss for the user may be severe. If a User's card were to become trapped in a public access terminal or unattended point of sale terminal, perhaps due to a power failure, the User may be placed in a very difficult position. For example, if a User has a multi-application card with e-cash and ticketing applications and this becomes trapped in a vending machine on a railway station, what can he or she do? To leave the machine to seek assistance creates the risk that the card may be retrieved by a third party.

The following provisions are recommended:

- A terminal should allow the User to retrieve his or her card at any time except during system activity (for example, during code validation or value transfer).
- However, it is accepted that, in many countries, a card issued by a bank remains the property of the bank and that a terminal operated by a bank may retain that card and refuse to return it to the cardholder. For multi-application cards, where banking applications may co-reside with non-banking applications, it may be important that individual applications can be suspended or cancelled without the necessity of withholding or cancelling the card.
- A terminal should also allow the User to retrieve his or her card in the event of a chip, terminal or power supply failure during system activity.
- Card retrieval may, for example, entail the use of an eject control, or the user manually pulling the card out. If a card is latched in position during system activity (for example, using a solenoid operated clamp) a fail safe system should be incorporated to release the latch in the event of a power or other failure. This may imply that the terminal should have an emergency power supply.

6.2.4 Un-retrieved Card Warning

High Level Requirements

Card loss may also result from the User's inadvertent failure to retrieve a card from the terminal after a session of use.

If a User fails to retrieve his or her card from a public access terminal at the end of a session of use, the terminal should draw the User's attention to this by a visible and audible warning.

This is a particularly important provision for unattended terminals.

Functional Specification

It is recommended that a warning should be audible at a distance of about 3 metres from the terminal, taking account of likely ambient noise levels.

6.2.5 Premature Card Removal

High Level Requirements

Any of a number of error conditions may cause the interruption of a transaction before completion. One potential cause is that the User may remove the card from the terminal too soon. This may be accidental where the User has mistakenly thought that the transaction was complete.

For some card applications, an interruption of this kind may result in an error record of some kind being stored on the User's card. For risk and security reasons, an application may be so designed that a certain number of such records may cause the application to close down, making the card unusable.

Therefore, when a transaction is in progress and the system is active on a public access terminal, the terminal should prevent or deter the User from prematurely removing the card.

For example, if a card is latched in position and an eject control is provided for emergency use, this control should be appropriately identified to discourage inadvertent use and/or disabled during normal operation of the terminal.

Similarly, during system activity on a public access terminal (for example, during code validation or value transfer), the terminal should advise the User not to remove the card. Terminals with messaging capability may, for example, present a "DO NOT REMOVE CARD" or similar message.

Where possible, the User should be informed of the potential consequences of card removal before a transaction has completed.

6.2.6 Effect of Card Removal

High Level Requirements

If a public access terminal is providing information read from the card and that information could be regarded as private or confidential to the user, it should cease to provide this information as soon as the card is removed. For example, if a terminal is displaying information read from the card, this display should disappear as soon as communication between the terminal and the card is broken.

When the card is removed, the terminal should not retain or store any information that might be subsequently accessed by a third party except where this information is essential for secure processing of a transaction or except where information is extracted and retained for risk management purposes.

A terminal should not extract and retain any information for commercial purposes without the knowledge of the cardholder.

When a transaction is complete, and before the User is invited to remove the card, the User should be informed of any changes made to the card, if the terminal is able to do so.

6.3. Doing things <<TO>> a Smart Card

6.3.1 Scoping the Content of a Smart Card

High Level Requirements

Some basic applications may exist on the cards at issue, or the User may acquire a blank card for later loading with one or more applications or services. However, it is most likely that the card issuer will require card personalisation data to be written to the card and at least its own "in house" application to be written to the card. For example, if a card were issued by a library then it is likely that the library will insist that its library application is loaded onto the card. The User should have the option to include additional applications at the time of issue and at a later date.

Different application packages should be available for different User profiles and they may change over time. For example, the basic application set for a university student might consist of university id, campus and facility access, local transport, city library and simple e-purse. Optional applications might include loyalty

scheme, train, parking, leisure, e-purse (cash, debit, credit), e-voting. Personalisation including photograph will probably be mandated. For a school child the core application group might consist of travel concession, school registration, school meals, library and leisure. Optional applications might include e-purse and loyalty but could be otherwise restricted or limited to educational use. Personalisation including photograph will probably be mandated. A commuter may require a number of transport applications (parking/train/bus/metro), e-purse (cash, debit and credit) and, say leisure, but prefer to hold secure local or central government or health applications on a different card.

The card could also be anonymous and available at a vending machine, but the inclusion of a season ticket may require personalisation. A photograph could be optional.

Secure identification cards may be issued to a citizen or to an employee for access to secure services (local or central government services and benefits, passport, health care/records, building access, corporate data). The eEurope 2002 smart card charter initiative, Trailblazer 1 – Public Identity has produced a white-book on this subject which should be referenced by those seeking more detail on the subject.

The criteria for additional applications on an identification card will be the prerogative of the issuer although the typical (uninformed) User might be concerned about mixing infrequently used secure applications (passport or health) with a frequently used application such as transport ticketing. One reason for this may be the care with which the card is looked after; a person might not worry about losing a bus ticket but would place a different level of protection over their passport. The application mix should be complimentary and despite the capability to black list cards and the rapid replacement of lost, stolen or damaged cards, the User will instinctively attach a different 'value' to the applications and be uncomfortable putting certain applications or cards at risk. The choice must remain with the User if trust is to be maintained and take-up and usage maximised.

6.3.2 Smart Card Issue

High Level Requirements

The card issuing process itself will depend on the card content. Anonymous cards may be issued 'over the counter' or through self-service machines, while low security, personalised card issue may entail little more than a simple proof of identity via a bank card, driving licence or home utility bill. High security card issue will require a formal registration process similar to applying for a passport. The card initialisation process is likely to be a simple choice of portfolio options based upon the level of security selected at the time of card issue.

In the case of high security personalised card issue, the more complex process, as well as requiring proof of identity, may also require the provision of authenticated photographs and biometric enrolment. Typically the card issuing process will be managed through a face to face User/clerk interface at a counter, but may also be through a remote postal service.

Personalised Card Issue should entail and facilitate

- The provision of clear menu driven information for data entry terminals that will facilitate card issue. This will be the direct online enrolment form or the data entry screen to transcribe paper based enrolment forms
- The terminal should enable the card to be encoded with any or all of PIN, password access and biometric enrolment template
- The terminal should provide a clear list of card encoding and printing options
- The current state of the card and its contents should be available throughout the issue and application load process
- All actions affecting the card should be confirmed on a step by step basis.
- The whole process should be able to be cancelled at any time with the card left in a non-issued state
- Where possible the process should be able to be restarted. However, it is recognised that in some circumstances of cards being part initialised the only option will be to scrap the card being processed and the operation restarted using a new card.

- It should always be possible to re-enter and re-start last operation subject to it not having been successfully completed
- A online help facility should always be available

6.3.3 Modifying the Contents of a Smart Card

High Level Requirements

The successful modification of the card will usually depend on the User translating instructions and executing them correctly. The positioning and configuration of the terminal will have a major impact on the User experience. The reader is directed to the guidelines for position and configuration of terminals 'Self-service for all' ref...page 16,17 etc and to 'Design for all' final report 15.5.2000, section 12 'Smart cards'.

The User should have the option to view the existing applications before approving the modification of content where such content includes data that is private to the User. The mechanism for viewing or modifying agreed sets of content information should be governed by the security that applies to the card such as PIN, password or biometric, thereby ensuring trust on the part of the User that the data really is private to them and used solely under their control.

The option to abort the modification process should be available at any time. All exit functions should include a display of the resulting relevant card content so that the User may be assured about the status of the information under consideration. Where card memory limitations restricts updates and additions to card held content, the User should be informed of the options available including the possibility to upgrade the card if this is an option.

It is recommended that in all cases the terminal interface will provide the following basic functions:

- Secure access to card data according to card personalisation rules to ensure privacy and trust
- The ability to view existing content prior to process initialisation
- A menu of options for data modification, update and addition
- The ability to view final content under all exit circumstances
- All actions affecting the card should be confirmed on a step by step basis.
- The option to abort should be available at any time, although it is recognised that the state of the card may not reflect its pre-process state
- The whole process should be able to be restarted. Even where data has be altered, it should be possible to "re-update" the data to correct any errors or set the card data back to its original state
- It should always be possible to re-enter and re-start last operation
- A online help facility should always be available

6.3.4 Loading Something On a Smart Card

High Level Requirements

This function is carried out on behalf of or by the User in order to make use of or gain access to goods or services that are able to be provided through an application on the card. Typically known as application products, they give 'permission' for access to goods or services, for example travel permits (day passes or season tickets), travel value, electronic money, membership entitlements (access to tennis courts),

At the terminal the User will wish to review the application options, select required options, identify the product or value to be added, execute the process and verify the process. The User should always be requested to

confirm a transaction of this type before completion as an explicit step in the process after the display of the proposed new card content.

It is recommended that in all cases the terminal interface will provide the following basic functions:

- Secure access to card data according to card personalisation rules to ensure privacy and trust
- The ability to view existing content prior to process initialisation
- A menu of options for card data and service addition
- The ability to view final content under all exit circumstances
- All actions affecting the card should be confirmed on a step by step basis.
- The option to abort should be available at any time, although it is recognised that the state of the card may not reflect its pre-process state
- The whole process should be able to be restarted. Even where data has been altered, it should be possible to remove the service and/or “re-update” the data to correct any errors or set the card data back to its original state
- It should always be possible to re-enter and re-start last operation
- An online help facility should always be available

Loading Something of High Value or Associated With High Risk

The process should proceed as above but the card platform and card issue options should ensure that secure access to the card is necessary involving PIN, password or biometric access controls

Authentication of card, card holder, reader terminal and application, and/or digital signature may all be required

6.3.5 Removing Something From a Smart Card

High Level Requirements

This process will be essentially the same as loading something onto a smart card as described above in Section 6.3.4, however, it is to be noted that technological constraints on many existing types of smart card, together with the original data load criteria (such as read only access right settings), make it impossible to remove certain data or applications resident on the card. In addition, even where removal is possible, memory card management and security update restrictions may mean that the card is not left in the same state that it was before the data and/or application was loaded in the first place. Further, regardless of this last point, the removal of data and/or applications from a smart card may not permit other, new data and/or applications to be loaded.

Given the above, it is essential that if Users’ expectations are to be met in full that detailed planning takes place at the outset of the whole smart card management and issue process in order to address these issues.

6.3.6 Transferring Elements From One Card To Another

High Level Requirements

This process must be handled with care. Where possible and practical, dual slot smart card readers should be used such that both cards may be inserted together to allow the process to proceed. If a dual slot smart card reader is not available on the terminal such that the cards will have to be inserted/presented and removed alternately, the menu driven instructions must leave the User with no doubt about what to do next. It is extremely important that in the event the process is aborted or cancelled, whether by User choice or User error, that error conditions are recoverable for both cards. Clearly in the case of system failure, the ability to recover will depend on the nature of the failure.

Similarly, it is important that where the User performs the wrong function part way through the process they can re-present the card without going back to the beginning of the process. This implies the completion of the process before commitment of change to either card and as near as possible simultaneous change to both cards. Failed requests for funds (e.g. request denied due to insufficient funds) should be terminated objectively without causing undue embarrassment or anxiety to the User, without updating either card and with both card holders kept fully informed about the status of the transaction and its effect (or none) on their card. Transactions involving transfer of funds from a debit or credit card may also require option of a paper receipt.

The issue of repudiation of a transaction applies in many circumstances especially in card to card activities where there may be no external process tracking the activity. Under these circumstances a certificate of non-repudiation may be generated with the transaction, written to the smart card data lag of the transaction and, where possible, externally logged to support any claims made.

6.4. Common Factors To Support User Requirements in a Smart Card Environment

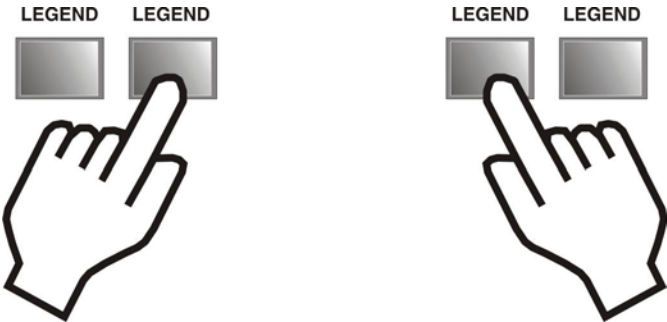
6.4.1 Pictograms, Icons and Symbols

High Level Requirements

For a graphical representation to be useful, a large proportion of the potential Users must be able to associate the meaning with the symbol. In general it is advantageous to also use text as well as the graphical symbol. It is important that the average User can readily discriminate the symbols used in an application; for instance if the symbol is to show the orientation of the card for insertion in the reader, it is important that the User understands the meaning of the symbol and can relate the pictogram to how to orientate the card

Functional Specification

The position of labels with text or icons is crucial for an unfamiliar User with impaired vision. All too often labels are positioned in a way that they are obscured from the User's view when the controls are being operated; allowance should be made for the 10% of the population who are left-handed. The problem is particularly common when the control panel is at an acute angle to the User's line of sight or at an inappropriate distance. When deciding on the positioning of graphics or labels, the way people who are left handed use the controls should also be considered. Also many people with low vision like to get their face close to the control panel to read the labels, or use face-mounted or hand-held magnifiers.



Icons used on buttons and controls must be easy to understand. Currently the 'enter' button on most keypads uses a 'return' arrow that originated on typewriters where this icon indicated a 'carriage return'.



In the case of this symbol, its commonplace use renders it familiar. However, this will not be the case with many new icons used for specific purposes within the field of ICT,

It is recommended that with respect to icons:

- Make icons highly discriminable
- Do not overlap icons
- Do not differentiate by colour alone
- Be consistent in design of icons
- Icons should be easily comprehensible
- Label icons consistently

6.4.2 Terminology

High Level Requirements

Despite the use of symbols and icons, Users of any particular ICT system are likely to be confronted with word-based information related to that system from diverse sources. These may include, for example, marketing material, product information, User instructions, terms and conditions of use, device control and feedback legends, and displayed text messages or audio messages.

Introducing a User to even a simple technology process – such as, for example – pre-paying for airtime on a mobile phone – can involve a service provider in the communication of a substantial volume of word-based information to the User, ranging from promotional material through step by step instructions to on-screen messaging. It is obviously in the interests of both the service provider and the end User that this information be communicated as efficiently and effectively as possible.

Underpinning the quality of this communication is a careful choice of terminology that can be easily understood by the User. Of equal importance is the consistent use of this terminology to allow interoperability between devices and to assist Users in the migration from one technology to another, or one device type to another.

There is therefore a need for standardisation of key descriptive words and phrases used to describe or explain aspects of an ICT system to the User.

Without such standardisation, device developers will inevitably originate different ways of explaining a particular thing, different variations in the wording of instructions and User feedback. This can be confusing for the User, increase the learning curve for schemes with multiple device types, cause User frustration and errors and generally slow down transaction processes. In the context of multiple European languages, unnecessary variations in terminology will also increase the barriers to usability.

As a simple example: What is the difference between the following 2 instructions?

- “Enter PIN”
- “Key in your PIN”

It may be (and should be) that the former instruction requires the use of the numeric keys and then the Enter key, whereas the second instruction means that the PIN is automatically entered by the system when the last digit of the PIN is keyed in. However, device developers often do not make this distinction and the two instructions above are in practice variously used on either devices that require manual entry of the PIN or do not.

Some key descriptive words and phrases will be system or scheme specific whereas others will be more generic. Generic terminology – for example, the PIN entry instructions described above – should be centrally determined by relevant standard authorities, User or trans-industry groups, whereas more specific terminology should be originated and controlled by scheme operators. In either case, multiple language versions will be required in the European context. Where language alternatives are used based upon a card held profile following CWA 13987:2000 URI, it will be apparent that the above simple variation can lead to major differences in other languages.

Functional Specification

The following are general guidelines for User-centric terminology:

- User-friendly terminology should be developed and standardised in all relevant languages to cover, for example, the following areas:
 - The names of artefacts and entities that are components of the system – for example: card, chip, reader, card slot, application, personal code.
 - Key terms used to describe the technology – for example: contact, contactless, multi-application, electronic purse, electronic wallet.
 - Key terms used to describe the application product or system: for example: tokens, pseudo-currency, pre-paid, stored value.
 - The descriptors for functions available to the User – for example: electronic locking, a signing transaction, transaction logs.
 - Key messages and instructions – for example: enter code or password, re-insert card, cancel, exit, paid, fault.
- Use familiar, simple terms and plain language in preference to technical jargon that may not be commonly understood.

For example, for adding an e-purse application to a multi-application smart card, terms such as “down-load application” or “load e-purse”, might be more clearly expressed by “add e-purse”. However, also be aware that consumer understanding is not static and that new words and terms can enter the vernacular surprisingly quickly.

- Be concise

For example, the message “The system cannot accept that type of card” might be replaced by “Card type not accepted”.

- Avoid abbreviations that are not commonly accepted.
- Avoid acronyms unless they are in common usage.

For example, the acronym ATM (Automatic Teller Machine) is less widely understood than the vernacular term “cash machine”.

- Use language that is appropriate to the end User.

For example, a student campus card scheme could use language of a different style and technical content to that used by a card scheme for elderly people.

- Do not develop language variants simply by direct translation. System concepts are often based on metaphors that may not translate well from one language to another.
- Be aware that local legislation may influence terminology. For example, in some English speaking countries, banking legislation prevents use of the English term “Statement” to describe an electronic purse transaction log although this is perfectly acceptable, for example, in the UK.
- Use short words where possible to facilitate devices with restricted display capacity (visual displays of any kind tend to be amongst the higher cost components of any device). Be aware that in translation from one language to another, key word length may vary significantly beyond standard localisation allowances.
- Be consistent in the use of terms.

For example, there are a bewildering array of terms that could (and are) used to refer to a numeric code intended for access control by the User. These include Personal Code Number, Personal

Code, Code, PCN, Personal Identification Number, PIN, Secret Code etc. Although it may not be possible to have a single universal term (for example, because banks will usually seek to differentiate account access codes – usually PINs – from codes used for non-banking applications) a chosen term should be used consistently within a scheme so that the User can understand which code is being requested.

6.4.3 Error Handling

High Level Requirements

The minimum requirement is that any device or terminal should advise the User of the occurrence of any error.

It is recognised that in some circumstances cost or technical constraints may make it impracticable for the device to provide the User with any information on the nature of the error or differentiate in any way between one error condition and another. A basic device may not, for example, have the facility to display text.

If a device is able to do so, it should provide the User with information on the nature of the error and/or any remedial action necessary. This information may be specific to each error condition or, the same information may be used for a group of errors with similar characteristics or requiring similar remedial action. The choice will be determined by the interface capabilities of the device – whether or not it can communicate word based messages (visual or audible), for example – but also, by its function and use.

Although there will be circumstances in which it will be beneficial to give the User as much information as possible about the error that has occurred, there will be other circumstances in which brief, generalised information will be better. For example, in the case of a smartcard supporting a payment application of some kind:

Where a cardholder is using a personal computer online to a bank or to a card issuer, detailed information concerning an error state may be necessary and appropriate to allow the cardholder to take corrective action or request or authorise this to be taken. The aim here may be to precisely explain the error and/or the action to be taken. For example, within a PC banking website, a card application that has been automatically closed down as a security precaution might be reported with the following message:

**Your card cannot be used because your access code
has been entered incorrectly more than 3 times.
Your card issuer can correct this for you.**

The User may then be provided with the option of an automatic link to the Issuer and/or may be provided with optional access to a help function that explains the error condition in more detail.

In contrast, specific information concerning any fault that cannot be rectified by the cardholder is likely to be unhelpful at a Point of Sale terminal in a real world retail environment. Information redundant to the circumstances may encourage the cardholder to enter into inappropriate discussion with the retail assistant and may slow transaction turnover. The aim here may be for the device to avoid giving too much information about the error but to make it clear that a particular type of transaction is not possible and to encourage the cardholder to resolve the problem elsewhere so as not to delay subsequent customer transactions.

For example, at a POS terminal, a card with a disabled payment application may be reported with the following message:

Card unusable. Please pay another way.

The type of card accepting device and the circumstances or environment in which it is expected to be used are therefore basic considerations in determining the way in which error messages to the User should be designed.

Interface Errors

Interface errors can be classified into groups based on the implications of their occurrence. These groupings may be of assistance in determining appropriate error handling and messaging for a particular device.

Errors Presented For Information Only

Error conditions classified under this heading may inhibit use of a device or terminal by varying amounts but cannot be rectified by User action and are therefore reported to the User for information only.

Examples:

- The card or application is incompatible with, or not accepted by, the particular device.
- The device is unable to display information read from the card – for instance, because it cannot display the currency held on the card or cannot display the character set required by the language preference set.

Some error conditions in this grouping may occur because of an invalid input command by the User – that is, the User has asked the terminal to do something that it cannot do.

Example:

- The User requests the device to read and present information that does not exist – for instance, a transaction log on a newly issued card.

Messaging should provide simple concise explanations of inhibiting the use of functions – for example: “Card not accepted”, “Cannot display”, “No record”

Errors Requiring Action By the User

These error conditions suggest that some User action is necessary and that this action may or will rectify the error. Messaging should explain the error and/or the action needed.

Example:

- Where a device detects the physical presence of a card but cannot read it, the problem may be, for example, that the card is inserted in an incorrect orientation or that an invalid card has been inserted. Corrective action would be to insert a valid card correctly.

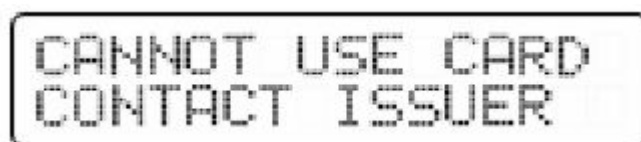
The User interface should generally be designed to be as error tolerant or forgiving as possible, allowing the User to achieve the desired result with no or minimal corrective action.

Errors Requiring Issuer Assistance

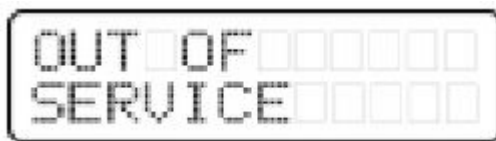
The User cannot rectify these errors, which are likely to seriously inhibit use, without assistance from the card Issuer. Messaging should explain the error and/or prompt the User to seek assistance.

Examples:

- Card has passed its replacement date. Application memory is exhausted.
- In circumstances where the User cannot take any immediate remedial action and continue to use the card, it may be appropriate to place emphasis on the fact that the card or application is unusable. This is likely to be particularly important where there is a need for fast customer throughput or high transaction rates.



These error conditions result from a malfunction of the system and are not associated in any way with the User's card or User actions. They cannot be rectified by the User and therefore there is no point in providing the User with any detail of the error. Instead, the User should be presented with a generic message indicating that the device is out of service or that a particular service is unavailable.



Errors may be reported to the cardholder using any of the following methods or a combination of them:

- indicators
- symbols and/or legends
- audible signals
- text messages
- error numbers or codes

The choice between these methods will depend upon:

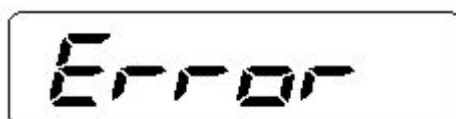
- The physical design of the device or terminal, particularly its display capability. Some devices may be able to display text messages, some may only be able to present numeric characters, others may have no dynamic display but may be able to indicate against fixed legends – for example, using LEDs (Light Emitting Diode lamps) – others may be able to provide audio feedback.
- The context in which the device or terminal is used and hence the level of detail which it is appropriate to provide to the User.
- The Users that the device or terminal is designed for, including their abilities, disabilities and language(s).

Functional Requirements

Minimum Requirements

Where cost or technical constraints prevent a device from differentiating between one error condition and another, all error conditions may be treated identically using, for example any of the following generic signals:

- An audible alert such as a “beep”
- A visual indicator such as a red lamp LED
- An on screen message such as the word “Error”



- A recognised alert symbol, for example:



The method adopted for signalling an error condition must be distinctive and easily distinguishable from other User dialogue or information presented by the device. For example: if an audible signal is used to indicate an

error, the sound should be clearly differentiated from any other audible signals used by the device. If a red lamp or LED is used, it should be used only to signal errors and not to communicate other messages.

To accommodate Users with impaired hearing or sight, it is recommended that both audible and visual signals should be used.

Text Messages

Text error messages need to be carefully designed to avoid either confusing the User with excessive detail or presenting simplistic messages that may mislead.

Additionally, the choice of displayed messages will be determined by:

- the number of character spaces available,
- the number of display lines and the need to segment messages between lines,
- whether alternating screens or scrolling messages are to be used, and
- whether error numbers are to be shown (see below) or whether text is to be supported by symbols.

Generally, error messages should be as short and simple as possible consistent with the essential information to be communicated. Superfluous text or information occupies the User's time and can increase transaction time and error resolution time. Just because a device has, for example, a 4 line by 24 character display, developers should not feel obliged to fill the display when a shorter message will suffice. The aim is efficient communication.

Use Of Error Numbers

Although error numbers are often regarded as cryptic and un-friendly to the User, the presentation of error numbers as an adjunct to other error signalling or messaging does have some practical advantages:

- Error numbers can provide information that is language independent, assisting implementation of a scheme in a multi-language area.

For any pan-European scheme, one of the highest level requirements is to allow an increasingly mobile User population to operate terminals in any Member State with ease and confidence, even if they are unable to understand the language of displayed text. This can be particularly important, for example, where the cost of providing language options on a device are prohibitively high.

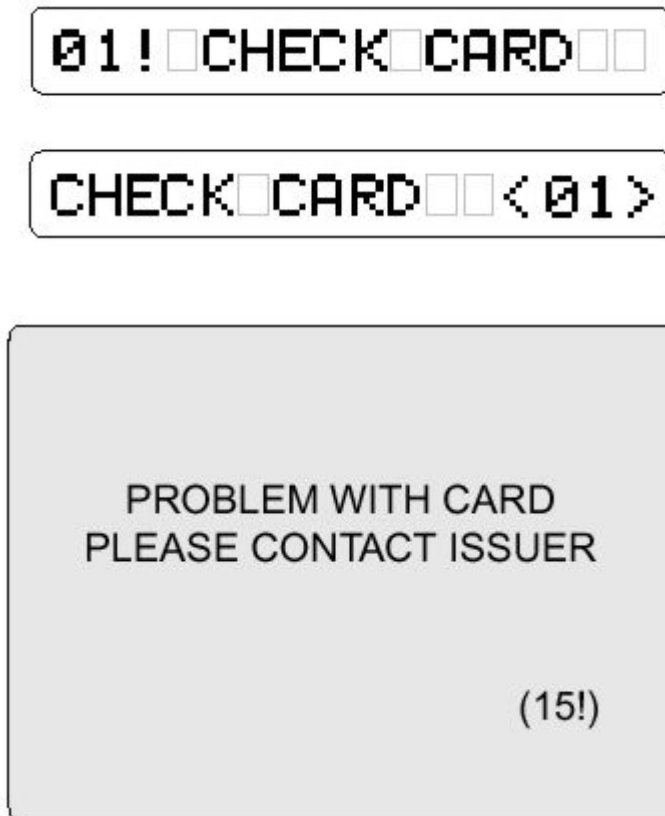
- Error numbers do provide precise and unambiguous identification of error states.

Despite the proposed standardisation of key terminology, the quality, accuracy and style of textual error messages will vary. It is reasonable to suppose that in practice, dissimilar messages may be used to describe the same error condition on different devices and in different territories or states.

- Error numbers potentially provide a simple way in which Users can accurately report errors to card Issuers, merchants, or device operators (again, in a way that is independent of language)
- Card accepting devices with the capacity to display numeric characters only are able to fully differentiate error conditions using error numbers – for example, those using a seven segment liquid crystal displays.



Error numbers can precede or follow an error message and, on larger displays, can be discreetly included without intruding on other information, so that they are only read when a User needs to read them.



The obvious disadvantage of error numbers is that Users will not understand them without instruction such as a crib card or look up list and their use should always be accompanied by provision for this through, for example, User guides and help facilities.

Re-entry

High Level Requirements

There are various types of error condition that can apply. In some cases the error condition forces the abandonment of the session or transaction and the only recourse is to start again. One example of this would be where a contactless card has moved out of the reader field. In other cases, the transaction process is still in progress but the flow has been temporarily halted while a recoverable error situation is reported to the User. One example may be where the User has entered an invalid date. In these circumstances when an error condition is encountered and that error is corrected by the User, the system should allow the User to resume the transaction from the point at which the error occurred.

This is particularly important where a transaction or session involves significant input from the User. The aim is that the User should not be required to repeat any part of an interaction process if this can be avoided. Repetitive interaction of this kind usually engenders very negative response from Users and developers should therefore pay particular attention to details of system navigation design to achieve the highest possible levels of User error tolerance.

An exception to the above, even where technically the transaction could be continued, would be where retention of data within the system presents an unacceptable security risk.

6.5. Human Machine Interface (HMI) when establishing cardholder identification, authentication and digital signature

A separate study is being undertaken on cardholder identification, authentication and digital signature. The text for this will be incorporated with this document as an appendix or attached document.

6.6. Cost Transparency

Cost transparency is a major requirement from the Citizen's perspective. The Citizen needs to understand how much it costs to access a given service from a given access device. If these costs are variable then the terms and conditions that apply must be clearly stated and the reasons for any additional costs over the 'standard' charge explained. A detailed analysis of cost transparency has been produced as an eEurope 2002 smart card charter white paper which is included in the annexes to this report as Section 7.2.

It is recommended that the following actions are taken to support cost transparency

- Each service provider, whether of applications, content, or infrastructure, should carry out a Total Cost of Ownership (TCO) study to identify: Fixed costs, variable costs, direct costs, and indirect costs. In each case they should allocate costs, where appropriate, to the Provider or those to be borne by the Citizen.
- Each such TCO study must be based upon a usage and volumetric analysis that is dependent upon Citizen uptake of the service.
- A high degree of co-operation is required between all the service tiers to develop a holistic view of total usage and thus calculate end-to-end TCO for a given service. The likely owner of this high level TCO model is the Service Aggregator who, from the Citizen's perspective, is the gateway to their personalised eEurope services.
- The recommended charging model is that the stakeholders involved in any given service provision for eEurope should have a cross-charging agreement, which can be complex, involving detailed charging for each access and a clearing function, or simple, where each agrees that the cost differential will be broadly neutral. As this will encourage take-up and Citizen usage it may well be the more cost effective over time. However this model does imply complex commercial agreements that may impact upon service delivery unless they are given appropriate prioritisation.
- Simple for the Citizen to understand, a service charge should be agreed that is uniform, or nearly so, across all access routes. Charges may change over a period of time due to the dynamic nature of the charge balancing but these changes should be 'smoothed' to encourage Citizen take-up and usage.

6.7. Privacy

The issue of privacy is of major importance both because unless a User feels that what he believes to be private is private, he or she will not make use of ICT based services and secondly as a result of the need to conform to the European Directive 95/46/EC which deals with the subject of data privacy. Although highlighted here in this manual, a detailed study has been carried out on behalf of the eEurope 2002 smart card charter which has resulted in the production of a code of conduct for privacy and which is reproduced in the Annex as Section 7.3. It will be seen that many of the articles set out in the code of conduct map the best practice principles set down above in this manual which is to be expected if privacy is an important issue on the part of the User.

Annex: Reference Material & Related Documents

This section is included for reference purposes. However, it is also intended to show the scale and complexity of the subject in order to highlight the approach taken in this Best Practice manual as a starting point for those interested in supporting User Requirements but with limited resource available.

LEGISLATION

Title	Year
UK Disability Discrimination Act A Code of Practice - Duties of trade organisations to their disabled members and applicants (http://www.disability.gov.uk)	1995
Australian Disability Discrimination Act (http://www.austlii.edu.au/au/legis/cth/consol_act/dda1992264/)	1992
Americans with Disability Act (http://www.phxdistrict2.org/CITZASST/adaregs.html)	1990

INTERNATIONAL STANDARDS

Number	Title	Year
ISO TR 9527	Building construction - Needs of disabled people in buildings - Design guidelines	1994
ISO/CD 9355-1	Ergonomic requirements for the design of displays and control actuators Part 1: Human interaction with displays	1999
ISO/DIS 9355-2	Ergonomic requirements for the design of displays and control actuators Part 2: Displays	1999
ISO 11429	Ergonomics - System of auditory and visual danger and information signals	1996
ISO/TC 159	Ergonomics of human computer interaction (Draft only)	Ikke ferdig
ISO/CD 13406	Ergonomic requirements for flat panel displays (Part 1-2)	Ikke ferdig
ISO 13407	Human-centred design processes for interactive systems	1999
ISO 7816	Identification cards - Integrated circuit cards with contacts (Parts 1-10)	1994-1999
ISO 9186	Procedures for development and testing of public information symbols.	1989
ISO 20282	Usability of everyday products	2001

ISO 3461-1	General principles for the creation of graphical symbols Part 1: Graphical symbols for use on equipment	1988
ISO 9241	Ergonomic requirements for office work with visual display terminals (VDTs)	1998
ISO 14443	Identification cards - Contactless integrated circuit cards Proximity cards Part 1: Physical characteristics Part 2: Radio frequency power and signal interface Part 3: Initialisation and anti-collision Part 4: Transmission protocols	2000
ISO 7176-5	Wheelchairs - Part 5: Determination of overall dimensions, mass and turning space	1986
ISO 7000	Graphical symbols for use on equipment	1989
ISO 7001	Public information symbols	1991
ISO 7239	Development of principles for application of public information symbols	1990
ISO/IEC 9995	Information technology: Keyboard layout for text and office systems	1994
ISO/IEC 10536	Identification cards – contactless integrated circuit cards	2000
ISO/IEC 11581	User symbol interfaces and symbols: Icon symbols and functions.	
ISO/IEC Guide 71	Guidelines for standards developers to address the need of older persons and persons with disabilities	2001
ISO 15408	The Common Criteria for IT Security Evaluations (Parts 1-3)	1999

International Telecommunications Union (ITU)

Number	Title	Year
ITU – T E.118	Automatic international telephone credit cards	2001
ITU – T E.121	Pictograms, symbols and icons to assist Users of the telephone service	1996
ITU – T E.133	Operating procedures for telephone credit cards	1988
ITU – T E.134	Human Factors aspects of public terminals: Generic operating procedures	1993
ITU -T E.135	Human Factors Aspects of public telecommunications terminals for people with disabilities	1993
ITU – T E.136	Specification of a tactile identifier for use with telecommunications cards	1997
ITU – T E.161	Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network	1995
ITU – T F.902	Interactive services design guidelines	1995
ITU – T F.920	Procedures for designing, evaluating and selecting symbols, pictograms and icons	1995
ITU – T P.370	Magnetic field strength around the earcap of telephone handsets which provide for coupling to hearing aids	1996

International Electro-technical Committee (IEC)

Identification	Title	Year
IEC 118-4	Hearing aids: magnetic field strength in audio frequency induction loops or hearing aid purposes	1981
IEC 73	Colour of pushbuttons and their meanings	1990

Comité Européen De Normalisation (CEN)

Identification	Title	Year
EN 614	Safety of Machinery: Ergonomic Design Principles: Part 1: Terminology and General Principles	1995
EN 1332-1	Identification Card Systems – Man-Machine Interface Part 1: Design principles and symbols for the User interface	1997
EN 1332-2	Identification Card Systems – Man-Machine Interface Part 2: Dimensions and location of a tactile identifier for ID-1 cards	1997
EN 1332-3	Identification Card Systems – Man-Machine Interface Part 3: Keypads	1996
EN 1332-4	Identification Card Systems – Man-Machine Interface	1996

	Part 4: Coding of User Requirements for People with Special Needs	
prEN 1332-5	Identification Card Systems – Man-Machine Interface Part 5: Embossed Symbols for Differentiation of Application on ID-1 Cards	Start 2002
EN 894	Ergonomics of human-system interaction	2000
EN 29241	Part 4 Keyboard requirements; Part 11 Usability statement	1998
EN 726	Requirements for IC cards and terminals for telecommunications use	
EN 729	Requirements for IC cards and terminals for telecommunications use	
CWA 13987-1	Smart Card Systems - Interoperable citizen services - User related information (based on DISTINCT) - Part 1: Definition of User related information	2000
CWA 13987-2	Smart Card Systems - Interoperable citizen services - User related information (based on DISTINCT) - Part 2: Implementation Guidelines	2000
CWA 14147 (8 parts)	Financial transactional IC card reader (FINREAD)	

European Telecommunications Standards Institute (ETSI)

Number	Title	Year
ETR 029	Human Factors (HF); Access to telecommunications for people with special needs: Recommendations for improving and adapting telecommunication terminals and services for people with impairments	1991
ETR 039	Human factors standards for telecommunications applications	1992
ETR 051	Human Factors (HF): Usability checklist for telephones basic requirements	1992
ETR 068	European standardisation situation of telecommunication facilities for people with special needs	1993
ETR 070	Human Factors (FA); The Multiple Index Approach (MIA) for the evaluation of pictograms	June 1993
ETR 095	Human Factors (HF); Guide for usability evaluations of telecommunications systems and services	1993
ETR 096	Human Factors (HF); Phone Based Interfaces (PBI); Human factors guidelines for the design of minimum phone based User interface to computer services	1993
ETR 116	ISDN Terminal Design	1994
ETR 136	Tactile marker on prepaid telephone cards	
ETR 147	Human Factors (HF): Usability checklist for integrated services digital network (ISDN) telephone terminal equipment	1994

ETR 160	Human factors aspects of multimedia telecommunications	1995
ETR 165	Recommendations for a tactile identifier on machine readable cards for telecommunications terminals	1995
ETR 167	User instruction for public telecommunications services: Design guidelines	1995
ETR 170	Human Factors (HF); Generic User control procedures for telecommunication terminals and services	1995
ETR 208	Human Factors (HF): HF Aspects of universal personal telecommunications (UPT); User requirements	1995
ETR 333	Text Telephony: Basic User Requirements and Recommendations	1998
ETR 334	The implications of ageing for the design of telephone terminals	1996
ETR 345	Characteristics of telephone keypads and keyboards; Requirements of elderly and disabled people	Jan 1997
ETR 261-1	Human Factors (HF); Assessment and definition of a harmonized minimum man-machine interface (MMI) for accessing and controlling public network based supplementary services; Part 1: General approach and summary of findings	1996
ETR 333	Human Factors (HF): Text Telephony; Basic User requirements and recommendations	1997
EG 201 013	Human Factors (HF); Definitions, abbreviations and symbols	1997
EG 201 024	Human Factors (HF); User interface design principles for the Telecommunications Management Network (TMN) applicable to the "G" Interface	1997
EG 202 048	Human Factors (HF); Guidelines on the multimodality of icons, symbols and pictograms	2002
EG 202 067	Universal Communications Identifier (UCI); System framework UCI Architecture	2002
EG 202 072	Universal Communications Identifier (UCI); Placing UCI in context; Review and analysis of existing identification schemes	2002
EG 201 471	Human Factors (HF): Usability evaluation for the design of telecommunication systems, services and terminals	
EG 202-116	Human Factors (HF): Guidelines for ICT Products and Services	2002
EG 201 103	Human Factors (HF); Human factors issues in Multimedia Information Retrieval Services (MIRS)	1998
EG 201 379	Human Factors (HF); Framework for the development, evaluation and selection of graphical symbols	1998
EG 201 472	Human Factors (HF); Usability evaluation for the design of telecommunication systems, services and terminals	2000

EG 201 795	Human Factors (HF); Issues concerning User identification in future telecommunications systems	2000
ES 201 125	Human Factors (HF); Universal Personal Telecommunications (UPT); Specification of the minimum Man-Machine Interface (MMI) for Phase 1 UPT	1998
ES 201 275	Human Factors (HF); User control procedures in basic call, point-to-point connections, for Integrated Services Digital Network (ISDN) videotelephony	1998
ES 201 381	Human Factors (HF); Telecommunications keypads and keyboards; Tactile identifiers	1998
TR 102 068	Human Factors (HF); Requirements for assistive technology devices in ICT Requirements for assistive devices for ICT	2002
TC TR 001	Human Factors (HF): Generic Handsfree Procedures	1991
TC TR 003	Human Factors (HF): Human Factors Aspects of Pan European Numbering	1992
TC TR 004	Human Factors (HF); Harmonisation of code schemes as minimum Man Machine Interface for Telecommunication Terminals	1992
TC TR 006	Human Factors (HF): Ssatellite Personal Communication Network; statement of User aspects for a S-PCN service	1995
TC TR 007	Human Factors (HF); User requirements of enhanced terminals for public use	1996
TCR-TR 023	Human Factors (HF); Assignment of alphabetic letters to digits on push button dialling keypads	Sept 1994
TR 102 068	Human Factors (HF): Requirements for Assistive Technology	
ETS 138	Public terminals for the elderly	1998
ETS 300 375	Pictograms for point to point videotelephony.	1994
ETS 300 381	Telephony for hearing impaired people; Inductive coupling of telephones earphones to hearing aids	
ETS 300 488	Telephony for hearing impaired people; Characteristics of telephone sets that provide additional receiving amplification for the benefit of hearing impaired	
ETS 300 679	Telephony for hearing impaired people; Electrical coupling of telephone sets to hearing aids	
ETS 300 738	Human Factors (HF): Minimum Man Machine Interface (MMI) to public network based supplementary services	1997
ETS 300 767	Tactile marker for use on prepaid telephone cards	July 1997
EN 301 462	Symbols to identify telecommunications facilities for deaf and hard of hearing	2000

	people.	
SR 001 996	Human Factors (HF); An annotated bibliography of documents dealing with Human Factors and disability	2001
ETSI HF 00006	Usability evaluation for the design of telecommunication systems, services and terminals	

Norges Standardiserings Forbund (NSF – Norwegian Standards Association)

Number	Title	Year
NS 3937	Funksjonsmål for bruk av rullestol (In Norwegian: Functional measurements for use of wheelchairs).	1981

Other

Number	Title	Year
AS 3769	Automatic teller machines - User access (Australia)	1990
CAN/CSA-B651.1-M99	Barrier - free design for automated banking machines	
	"Self Service for All", Deltasenteret, Norway	

Literature

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Web-Links

www.usabilitynet.org

Comprehensive site which aims to promote usability, User-centred design and process improvement. Includes design guidelines and links to a list of international standards for HCI and usability

http://trace.wisc.edu/docs/consumer_products_guidelines/toc.htm

US body that aims to promote use of ICT to remove barriers to accessibility.

Gives guidelines for the design of consumer products to increase their accessibility to people with disabilities or who are ageing: accessible design of consumer products. Contains links to resources.

www.design.ncsu.edu/cud/

The internationally renowned Centre for Universal Design is based at North Carolina State University.

www.accessibility.lexir.net/

Promotes universal access in products, transport, tourism, built environment, labour market and disabled access to the information society. This is the home of European Disability Forum. Includes a standardisation section with excellent links.

www.tiresias.org/guidelines

Specifically for professionals working in the field of visual impairments, this site contains one of the most complete lists of standards and guidelines, plus other references

<http://csrc.nist.gov/cc/sc/sclist.htm#page%20top>

The Computer Security Resource Centre site contains sections on security requirements for smart cards and links to the Information Technology Laboratory

www.w3.org

The World Wide Web Consortium (W3C) develops interoperable technologies (specifications, guidelines, software, and tools) to lead the Web to its full potential

www.stakes.fi

Some useful links and guidance on design for all.

www.stakes.fi/cost219/cosb235.htm

This link takes you directly to some useful downloadable guidance documents on design for all

www.cost219.org

This link takes you directly to some useful downloadable guidance documents on design for all

www.eyecue.co.uk/pats

At this link, you will find "Access Prohibited?" (Gill, J., 1997). This includes information for designers of self-service systems

www.disability.gov.uk

Here you will find the UK Disability Discrimination Act, 1995 amongst other information.

www.delta.oslo.no

Here you will find the homepage of the Delta Centre, some useful links and publications from the Delta Centre. Delta, a Norwegian acronym which stands for "participation and accessibility for all"

www.trace.wisc.edu

Here you will find useful links to guidance on the design of consumer products, in a design for all perspective.

www.austlii.edu.au/au/legis/cth/consol_act/dda1992264/

Here you will find the Australian Disability Discrimination Act, 1992.

www.phxdistrict2.org/CITZASST/adaregs.html

This page is a good starting point to find out more about the Americans with Disabilities Act.

<http://www.ictsb.org/Activities/design.htm>

Here you will find the ICTSB "Design for All" project report. This report provides an ICT standardisation work programme to facilitate design for all.

www.centil.dk/cgi-bin/gentest.pl

This is NORDICTS homepage. Here you will find many useful links to other websites that concern universal design and standardisation.

www.talkingsigns.com

This describes talking signs

<http://www.tiresias.org/controls/index.htm>

Designing User Interfaces for People with Visual Impairments