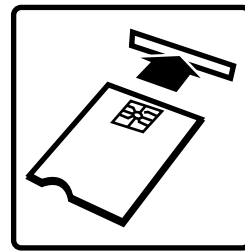
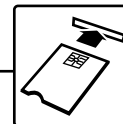


Chapter 12

Smart Cards





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Introduction

Card based systems have permeated key areas of the information society: they are the key to bank services (at ATMs or via telephone), are the key to communications (phone cards, GSM), transport (tickets, toll booths) and identity cards, (electronic passports/machine readable visas), health (patient cards/ health care professional cards) TV cards, electronic purses, access control for buildings, social security cards, etc. They are regarded as the “key” (currently the

missing key) to business to consumer Electronic Commerce.

Given that smart cards are the key to the information society, and given that there is a desire to avoid a two tier society (those that are members of the information society and those that are not) it is essential that no barriers to use (economic or technical) of smart card systems exist. They are the key to replacing the “service” society with a self-service society.

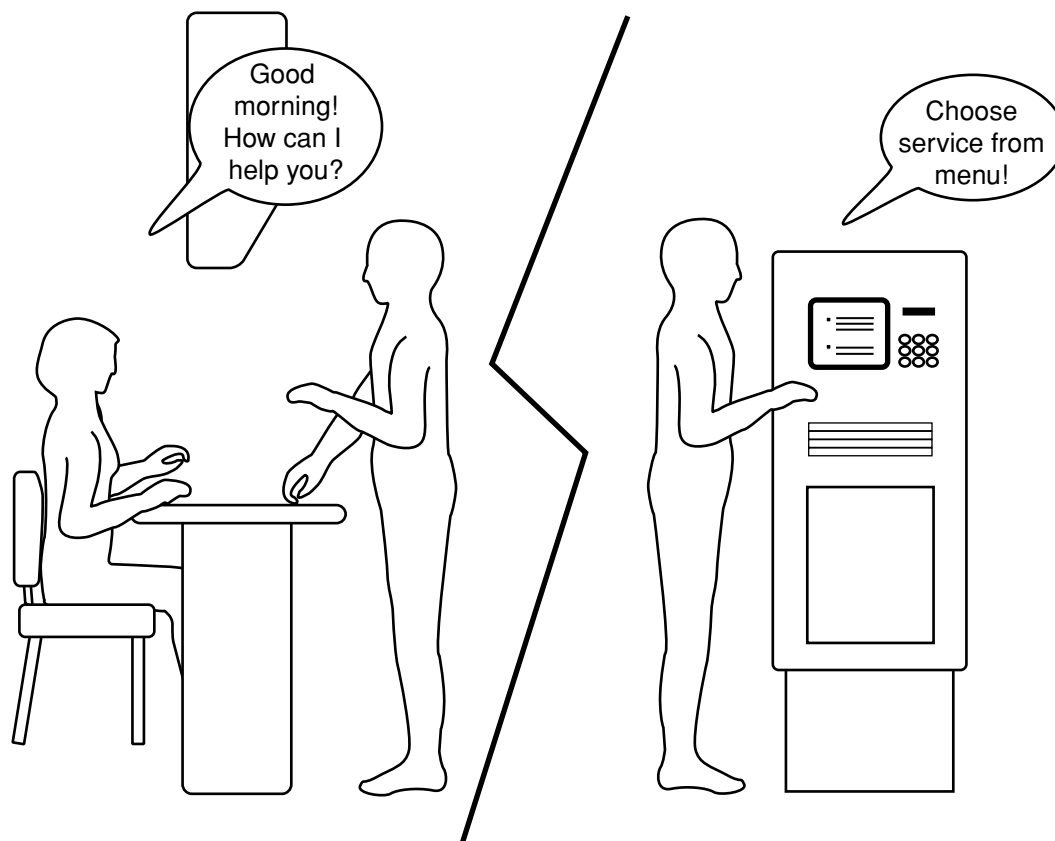
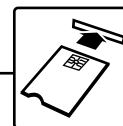


Figure 12-1: "The service society is being replaced by a self service society."



As figure 12-2 shows, the success of using a smart card system is similar to completing a puzzle. Completion of a task – or puzzle - is dependant upon the correct interoperation of all the different pieces. If one piece is missing, or sub-standard, the puzzle cannot be completed successfully. (This is very important when considering standards, which are the basis for smart card interoperability).

The development of smart card systems has also led to a potentially increasingly complex user interface as figure 12-3 shows:

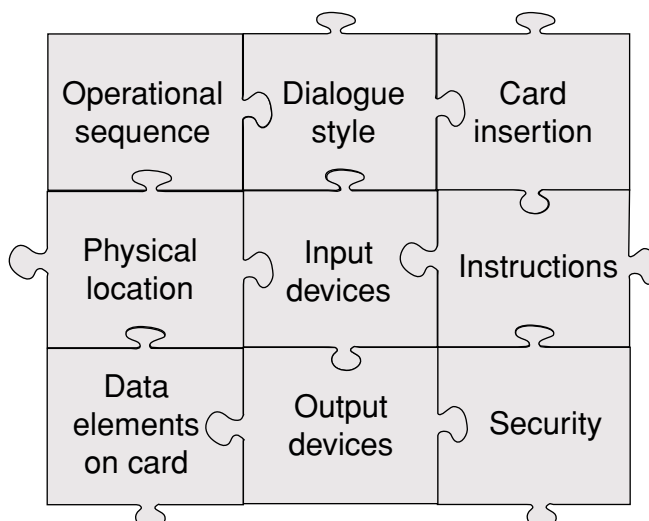


Figure 12-2: "The chain is only as strong as the weakest link."

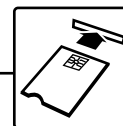
Today's user interface	Tomorrow's user interface
Monochrome	Unlimited number of colours
Limited numerical keying	Unlimited alphanumeric input
One channel of input	Several channels of input
Limited use of sound	Voice recognition/ synthetic speech
Limited responsibility with loss of card	Unlimited liability
Constant service offered	Different services – different times
One simple task to complete	Several subtasks to complete complex prime task
Mainly bank related	All societal functions
Voluntary use	Enforced use
Requires use of 1 card	Two or more cards
1 card – 1 PIN to remember	Many cards, many codes to remember

Figure12-3: An overview of today's and tomorrow's user interface

Not only is the user interface becoming more complex and demanding for its users, the consequences of not successfully using the system become more severe; - in the worst case social exclusion or an unlimited economic liability. The case for "Design for All" should be clear both from an individual and societal perspectives.

About smart cards

The term "smart card" refers to any plastic card with an embedded integrated circuit. As far as the public is concerned these cards will have physical dimensions according to ISO 7810. There are smart cards of other dimensions (e.g. SIM cards in mobile phones). Smart cards can perform two main functions: store data and perform calculations. Data storage allows the card to act as a data repository specific to the card holder; the calculation function allows the card to control access to that data.



Standards

The review below reflects that smart cards are used in many different domains and applications – providing a clear cut standards overview has therefore not proved to be easy. There is no one standards organisation that covers all user aspects of smart card systems.

ISO

ISO JTC 1 SC 17 Identification Card Systems

There are nine working groups in this ISO Sub-technical. None of them work specifically with ensuring that end users interests are systematically taken account of. Several of the working groups have work items that touch upon aspects that will affect the end user, for example WG 1, Physical characteristics and test methods for identification cards and WG 9, Optical Cards. Both working groups have work related to having a tactile identifier to assist visually impaired people orient a card (EN 1332-2) on the card.

Note:

WG 9 states that there will be a lamination problem with the dimensions specified in EN 1332-2 if there is a tactile identifier on the card. This has not been resolved.

ISO/IEC JTC 1 SC 17 WG 8 Contactless integrated circuit cards Task Force Two is producing a four part standard for proximity cards/ contactless cards.

ISO/IEC 14443-1

Identification cards – Contactless integrated circuit cards Proximity cards – Part 1: Physical characteristics

ISO/IEC 14443-2

Identification cards – Contactless integrated circuit cards Proximity cards – Part 2: Radio frequency power and signal interface

ISO/IEC 14443-3

Identification cards – Contactless integrated circuit cards Proximity cards – Part 3: Initialisation and anticollision

ISO/IEC 14443-4

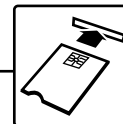
Identification cards – Contactless integrated circuit cards Proximity cards – Part 4: Transmission protocols

This four part standard is of relevance not only for accessing terminals without actually having to insert a card (of benefit to people with dexterity/ manipulation problems), but also for being able to gain access to buildings, and to use wayfinding systems in a complex builtup environment (see also Chapter 8, on Wayfinding).

Comment

Since cardholders may transmit confidential information to the system, measures must be taken to establish security of transmission between transponders and readers.

Protocols for communication between smart card, transponder and reader should be standardised so that the users can use their own personal equipment as an interface when communicating with the system. As such there should be interoperability between the wayfinding system and other smart card reading devices / personal devices. This also implies that there should be a certain compatibility between private smart house systems and public wayfinding systems.



Electronic commerce and smart cards

Within the domain of smart cards and business to consumer electronic commerce at the ISO level, there are at least two major initiatives that need referring to:

The ISO JTC 1 Business Team on Electronic Commerce and the ISO TC 68 /CEN TC 224 SC 6 Project Team on Electronic Commerce.

The ISO/IEC JTC 1 Business Team for Electronic Commerce, made several smart card related recommendations for standardisation as listed below (source ISO JTC 1 BT EC N071). (Note: These recommendations are also relevant for the chapter on the Internet and Electronic Commerce).

A.1	Review existing and emerging standards regarding user interfaces, formal and de facto, to establish the status of work in this area and their interworking. Establish their relevance from a consumer/user interface perspective in a home environment, using also delivery mechanisms other than a PC.
A.2	Develop a set of metaphors that are relevant for different domains within Electronic Commerce (e.g. shopping, travelling, ordering, searching, etc.). Existing desktop metaphors (office environment) may not be relevant for the consumer (home) environment, nor for other delivery mechanisms (smartphone, WebTV)
A.3	Develop a list of functions to be represented by each of the three (3) categories of icons; namely: (1) facilitating interaction; (2) representing certifications; and, (3) facilitating navigational aspects. Provide a functional description of these icons and provide design examples, both for visually represented icons and auditory ones (earcons). Define the grammatical rules for how these icons can be opened, closed, moved, emptied, etc. Icons to be developed in accordance with existing relevant standards. Relevant standards include not only office system standards, but also standards related to the design of information for the public.
A.4	Review existing dialogue design principles for office systems (ISO 9241-10) and self-service card-based systems (prEN 1332-1). Adapt these and others to consumers in a home environment. Determine which navigational aids are needed and standardise their representation (e.g. icons) and functionality.
A.5	Develop an approach to defining customer class profiles and individual customer profiles
A.6	Develop a starter set of customer class profiles using the approach defined in work item A.2.

Figure 12-4: Recommendations from ISO JTC/BT-EC.

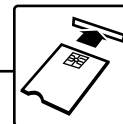
The ISO TC 68/CEN TC 224 Project Team on Financial transactions in Electronic Commerce is of direct relevance for smart card systems (and of course the internet and electronic commerce chapter of this report). The three deliverables provide an excellent analysis of electronic commerce with regard to ordering, delivery interfaces, payment, security and interoperability (including payment interoperability and communications protocols); a comprehensive overview of relevant existing standards and specifications and Requirements for Standardisation.

Note: CEN /ISSS has formed a co-ordination group of interested technical groups in order to monitor the follow up of these issue.

The key standardisation recommendations of relevance for this report are the recommendation for a Quality Standard and Transaction Profiles.

The proposed scope for a Quality Standard is as follows:

Guidelines for the behaviour of parties during the various stages of the transaction should be defined and agreed in order to establish a quality approach.



ISO 8402 states that “Requirements for quality” are an “Expression of the needs or their translation into a set of quantitatively or qualitatively stated requirements for the characteristics of an entity [e.g. a software solution for Electronic Commerce] to enable its realization and examination.”. Such requirements shall “fully reflect the stated and implied needs of the Customer.” And they cover “market-based and contractual, as well as an organization’s internal, requirements.”.

The requirements referred to below should be considered as such “requirements for quality”, and as such should be used to establish “quality standards” for Electronic Commerce. They may be supported by ergonomics related standards.

The proposed scope of Electronic Transaction Profiles is:

The purpose of this standard is to provide web site developers with a standardized method of describing to the Customer the sequence of the Electronic Commerce transaction.

The Merchant’s presentation of the sequences of stages and activities, in which Electronic Commerce transactions could be carried out, should be defined and agreed to ensure a good understanding of those sequences by the Customer. This presentation may include pictograms and flow charts.

The various transaction stages and their activities shall be defined, according to deliverable in section 4.1 for the ordering stage, section 5.1 for the delivery stage and section 6.1 for the payment stage). Some typical sequences, called profiles, might be included in the standard: their description may reflect codes of conduct.

Especially for order scenarios (see section 4.1.2 of deliverable 1), transaction profiles should be defined for the scenarios which comply with the quality criteria defined above.

Comment

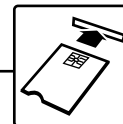
The recommendations from both of these project teams provide the opportunity to ensure a Design for All philosophy when specifying user interface elements and dialogue design for electronic commerce.

Accessing smart card systems

With regard to accessing smart card systems (see also chapter on Public Access Terminals) there is an ISO Technical Report ISO TR 9527 “Building Construction – Needs for disabled people in buildings – Design Guidelines and two national standards– one Canadian - CAN7CSA – B651.M99 (1999) Barrier free Design for Automated Banking Machines, and one Australian - AS 3769 (1999) Automatic Teller Machines: User Access.

User Interface Design

There are no ISO standards on the design and evaluation of user interfaces for smart card systems. There are standards that have been developed for other domains (signs for public information (ISO TR 9186, ISO 3461, user interfaces for offices systems (ISO 9241 – parts 10 –19) that could be applied to smart card systems in a Design for All perspective.



ITU

ITU - the International Telephone Union has several standards related to smart card systems as outlined below. These are more fully described in the Chapters on Communication Devices and Services.

ITU-T E.135 (10/93) Human Factors aspects of public telecommunications terminals for people with disabilities

ITU-T E.136 (05/97) Specification of a tactile identifier for use with telecommunications cards.

ITU-T E.121 (07/96) Pictograms, symbols and icons to assist users of the telephone service.

ITU-T F920 (02/95) Procedures for designing, evaluating and selecting symbols, pictograms and icons.

ITU-T E.161 (05/95) Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network

ITU-T F.902 (02/95) Interactive services design guidelines.

ITU-T E.134 (03/93) Human Factors aspects of public terminals: Generic operating procedures.

CEN

Within CEN/ISSS there are three technical committees that currently perform standardisation work that is smart card related:

CEN TC 224 Identification Card Systems

CEN TC 251 Medical Informatics

CEN TC 278 Road Transport Informatics

The work of CEN TC 251 Medical Informatics, (www.centc251.org/) has currently only a remote link to smart cards used by the public (or in 251s case "patients"). This link, is in relation to being able to use cards that contain patient data in an inter-sector environment.

Comment

EN 1332-4 describes the data and coding format for data that should be entered on a card. It does not take a stand as to who should enter that data. Perhaps medical practitioners should enter the data, since it is very confidential.

Within TC 278, WG 3 has started work in relation to the user interface of ticket machines.

CEN TC 224, established in 1990 is charged to ensure cross border, inter sector interoperability within smart card systems. It has twelve working groups, of which only four are currently

operative. Working Group Six, Man Machine Interface, is specifically mandated to produce standards in relation to user requirements. It has produced a four part standard (EN 1332 parts 1 to 4) as described below.

Scope of EN 1332

The scope is stated as follows:

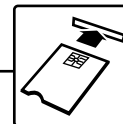
"Machine readable cards facilitate the provision of a growing variety of services cross Europe. The purpose of this standard is to increase the accessibility of these services for the benefit of consumers. This will be achieved by facilitating the inter-sector and cross border interoperability of machine readable cards and to do so with the maximum possible degree of user friendliness. EN 1332 addresses the needs of all users, including people with special needs, not overlooking first time users, minors, those not conversant with the local language."

Part One: User Interface dialogue design specifications

Part Two: Tactile identifier

Part Three: Keypads

Part Four: Coding of Special User Requirements



New Work Items to be completed by CEN TC 224WG 6

The following items are currently being worked on by WG 6.

- Physical access to card reading devices.
- Differentiating Plastic Cards by Touch.
- Supplement EN 1332-1 with an Annex of Icons, symbols and pictograms.

Comment

The standards have been written for typical ATM /Ticket Machine technology and for use in the public domain. Hand held devices, PDA's and use at home were not considered during development. Domains such as electronic commerce, transport, wayfinding, car useage, access control to buildings were not considered. Therefore the existing standards may be limited in their application.

EN 1332-2, "Tactile Identifier" has four options. Empirical research has shown that only one of the options actually meets the scope of the document. It is the option specified by ETSI. However this option is opposed by ISO/IEC JTC 1 SC 17 WG 9. A solution needs to be found.

CEN ISSS Workshops

Three workshops of direct relevance to smart cards are the CEN ISSS Distinct Workshop, CEN ISSS WS FINREAD and CEN ISSS WS E-SIGN.

The newly formed DISTINCT workshop intends to produce a CWA on coding of user requirements on cards (based on EN 1332-4) and to provide a mechanism for payment between those parties providing services to the cardholder. It will also provide a register of requirements that are coded in order to ensure interoperability. It has also provided coded user requirements in addition to those already specified in EN 1332-4.

Comment

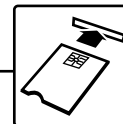
The concept behind this workshop has the potential to improve access to smart card systems for all users and is of considerable importance.

The CEN/ISSS FINREAD Workshop aims to provide a CWA specifying IC readers for use in the home in order to facillitate electronic commerce and other pay services such as Pay TV. It could also be used for authentication – e.g. electronic voting.

Comment

This CWA could have an considerable impact on daily living for all people. It is therefore important that the CWA embodies Design for All principles.

In response to the Electronic Signatures Directive, a CEN ISSS WS E-SIGN has been started. It is supported by a project team which is , inter alia, identifying requirements on "User interface and operating environment for electronic signature creation". This particular activity will be taking on board a "design for all perspective".



ETSI

For a more complete overview of work done by ETSI, the reader is referred to the chapters on Communication Devices and Services.

Work on smart card systems and its component parts is split up between different Technical committees in ETSI, such as SMG, Terminal Equipment, Human Factors, and The ETSI User group.

The ETSI Board is currently reviewing the Institutes card work, with a view to restructuring it. Particularly relevant are card requirements for UMTS (third generation mobile, with the global GPP Project).

The following produced mainly from the Technical Committee on Human Factors is of particular relevance to smart card systems and Design for All:

- ES 201 381 Keypads and keyboards for telecommunications equipment
- ETS 300 767 Tactile marker for use on prepaid telephone cards
- ETR 333 Text Telephony; Basic user requirements and recommendations
- ETR 165 Recommendations for a tactile identifier on machine readable cards for telecommunications terminals.
- ETR 029 Access to telecommunications for people with special needs; Recommendations for improving telecommunications terminals and services for people with impairments.

- ETR 116 1994 ISDN Terminal Design
- ETR 334 The implications of ageing for the design of telephone terminals.
- ETR 345 Characteristics of telephone keypads and keyboards; Requirements of elderly and disabled people.
- E.138 1998 Public terminals for the elderly

The ETSI User Group, 1996, produced a document: "Users requirements; Mobility; interworking and Interoperability between Networks". This lists a series of important requirements that will help to achieve Design for All.

Comment

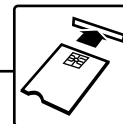
There is no one body in ETSI responsible for producing a set of standards related to the user interface of smart card systems with regard to Design for All issues. Much of the work that is relevant is produced as Technical Reports (i.e. recommendations), not standards. It is not clear if this work is used.

De Facto

There are a series of initiatives/ organisations/ industry associations that produce defacto standards/ agreements in relation to smart card systems which include EMV (Europay, Mastercard and Visa), Global Chipcard Alliance, ECBS (European Committee for banking Standards), Multos. There are several annual trade fairs; -ESCAT, ScandiCards, Smart Card Conference.

Comment

There is no apparent systematic focus on user interface and Design for All issues in any of the above mentioned defacto fora. It is worth noting that this defacto fora is the one that sets the standards that are in fact used.



Conclusions in Relation to Standards

Given the wide variety of uses for smart card systems and the potentially many different organisations (de facto and de jure) that perform standardisation of various components of smart card systems, it is hardly surprising that there is no overall holistic and consistent approach to the standardisation of smart card systems in relation to "Design for All". In addition, it must be recognised that the user interface is seen as an area of competition amongst service providers and therefore often stated as not one for standardisation.

The relevant standards that do exist have been driven mainly by the financial services and telecommunications industries. Other domains, such as transport, wayfinding, building access, have not been so proactive in the standardisation of user aspects.

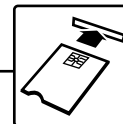
The one group charged with cross border inter sector interoperability is CEN TC 224 WG 6. Standards developed by this group have been based on achieving consensus (as indeed most standards are) as opposed to being based on empirical data, i.e. they do not necessarily meet users requirements. Output from ETSI TC Human Factors, which is often based on empirical data is produced as Technical Reports as opposed to ETSI Standards. Technical reports are not binding.

The starting point for CEN TC 24 WG 6 standards has been ATMs/ Ticket machines/ Telephone kiosks. Technology such as hand held devices, smart card readers in the home, set top boxes, wayfinding, access control, inter-sector purse, home banking, have come after publication of the existing four part standard.

In the defacto standardisation world there is little/ no evidence of standardisation and related activities that take account of Design for All.

There is however a potential prospect of adapting smart card systems to suit "all" users, and that is by getting the terminal and service to adapt to the individuals requirements (EN 1332-4, subject of the CEN/ISSS DISTINCT Workshop). This concept could be applied across many other areas of ICT.

There is a proposal under discussion for a European Payments observatory. This is an ISIS project. CEN / ISSS is interfacing by providing the standards link. It will take high level requirements, including on cards, so could provide a future focal point at that level.



Output from Projects

One of the most relevant EU projects for smart cards and disability was TIDE Project 1040 SATURN, 1994-1996. Its participants included smart card manufacturers, terminal equipment suppliers, telecommunications providers, a consumer council, disability and human factors experts.

The project has provided the basis for standards on coding of user requirements on cards (EN 1332-4), provided a holistic user requirements specification for smart card systems, and increased awareness of the need to “Design for All” amongst the terminal equipment suppliers (the largest in the world), card manufacturers and service providers. A series of brochures/guidance documents have been spawned on making smart card systems accessible to all users. Useful documents from the project include:

- An overview of legislation, standards, literature and other research on the useability of smart cards and related self service systems” Balfour, Klein and Petrie, Deliverable One, SATURN project 1994.
- User Requirements for Smart Card Systems, Balfour A, 1995, Deliverable 3, SATURN project.
- Cost 219 “Proceedings of the Cost 219 seminar on Smart cards and disability”, 1994
- Access Prohibited ? Information to Designers of Public Access Terminals, RNIB.

Another highly relevant EU project is DISTINCT. It has further developed the concept of coding user requirements on smart cards (started in SATURN), especially in relation to public transport (not covered in SATURN). It has added additional suggestions for coding to functions not currently specified in 1332-4, and since been taken forward as a CEN /ISSS Workshop.

The TIDE Project DE 3201 ARiADNE, a project demonstrating the use of smart cards and transponders to help disabled people navigate in complex buildings (see Chapter on wayfinding) has developed a set of standardisation

recommendations (December 1999) in relation to access and navigation in buildings, accessibility, standardisation requirements between smart card, transponders and terminals, user interfaces for transponders and terminals and user profiles.

In the Scandinavian countries, various consumer councils and disability organisations have attempted to put a focus on making self service systems more accessible for all users. A number of reports have been published and seminars held:

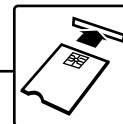
- Consumer Requirements for Specification for Smart Card Systems, TemaNord 1995
- Ensuring Consumer Interests in card based Self Service Systems, TemaNord 1995
- Automatic service machines – Service for Everybody ? Swedish Handicap Institute
- Self service for everyone ? – Guidelines for the procurement and installation of self service systems to meet a Design for All Approach. DELTA-senteret, Norway, 2000.

In anticipation of the UK Disability Discrimination Act, the financial services industry in the UK has developed a Code of Practice on Accessibility to ATMs.

Access to ATMs: UK Design Guidelines, Centre for Accessible Environments.

Comment

There is a range of output (holistic frameworks, research results, guidelines, etc) from a variety of projects (european and national) that could be applied in standardisation so that smart card systems could be “Designed for All”.



User Requirements

Locating and Accessing Terminals



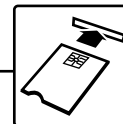
Home Environment

- Interoperability between smart card readers and different types of terminals (e.g. television, telephone and PC) is required.
- Card readers should read all smart cards in order to avoid the home user having several different card readers.
- Card reading equipment in the home should be usable for different functions such as payment on the internet and for pay-TV (i.e.. access control). This is in order to avoid the consumer having several card readers.
- Users should not be required to purchase any special equipment in order to get access to the services.



Public Environment

- There must always be a manual alternative to electronically provided services. Manual services should not be more expensive for the users.
- If possible the terminal should be located in the vicinity of an information desk.
- The terminals should be placed according to standard guidelines (aiming at conformity in placement of terminals).
- Some form of manual help, e.g. from personnel at an information desk, must be available.
- Terminals of the same type should have a unitary visual/auditory/tactual profile, be placed according to standard guidelines, and clearly identifiable from both long and short distances. The identification should tell the reader what kind of terminal this is (e.g. teller or ticket machine).
- No obstacles (street furniture etc) should be located in a predefined area around the terminal or on the route to the terminal. The area around the terminal should be large enough to turn a standard size pram or a wheelchair.
- Terminals should be on the same level as main pathways/walkways.
- Terminals should be installed according to existing and ongoing standards.
- Exit from indoor terminals should be clearly marked (alternative manual exit should also be marked).
- Tactile markings should be provided in the floor.
- Appropriate lighting around and on the route to the terminal is required.
- Pavements on access routes and in front of the terminal should be smooth with slip-resistance surface.
- Drainage gratings should be outside the route if possible.
- Where queuing is expected there should be room for people standing in a line.



Requirements

Standardisation



Physical

- Operation of the terminal should not require the user to move back and forth between different component parts of the equipment.
- The user should be able to operate the terminal from the position normally used when operating the equipment where the terminal is installed (e.g. from the sofa when using the TV).
- Provide means for storing cane, briefcase, etc. while using the terminal.
- Automatic doors preferred.
- Automatic doors should not create walking hazards (sliding doors are preferred).
- Terminal should be adaptable to the users size and position (e.g. mounted on flexible arm). Preferably the terminal should adjust automatically based on information stored in the user profile.
- The terminal must be mounted so that all users can reach the functional areas.
- Access routes should be flat, without steps, stairs or unevenness and not present barriers or hazards to people with impaired mobility or vision (UK Design Guidelines).

In progress:

- CEN TC224 WG6 – Provisions for physical accessibility to card reading terminals

Other relevant standards:

- ISO 7176-5 Wheelchairs – Part 5: Determination of overall dimensions, mass and turning space.

Existing guidelines (not standard):

- Access to ATMs – UK Design Guidelines.
- ISO TR 9527 Building construction – Needs of disabled people in buildings – Design guidelines
- Access Prohibited? Information for designers of Public Access Terminals
- ENV by CEN TC 224 WG6 should cover these issues.



Auditory

- The area surrounding the terminal should be protected against excessive background noise.
- Audible signals, used by visually impaired persons to find the terminal, must be heard at a distance of a few meters.

- ENV by CEN TC 224 WG6 should cover these issues.

- Standards required

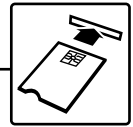


Visual

- Clear and visible markings of the terminal.
- Signs showing the location of the terminal must have letters that are at least 100 mm high, an easily recognisable font and high contrast between text and background.
- Terminals should be easily identifiable at night and on overcast days.
- Colour and contrast should be used to enable visually impaired persons to locate the terminal.

Existing:

- AS 3769 – ATM – User access
- ENV by CEN TC 224 WG6 should cover these issues.



Requirements

Standardisation

- Colour markings should be at least 40 cm wide on the walls and floor surrounding the terminal.
- Glare should be avoided from the terminal and its components.
- Light fixtures should not be placed so that the users of the terminal are dazzled or cast shadow on the screen.
- Lighting should be according to recognised guidelines (UK Design Guidelines) or standards.
- Terminal controls and function areas must be within the users comfortable viewing angle.



Cognitive

- Signs and symbols telling the user the type and location of the terminal should be easy to interpret.

Ongoing:

- EN 1332-1, N.W.I. on icons, symbols and pictograms.



Dexterity

- Hands free operation would be preferred. Other alternatives are: Intelligence in card remembering the most frequently used function presented as a default (user only needs to confirm the operation). Alternatively a preprogrammed sequence of commands could be transferred to the terminal from the users own digital assistant (requiring only one key press).
- Automatic doors are preferred
- Contactless means for identification to get access should be provided.

Required:

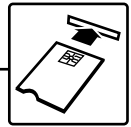
- A media independent, uniform protocol for secure digital data transfer explicitly directed from the contact-less smart card (device) to the terminal is needed.
- Further development of EN 1332-4.
- To be investigated in CEN ISSS WS E-SIGN.



Combination

- Tactile markings on the floor leading the user towards the terminal.

- Guidelines exist, standards required.



Physical Handling of Smart Cards and Controls



Home Environment

- It should be possible to operate the terminal from where the communication equipment (TV, Phone, PC etc.) usually is operated (e.g. from the sofa for the TV)



Public Environment

- The terminal should never be allowed to confiscate a card due to terminal malfunction (or alternative means for identification etc. should be provided immediately)



Mobile Environment

- None identified

Requirements

Standardisation

General

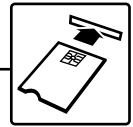
- There must be compatibility across card readers.
- Layout of functional areas on the terminal should be standardised.
- Connection between terminal and users personal user interfaces/equipment (e.g. headphones) should be standardised. Both communication protocol and technological interface should be standard.
- Differences between the different function areas should be emphasised in the design.
- Standardise card insertion slots.
- When touch screens are used, all screen functions should also be available from a tactile keypad,

Existing standards:

- EN 1332 Part 3: Keypads
- ISO/DIS 9355 Ergonomic requirements for the design of displays and control actuators:
Part 1: Human interactions with displays and actuators.
Part 2: Displays.

Other relevant standards:

- ISO 9995 Information technology - Keyboard layouts for text and office systems
- ISO 9214 Ergonomic requirement for office work with visual display terminals:
Part 11 Guidance on usability



Requirements

Standardisation



Physical

- Differences between the different function areas should be emphasised in the design.
- Tactile marking of numerical keypad (e.g. number 5 is elevated).
- Screens and controls must be located so that all functional areas are within comfortable reach of intended users without excessive effort (e.g. wheelchair users).
- The installation of the terminal must allow intended users to both provide input and receive necessary output without use of excessive effort.
- Terminals designed for use by car drivers (e.g. parking, etc.) should not require the driver to step out in order to be operated. (Terminals should be flexible enough to be operated from the driver seat, not requiring excessive physical effort from the driver).
- The driver should not be required to leave the car to get e.g. a parking ticket.
- The angle of control and output devices should be in such a way that it can be seen and operated by all users independent of height.
- Knee-holes for wheelchair users should be provided when possible.
- When the machine is a hole-in-the-wall solution the top collar of the machine should not be an obstruction.

Ongoing work:

- TC 224 WG 6 N.W.I. Physical accessibility should cover issues identified here.



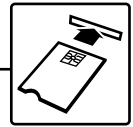
Auditory

- Voice messages should describe the transaction sequence and give audio confirmation of the keys selected.
- Standard required.



Visual

- If contact-less technology is used – the blind user must be provided with means to help him/her point at the spot where the sensor is located.
- Parallax should be avoided.



Requirements

Standardisation



Cognitive

- Consistent location and orientation of card insertion unit. Symbols for same.

Ongoing:

- Symbols should be developed in annex A of EN 1332 part 1



Dexterity

- The card must be designed so that it is easy to grip and handle for people with dexterity problems. Comment: Is card a good solution? For some user groups it would be better to avoid cards altogether.
- Contact-less technology should be used.
- International standards for keyboards should be followed (good contrast, large keys etc.).
- Buttons should be reliable and with a standard weight (pressure).
- If touch screens are used – an alternative solution with manual buttons should be provided.
- Means for correct orientation of card should be provided (e.g. tactile marking of card).
- It should be easy for the users to distinguish between different types of cards (e.g. tactile marking).
- It should be possible to orient the card in at least two ways, not just one.

Existing standards:

- EN 1332-2 – Card orientation
- EN 1332-3 – Keypads
- AS 3769 ATM – User Access

- EN 1332-3 may need revising.

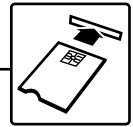
Proposed new work item:

- CEN TC224 WG6 – Tactual differentiation of cards
- Standard required.



Combination

- None identified



User Interface (UI)



Home



Mobile Environment

- User interface should be adaptable to individual abilities and needs.



Public Environment

- The design of new services must be standardised across service providers, and should where possible be designed in accordance with the already established user practice for carrying out the service (according to users expectations).

Requirements

Standardisation

General

- The user interface must be flexible enough to be adapted to individual users special needs.
- Users should receive feedback adapted to their special needs.
- The user interface should be developed according to recognised standards for usability

Existing:

- EN 1332-1 – General Design Principles

Required.

- Standards for information needs related to different user groups/abilities must developed.

Other relevant standards:

- ISO 9241 – Ergonomic requirements for office work with visual display terminals:
Part 9: Non-keyboard input devices.
Part 11: Guidance on usability



Physical

- Non identified

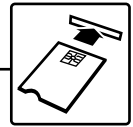


Auditory

- Optional connection to an inductive loops or headsets should be provided.
- Voice input is desirable.

Other relevant standards:

- ISO/DIS 11548 Communication aids for blind persons:
Part 1: General guidelines for Braille identifiers and shift marks.
Part 2: Latin alphabet based character sets.



Requirements

Standardisation



Visual

- Contrast and brightness should be designed in accordance with existing standards.
- Contrast and brightness controls should be designed and dimensioned to enable visually impaired users to adjust the screen according to their individual needs (Ref. RNIB Font type Tiriases).
- Letters should be designed according to standards for legible interfaces.
- Printed output should be in a clear and strong inked font.

Existing standards:

- AS 3769-1990 Automatic teller machines – User access.
- ISO/CD 13406 – Ergonomic requirements for flat panel displays:
 - Part 1: Introduction
 - Part 2: Ergonomic requirements for flat panel displays.

Other relevant standards:

- SO9241 – Ergonomic requirements for office work with visual display terminals:
 - Part 3: Visual display requirements.
 - Part 8: Requirements for displayed colours



Cognitive

- Graphics should be used for the main operating features (e.g. card insertion, money outlet)
- Standard symbols that are established in the surrounding culture should be used.
- Symbols should be easy to understand.
- Interface to be developed according to principles for User Centred Design and satisfy established standards for usability.

Existing standards:

- ISO 9241-11

In progress:

- CEN TC 304 is ongoing
- Annex A of EN 1332 part 1 is under development.

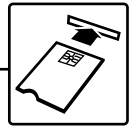
Other relevant standards:

- ISO 9241 – Ergonomic requirements for office work with visual display terminals:
 - Part 11: Guidance on usability



Dexterity

- None identified.



Operation



Home



Mobile Environment

- There must be a standardised procedure across different types of terminals. Users might need a training program to learn to operate the terminal.



Public Environment

- There must be a standardised procedure, but flexible (accepting different user strategies) across different types of terminals. The procedure should be communicated through visual, auditory and tactile information channels (flexible user interface).

Requirements

Standardisation

General

- The dialogue between the user and the terminal should be standardised and based on established standards for dialogue design.
- Help function adapted to the user's abilities should be provided (e.g. get in contact with certified personnel).
- There should be an "undo" button for all steps in the sequence. It should be possible to undo only the last step, or the whole transaction.
- The procedure must be designed to give the user full control of the transaction/process. Means for confirmation of transaction and identification of user must be provided.
- The user must be able to retrieve the card from the terminal at any stage during the process.
- Receipts should not be provided automatically, only on users specific request.
- The same type of procedures should be used for the same functions, irrespective of the type of terminal used (e.g. telephone and teller machine).

Existing standards:

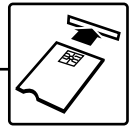
- EN 1332-1 General design principles

Required:

- A standard procedure for terminal use must be specified and standardised.
- Standards for help functions are needed.

Other relevant standards:

- ISO9241- Ergonomic requirements for office work with visual display terminals:
 - Part 10: Dialogue principles.
 - Part 13: User guidance
 - Part 14: Menu dialogues
- ISO 11429 Ergonomics – System of auditory and visual danger and information signals



Requirements

Standardisation



Physical

- The position of the instructions should relate to where the operation should take place.



Auditory

- An optional voice feedback telling the users which operations that have been performed should be provided.
- Standard procedure for use of voice recognition/voice feedback should be developed.

Other relevant standards:

- AS 2822 provides guidance on how to achieve intelligibility of audio messages.



Visual

- The next step in an operating sequence and associated functional areas should be clearly indicated according to the user's needs.
- Bleeps used for feedback should always have a visual feedback in addition.



Cognitive

- Messages and dialogues must be easy to interpret and should be standardised.



Dexterity

- None identified

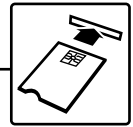


Combination

- Feedback, input and output should be adjusted to the users individual needs.

Existing standards:

- EN 1332-4 Coding of user requirements.



Adaptation to User Profile



Home



Mobile Environment

- Memory for personal adjustments (different profiles).



Public Environment

- Compatible with a standard profile.
- Easy to change profiles.
- User profile to be interoperable between devices.

Requirements

Standardisation

General

- It should be possible to adjust the timing to the needs of the user.

Existing:

- EN 1332-4 Coding of User Requirements
- Revise EN 1332-4 to include this requirement.



Physical



Visual



Cognitive

- None identified



Auditory

- Voice control and voice recognition should be provided.

- Revise EN 1332-4 to include this requirement.



Dexterity

- Hands free alternative should be provided.

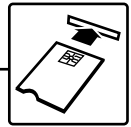
- Revise EN 1332-4 to include this requirement.



Combination

- Any combination of the above to suit the needs of individual users.
- Users should be able to choose identification method adapted to their abilities/user profile.

- Revise EN 1332-4 to include this requirement.



Security of Operation



Home Environment

- Safety measures should be built into the terminal-/system to protect the users from:
- Being robbed in their own home (e.g. held as hostages until the “pay up”).
- Unauthorised use (kids playing, etc.)



Public



Mobile Environment

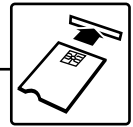
- Manual help from others should be available.
- The user must frequently receive feedback that the correct operations have been executed.
- The terminal should be designed to provide safety both with regards to surveillance and privacy regarding the use of the terminal.
- Privacy must be provided for the user during identification (e.g. screen blocking the sight of others when giving up the pin code).
- The terminals should be located in places that are experienced as safe by the users.

Requirements

Standardisation

General

- The transmission between the card and the card-reader must be encrypted (should be conformant with established standards).
 - The service provider should be responsible for designing an individual security profile for the different users. **Comment:** The service providers should be obliged to provide the service to all user groups. User groups that the service provider consider as a security risk due to their special needs should not be denied the service.
 - Special safety measures should be implemented in the different user profiles (e.g. maximum limit on withdrawals, maximum limit on giros that are not issued in the users name, and card should not be used on services that the user does not have access to)
 - The users should determine the user profile and the type and amount of information stored on the card. An optional security profile defining the services available to the user. The profile should be determined by the user him-/herself.
 - If the smart card is confiscated by the terminal the user should receive documentation for this.
- Standards required to be covered by CEN ISSS WS E-SIGN.



Requirements

Standardisation

- The contactless card must be protected against unintended use (e.g. tapping the users account while the users are passing by the terminal).
- Card should be resistant/protected against magnetic influence.



Physical

- Means to provide privacy and security for the users must be designed to take account for all users, irrespective of height and size.
- Standard required.



Auditory

- When auditory feedback is provided, care should be taken to keep this information/communication private. No sensitive information should be publicly announced.
- Standard required.



Visual

- None identified



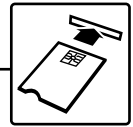
Cognitive

- Alternatives to pin codes should be provided for identification purposes.
- Means to reduce the number of pin codes should be investigated.
- CEN ISSS WS E-SIGN to cover this.



Dexterity

- It must be easy for the users to hold and grasp the smart cards.



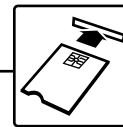
Requirements

Standardisation



Combination

- Security mechanisms should be adapted to the different users abilities (e.g. voice recognition for visually impaired users).
 - Alarms should appear if the user leaves the card, money, ticket etc. in the terminal. (At minimum a visual and an audible alarm should be provided)
- CEN ISSS WS E-SIGN to cover this.



Conclusions

Framework

Develop a framework of all user interface related smart card issues that should be standardised, taking into account the proposals for standardisation below. Develop a business plan for this work.

Revise the EN-1332 series to take on board hand held devices, IC card readers in the home, domains other than financial services and telecommunications, and environments other than public space. Output from relevant projects (SATURN, DISTINCT) and guidelines (national, scandinavian) should be incorporated.

Adapt usability standards (ISO 9241-11) to smart card systems and the Design for All philosophy. Determine usability goals for smart card systems.

Adapt design process related standards (ISO 13407, EN 614) to smart card systems and Design for All.

Access

Revise CEN TC 224 WG 6s Scope of Work on the ENV Physical access to terminals, to include visual (lighting, colour, size of text, reflections, glare - day and night) and cognitive accessibility. The ENV to take on board existing national standards, design guidelines, results of projects, other national standards. Car drivers requirements at drive in terminals to be covered (tollbooths, ticket dispensers, etc).

When revising the scope consider:

- “coding” the environment
- facilitating wayfinding information to severely visually impaired people
- defining the use of sound for navigational purposes
- defining the location of visual elements of a way finding system in relation to different user groups
- representing the built environment in a digital format

Auditory

Develop standards (taking account of relevant existing ETSI /ITU standards) for testing the intelligibility of speech/ voice output from systems in various environments, including public spaces.

Develop standards for the structure, form and presentation of verbal messages.

Card design

The CEN TC 224 Proposed New Work Item, Differentiating Plastic Cards by Touch, should proceed.

Revise 1332-2 to provide one tactile identifier that meets its Scope of Work and that is in line with other existing standards (ETSI).

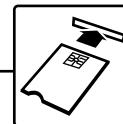
User interface

Key elements of visually presented user interfaces should be standardised. This standardisation should not compromise competition. Elements for standardisation could include, but not be limited to: metaphors, legibility, comprehensibility testing, text sizes, colours allocated to specific functions and icons, symbols and pictograms.

When, supplementing EN 1332-1 with an Annex of Icons, symbols and pictograms, follow the development process as specified in ISO 9186 and develop according to ISO 3461, ISO 7001.

The Annex should include icons, symbols and pictograms in relation to wayfinding, operational procedures, interaction elements / interaction design for physical and screen controls, how to activate the different forms of output (speech, visual), message typologies, tactile feedback, timely feedback during and after task completion, effective prompting during sequential actions and help functions.

There should be equivalent “earcons” /sounds specified in terms of frequency, amplification, number of.



Coding of user preferences

Code user requirements for service interfaces and for different application domains (e.g. electronic commerce, transport, wayfinding) based on EN 1332-4 and the output from the CEN ISSS WS DISTINCT. This will require a further analysis of which functions should be coded for different services and different people.

Coding is needed in relation to wayfinding information and its presentation in different modalities.

A “smart” function should be considered, i.e. the possibility of learning a card holders patterns (e.g. travel – if card is activated during evening rush hour, one automatically gets asked if you want a ticket home) or previous use of terminals (you have never used this system before - do you want a guided tour?).

Consider coding requirements in relation to different environments — home, mobile, public. This may require a terminal/ service coding.

The user should be able to customise which services the card can be used for and what limits are to be set for different services.

Security at the MMI

Standards for specifying and measuring security at the man machine interface, should be developed. It should take into account all sizes of the population, irrespective of height and size. The standard should take account of surveillance equipment and the possibility of observation from other people. When auditory feedback is provided, care should be taken to keep this information/ private. No sensitive information should be public.

Security mechanisms should be adapted to the different users capabilities (e.g. voice recognition for visually impaired users).

Alarms (visual and audible) should warn if the user leaves the card, money, ticket etc. in the terminal.

Interoperability

Standards to allow IC readers to be interoperable with a variety of home ICT delivery mechanisms (telephone, TV, set top boxes, smartphones, PCs) and accept all smart cards should be developed building on the proposed FIN-READ CWA.

This standard should allow smart card readers to be interoperable with assistive technology.

Terminal Equipment design

The orientation of card insertion slots should be standardised. A “funnel” should be placed over the slot to aid insertion.

The layout of functional areas on the terminal should be standardised. Differences between the different function areas should be emphasised in the design.

Connection between terminal and users personal user interfaces/equipment (e.g. headphones) should be standardised. Both communication protocol and technological interface should be standard.

When touch screens are used, all screen functions should be available from a tactile keypad or buttons.

A standard for the location, design and dimensions of screen contrast and brightness controls should be developed with the intention of enabling visually impaired users to adjust the screen according to their individual needs.

A standard for the connection of an inductive loop or headset to a card reading device should be developed.

A standard to ensure that the design of hand-held terminals allows visually impaired people to use them should be developed.