The Markets for the Adaptation of Self-Service Terminals to be Accessible by People with Disabilities

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Contents

Appendices

Terms of Reference

The Market Study is to:

a. Provide an overview of the markets for the adaptation of self-service terminals to the disabled;

b. Provide an overview of the accessibility portals for assistive technologies;

c. Capture evidence the market opportunity in e-accessibility of self-service terminals as well as assistive technology and accessibility portal;

d. Serve as an information dissemination tool.

Introduction

The number of self-service terminals has been increasing over the years and it is anticipated that the number and variety will continue to increase over the next few years. However there are exceptions such as the number of public payphones is predicted to decrease owing to the increase in usage of mobile phones. A significant aspect of self-service terminals is that, in many cases, there is no viable alternative method for accessing the service if one cannot use the terminal. Often other methods of carrying out the transaction would incur additional costs to the user. Therefore inaccessibility of these terminals can significantly limit an individual's ability to fully participate in society.

Over the next few years there will be an increasing number of people over retirement age, and thus an increasing number of people with a combination of impairments. In addition there are many people who do not consider themselves disabled but who have problems with self-service terminals. For instance someone who wears bifocal spectacles may have problems in reading a screen since the reading distance is not appropriate for either lens (typically one lens is prescribed for a reading distance of about 30 cm and the other for distance viewing).

The general approach has been to encourage manufacturers to adopt inclusive design which means designing the terminal such that it can be used by as many people as is reasonably possible. In some cases this makes negligible difference to the cost if it is considered from the outset when designing a new terminal. However in other cases it can add significantly to the capital or running cost of the terminal. Sometimes a feature which is particularly beneficial to one group of customers may be detrimental for another group. For instance terminals at a height to suit a wheelchair user can be problematic for a tall person who has difficulty in bending down to be able to read the screen. On some terminals, such as the iris scanners at London airports, two cameras are provided at different heights, but this adds to the cost of terminal.

When inclusive design does not meet all the needs, it may be possible to provide an interface to an assistive device. The most common have been inductive loops for hearing aid users and jack sockets into which headphones can be plugged by blind users. The increasing use of mobile phones means that a significant proportion of the users routinely carry such a device which could be used to provide a personalised interface to a self-service terminal. Many other interfaces have been suggested but these have not been widely deployed for a variety of reasons.

When there is no other method of meeting the needs it may be necessary to provide a special terminal for a specific group of users. This is a very expensive solution so it has not been widely adopted in Europe.

Self-Service Terminals

Terminals can be fully supervised, partly supervised or unsupervised. Examples of fully supervised terminals include those used for biometric registration or a payment terminal in a shop. Partly supervised terminals can include biometric authentication terminals and check-in terminals at airports where someone may be available to assist but is responsible for a number of terminals. Alternatively there may be someone remotely who can provide advice or assistance; this is common for payment at petrol pumps. However there are many applications where the terminals are unsupervised; these include:

- ATMs (automatic teller machines)
- Public telephones
- Check-in terminals in a doctor's surgery
- Ticket selling machines for public transport
- Ticket barriers
- Car park ticketing machines
- Information kiosks in shopping centres
- Vending machines

- Self-service checkouts in a supermarket
- Public computer terminals
- Book return terminals in a public library
- Access control systems
- Voting terminals

Typically the user may be required to:

- Select the service they require
- Identify themselves (possibly using a token coupled with a personal identification number or biometric)
- Retrieve output (eg a ticket or receipt)
- Have money or credit card available or be able to pay with their mobile phone

The tasks for the user are:

- Locate the terminal
- Reach the terminal
- Ascertain what services are provided by the terminal
- Ascertain whether the terminal is operational
- Select service required (possibly requires use of keypad or touchscreen or presentation of a token)
- Retrieve output which may be in the form of cash, tickets or a receipt
- Terminate transaction

Important aspects for consumers include:

- Is there an alternative to using the terminal?
- The ability to easily correct errors
- Privacy
- Security
- What to do if transaction fails (eg the terminal retains the user's card)

If the terminal is perceived to be inaccessible or difficult to use, the user may decide not to use the service. In areas such casting a vote in an election there may be no financial loss to the service provider if the user does not use the service but the voter may feel aggrieved by the service not being available to them in a manner that they find easy to use.

Inclusive Design

The Center for Universal Design at North Carolina State University defined inclusive design as "The design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible on a global basis, in a wide variety of situations and to the greatest extent possible without the need for special adaptation or specialised design" [1]. The word 'reasonable' is often interpreted as meaning no significant increase in the capital or running costs for the terminal. However in some applications there is much greater tolerance to incurring additional costs; for instance the ability to vote in an election is often considered to be an essential part of the democratic process, so voting systems should be accessible and easily usable by as many people as is technically possible. In contrast commercial organisations may be reluctant to incur any additional costs unless there is a legal obligation to do so.

For self-service terminals, accessibility can be affected by the environment around the terminal. This may include access for wheelchairs including appropriate space for turning. It will also include factors such as illumination which will impact on partially sighted users as well as affecting security aspects[2].

Terminal designers tend to look for sophisticated solutions for people with severe disabilities and ignore apparently minor impairments. For instance people who use walking sticks might be helped by having a notch in the facia of the terminal against which the stick can be leant without it falling over.

Guidelines for inclusive design of terminals tend to consider 'typical' users. So for a wheelchair user it is often recommended the user controls (eg keypad, touchscreen, card slots) should be between 800 and 1200 mm from the ground. However this recommendation does not satisfy the needs of all wheelchair users – some users have a much more restricted range, and some electric wheelchairs result in the user needing the controls higher from the ground. There can be practical problems in implementing this recommendation when the terminal includes a facility for payment by coins including providing change; the problem being that gravity feed systems require more than 400 mm between the coin entry slot and the receptacle for the change, and non-gravity systems add significantly to the cost of the terminal.

Inclusive design can include the a facility for the user to adapt the user interface. For instance a public telephone may include a volume control or buttons to select that instructions are displayed in an alternative language. However it is only practical to offer a very limited number of options in this manner. An alternative is to store the user's preferred user interface on a card which is presented to the terminal; for instance this could be the preferred frequency response for the audio output on a public telephone. This approach has been demonstrated by libraries who have computers for public use, and bus operators who have information terminals at bus stops[3]. The most common requests from users are for larger characters on the screen and for more time to use the terminal before getting 'timed out'.

Automatic teller machines (ATMs) have been around for over 40 years and offer a service when bank branches are closed. The disability organisations have campaigned for a long time for ATMs to be fully accessible to blind and wheelchair users (see Appendix 1), but have less interest in the accessibility of other self-service terminals.

With the increasing requirement to ensure that the person presenting the token (eg card) is the same person as the one to whom the token was issued, biometric authentication systems are generally considered more reliable than personal identification numbers (PINs). The biometric modalities used in self-service terminals include:

- Facial recognition
- Fingerprint
- Hand geometry
- Iris pattern
- Vascular characteristics

These biometric systems have introduced a number of accessibility problems for various groups of people with disabilities (Appendix 2).

[1] http://www.snapi.org.uk/info/guidelines/inclusive.htm
[2] http://www.snapi.org.uk/info/guidelines/pats_built_environment.htm
[3] http://www.snapi.org.uk

Interfaces to Assistive Devices

As mentioned earlier, the preferred approach is to use inclusive design. However this may not be able to achieve full accessibility for all groups, so one possibility is to provide an alternative interface that permits the use of assistive devices[4]. The most common examples are hearing aid inductive loops and jack sockets to permit audio output on headphones carried by the user.

However much more is potentially achievable but it would require consensus on the interface standards. Standards for text, audio and video are well defined but control commands tend to vary from system to system. For instance a pedestrian at a light-controlled crossing might want to use their mobile phone handset (equipped with Bluetooth) to request more time to cross the road; the Bluetooth protocol is fully defined but it does not incorporate a command for requesting more time.

Wired interfaces such as RS232C and USB have been around for many years, but it is the increasing prevalence of wireless systems which has stimulated interest in this area. Infra-red systems are widely used for remote controls for domestic appliances such as television sets. Infra-red works well indoors with short-range line of sight to the terminal, but degrades significantly in sunlight. Also the protocols vary from one manufacturer to another. However wireless systems do not have these disadvantages.

For personal area networks the Bluetooth system dominates the market. It works at 2.4 GHz and frequency hops 1600 times a second. This frequency hopping provides a level of security which was incorporated since it was envisaged that a major application would be financial transactions. However the main applications have been for connecting a mobile phone to an earpiece and for interfacing mobile phones within cars. One disadvantage of Bluetooth is its power consumption when it is powered by a battery; a low energy version of Bluetooth is under development to overcome this limitation. Proponents of Bluetooth LE hope that it will be the dominant protocol for telemedicine and telecare applications.

For local area networks and metropolitan networks, WiFi (IEEE 802.11b and 802.11g) dominates the market. It also works at 2.4 GHz but in basic mode has no inbuilt security features. Many laptop and notebook computers have WiFi capability installed as a standard feature. There are many variants which give greater data capacity (eg IEEE 802.11a) or greater range (eg Wi-Max).

For smart housing applications the requirement is for a system with very low power consumption which remains dormant for most of the time and then wakes up to send a short burst of data before returning to a dormant state. There is no single dominant protocol in this area at present. The main players are ZigBee and ZWave, but new protocols appear at regular intervals.

Another technology for interfacing at very short range is near field communication (NFC) which permits two devices to exchange information at low data rates. For instance it can be used to store tickets on a mobile phone handset which is then touched on the terminal to activate. If faster or more secure communication is required, the system can be set to introduce another protocol without the user having to do anything. For instance the user may place their digital camera on top of the television set, and NFC connects the two devices, then WiFi is used to download the photographs to the television set. This is a relatively new technology so it is not yet known how widespread will be its use. Although there are comprehensive standards for the technical aspects, the user interface specification has been left to the various terminal manufacturers. Therefore there could be a case where the user touches their handset on a transport terminal and gets a particular audio signal to confirm a successful transaction, and then uses the same phone handset to purchase a sandwich but gets a different audio signal; in the worst case, the successful signal on one terminal could be the same as the signal for failed transaction on another terminal.

A universal remote control protocol has been developed by Trace Center (University of Wisconsin)[5] which is now an ISO standard (ISO/IEC 24752:2008). The family of standards enables full functioned remote operation of products and it also allows operation of products through intermediate devices and intelligent agents. The standards are network neutral; they work with diverse networking and control technologies

[4] http://www.snapi.org.uk/info/guidelines/interfaces.htm
[5] http://myurc.org/

including Universal Plug and Play, Java-Jini, etc. The standards describe methods a product can use to provide user interface information for any remote console or artificial agent. This information is sufficient to construct a full-function user interface for the product without any prior knowledge of the product or product type. The methods also allow direct access to the functionality of the product; an individual can execute a specific command without having to navigate menus in order to get there. Entirely visual, entirely audio or natural language interfaces can all be constructed from the information provided by the product. As yet, the URC protocols have not been widely adopted in Europe.

A different approach has been the development of an experimental platform that permits the demonstration of how people with disabilities can access automatic teller machines (ATMs) from their mobile phones[6]. The project defined the technical features of the experimental platform: the users download virtual credit cards from their bank's online service and install them in their mobile phones. When wishing to use an ATM, they select the card they wish to use on their mobile phone; using near field communication (NFC), the user is identified at the ATM, setting up a secure wireless communication between the user's mobile phone and the ATM. Once communication is established, the ATM interface is shown on the mobile phone, allowing the user to withdraw money, check the account balance or recharge the mobile phone.

The area of interfaces to assistive devices offers many exciting possibilities but we are a very long way from a consensus of the most appropriate interface, and how to ensure widespread take up.

The Market Case

Commercial organisations tend to quickly respond to any opportunity to increase their profits by either attracting additional customers or reducing costs. However the general perception of many mainstream companies is that disabled customers do not generate sufficient income to justify the effort of addressing their needs. They tend to have the view that disabled customers have severe impairments (eg totally blind or deaf or are in a wheelchair) and can be very demanding of staff time. There are some notable exceptions, among large companies, where inclusive design is an integral part of company policy and is considered from the outset when designing new products or services; unfortunately the number of companies where this happens is numerically low.

When the purchaser of the self-service terminal is a government department or agency the situation is different. Then the matter of profits is not relevant but any additional costs may be significant when trying to keep within tight budgets. If the procurement is of significant size, the purchaser can influence the design of the terminal and include requirements relating to accessibility.

There are other factors which influence organisations to consider accessibility when introducing new self-service terminals – these include:

- Meeting a social responsibility agenda
- Public relations
- Legislation or other mandatory requirements

Adaptations to the physical structure of the terminal normally have to be done when the terminal is designed or installed; retrofitting is usually prohibitively expensive. However software adaptations can be done at any time with minimal cost penalties. Not all organisations have systems in place to ensure that any updates to the ordinary software on the terminal also takes into account any changes in accessibility of the terminal.

Disability organisations often quote estimates of the number of people with a specific impairment but this may have little relation to the potential usage. To convince organisations to seriously address accessibility issues may require producing verifiable figures for the number of customers likely to make use of a

[6] Experimental Study of the Potential of the Mobile Phone as a Terminal Able to Interact with Automated Teller Machines.. Fundacion ONCE.

particular feature (ideally broken down into the numbers for whom this feature is essential and the ones for whom it is desirable). This would enable the organisation to reliably calculate the costs and related benefits associated with each additional feature.

One reason for low usage is that many disabled customers are unaware of the features on that terminal, or that the features have only been installed on selected terminals. Marketing departments are often unfamiliar with the mechanisms for informing disabled customers of this information, and disability organisations may be reluctant to be involved unless they can see some financial benefit.

Regulation and Legislation

Where the commercial sector does not provide the necessary services or facilities, it may be necessary to consider introducing mandatory regulation or legislation. In the area of accessibility of self-service terminals, the market is not providing terminals which the user organisations deem to be acceptable in terms of accessibility. However to introduce mandatory requirements necessitates that there are a clear set of guidelines which cover all relevant types of terminal and do not limit manufacturers from introducing new ways of improving accessibility.

In the USA, they have introduced Section 508 of the Rehabilitation Act[7] which requires government procurement to adhere to certain specifications related to accessibility. The approach has been to examine each component of the system and specify certain requirements. This goes some way towards addressing the unmet needs but does not consider the accessibility of the overall system.

In Europe there have been moves towards adopting a similar approach but it is likely to be some time in the future before it could be implemented since the underlying standards are not in place. Also it is likely to only address government procurement whereas many self-service terminals are installed and operated by non-governmental organisations.

An alternative approach is to use horizontal legislation such as ‘equality’ or ‘disability discrimination’. This has the advantage that it would also apply to the non-government sector, would still require a consensus on a set of measurable standards to define what is accessible. The UN Convention on the Rights of Persons with Disabilities may be relevant in this context.

One approach which has been used successfully has to make accessibility a condition of granting planning permission for the installation of a new terminal. However this has led to some companies just doing the minimum to obtain the necessary permissions and then not maintaining the accessibility features.

Standards and Guidelines

Standards are produced by the formal standards bodies such as ISO, ITU, CEN and ETSI, as well as by national standards organisations (see Appendix 3). However many other groups have produced documents which are labelled ‘standards’ but are more often guidelines and frequently have no official status. Many of these standards and guidelines are sector specific and are often incompatible with the recommendations in other related sectors. This has led to considerable confusion among the designers and manufacturers of self-service terminals.

A priority is to develop a single common standard for accessibility across the different application sectors so that manufacturers and service providers are clear as to what they are expected to provide. The next stage would be to legislate that this standard is mandatory.

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[7] www.section508.gov

Appendix 1 Automatic Teller Machines

Cash dispensers and automatic teller machines (ATMs) are a common form of public access terminal, and have been in general use for many years. A number of guidelines, in various countries, have attempted to specify the parameters to alleviate the problems of disabled users. However it is only where there is relevant legislation, that these guidelines have been applied in a consistent manner.

Within the European Union there are numerous different specifications required for ATMs, which means that manufacturers have to make slightly different models for different countries which adds to their costs. Although keypads with 1,2,3 in the top row (as on a conventional telephone) and with a raised dot on the 5 key are the norm, the position and marking of the function keys varies from country to country.

Many manufacturers offer a range of accessibility options such as:

- Audible prompts or audible output of non-confidential information
- The facility to operate all functions from the keypad so overcoming the need to use a touchscreen.
- Providing space for a wheelchair footrest when using a perpendicular approach (rather than a parallel approach) to the ATM.
- Illuminated card slots.
- Multi-lingual display screens.

However many purchasers are reluctant to pay extra for such facilities unless they are obliged to do so (eg a regulatory or legal requirement). The MeAC study[8] found that across the EU countries as a whole on average 8% of the ATMs installed by the two main national retail banks provided talking capabilities to customers with disabilities. A follow-up study a year later indicated that there had been no significant change over the intervening period.

The guidelines issued by banking organisations are frequently ignored by the ATM suppliers since they feel them to be unimplementable or inappropriate. For instance the force to operate a key is quoted in a number of guidelines as not to exceed 22.2 Newtons; many experts feel this figure ought to be an order of magnitude lower.

[8] Assessment of the Status of eAccessibility in Europe
http://ec.europa.eu/information_society/activities/einclusion/library/studies/meac_study/index_en.htm

Further information

Access Prohibited? Information for Designers of Public Access Terminals
http://www.snapi.org.uk/info/reports/pats

Adaptability of Cashpoints for the Disabled: Normalisation Proposal. Fundacio Barcelona Digital, July 2006.

AS 3769 (1990) Automatic teller machines: User access.

Automatic Service Machines: Service for Everybody? The National Swedish Board for Consumer Policies and The Swedish Handicap Institute, 1995.

Automated Teller Machines http://www.bankers.asn.au/articledocuments/atm standard.htm

Automatic Service Machines - In Our Way http://www.hi.se/en/Swedish-Institute-of-Assistive-Technology-/Publications-and-documents/Automatic-Service-Machines---in-our-way/

B65.1.1-01 (2001) Barrier-free design for automated banking machines

Design for All and Assistive Technologies
http://www.ict.etsi.fr/activities/design_for_all/Documents/11%20Access%20Terminals.pdf

Designing More Usable Information / Transaction Machines http://trace.wisc.edu/world/kiosks

Electronic Funds Transfer at the Point of Sale

EG 202 116 (2002) Human Factors (HF); Guidelines for ICT products and services: Design for all

EN 726 Requirements for IC cards and terminals for telecommunications use.

ETR 165 (1995) Recommendations for a tactile identifier on machine readable cards for telecommunications terminals.

ETR 334 (1996) The implications of ageing for the design of telephone terminals.

ETS 138 (1998) Public terminals for the elderly.

Feeney R Access to ATMs. ISBN 0 903976 32 3, 1999.

Guidelines for Accessibility of Information and Communication Technology Systems
www.snapi.org.uk/info/guidelines

Irish Accessibility Guidelines for Public Access Terminals
http://universaldesign.ie/useandapply/ict/itaccessibilityguidelines/publicaccessterminals

ISO 7165-5 Wheelchairs - Part 5 Determination of overall dimensions, mass and turning space

ITM accessibility checklist from US Department of Justice
http://www.justice.gov/crt/508/archive/olditm.html

Making Cash Dispensers Easier to Use http://www.snapi.org.uk/info/reports/mcdeu.htm

Section 508 of the US Rehabilitation Act www.section508.gov

TC TR 007 (1996) Human Factors (HF); User requirements of enhanced terminals for public use.

Trace EZ Access http://trace.wisc.edu/world/ez/

Appendix2 Biometric Systems

A biometric is a physical or behavioural feature or attribute that can be measured. It can be used as a means of proving that you are who you claim to be, or as a means of proving without revealing your identity that you have a certain right.

Biometrics which are commonly used to confirm identity include:

- Fingerprint recognition
- Iris recognition
- Face recognition
- Hand geometry recognition
- Vein recognition

Other biometric modalities which have been developed but are not currently used in self-service terminals in Europe include:

- Voice recognition
- Gait
- Ear shape
- Retina patterns
- DNA

A biometric system is essentially a pattern recognition system that operates by acquiring biometric data from an individual, extracting a feature set from the acquired data, and comparing this feature set against the template set in the database. Some physiological and medical factors can affect the usability and efficiency of biometrics.

The obvious advantage of biometric systems is that the user no longer has to remember PINs (personal identification numbers) and keep this number secret. People with a cognitive impairment will find most biometric systems easier to use and provide a greater level of security. People who have limited or no use at all of arms or hands will find using face and iris recognition systems an advantage as they will not have to swipe a card or type in a name or PIN number.

To register a biometric for public use (eg for a passport), the subject will usually have to go to a centre where specialist staff take the biometric and check other relevant documentation. Ideally these staff should be trained to work with people with disabilities. For private use (eg replacement for a password on a personal device such as a laptop computer), the subject is expected to follow instructions on the screen or in a printed manual to register the biometric.

Authentication terminals may be fully supervised, partially supervised or un-supervised; this is likely to be significant for occasional users and for some people with disabilities. In general, a consistent user interface will benefit all users and may be of particular importance for some people with disabilities.

It is essential that the authentication terminal is comfortable to use. For instance, enrolment of fingerprints will normally be done with the subject sitting down. However the authentication may be done with subject standing. It is important that the height and angle of the fingerprint reader is comfortable for both a tall person and someone in a wheelchair. If it is not viable to make the reader variable height (or on a flexile lead), it might be helpful if it was tiltable to allow a comfortable angle for the wrist. A wrist rest might be beneficial for a subject with hand tremor.

Like all input devices on public terminals, it is important that the device gives both auditory and visual feedback of the current status (eg still processing, accepted, rejected). It is also important that error messages are helpful and give guidance on what the subject should do differently.

The biometric information can be stored in a central database or on a token such as a smart card. Users are likely to prefer the information to be stored on their card rather than on a remote database. However, it is easier to regularly update the database with revised biometric data as the user's characteristics change.

Two (or more) modalities could be combined in parallel to produce a system that would allow more flexible use. This could prove extremely useful to those users who have temporarily lost the ability to provide one of their biometric traits (for example, a temporary eye problem that rules out an iris scan).

The ISO standard specifies that:

1. Systems using a biometric should be designed so that as many potential subjects as is reasonably possible can use the system effectively and with the minimum of discomfort.
2. In the design of such new systems or services, the needs of disabled subjects should be considered from the outset.
3. Before systems are deployed, they should be thoroughly tested with subjects who represent the widest range of abilities (that is, in respect of visual, auditory, physical, cognitive and behavioural ability).
4. For subjects with a disability, adequate training in the use of the system should be offered.
5. Wherever practicable, the subject should have a choice of biometric systems, and should not be discriminated against if their disability prevents them from using a specific biometric.
6. Where no alternative biometric is available and where the disability prevents the use of this biometric, subjects should be permitted to use an alternative method. Wherever practicable, the use of such an alternative should not result in an inferior level of service or functionality to the subject.
7. If the subject can no longer use a verification system reliably, the subject should be provided wherever feasible with the opportunity to repeat the registration process.
8. Staff operating systems using a system with biometrics should be trained in how to process disabled subjects.
9. A system using a biometric should not store details of a subject's disabilities without their informed consent.
10. The rights of privacy of a disabled subject should be the same as those of a non-disabled subject.

Fingerprint recognition

Fingerprint recognition consists of comparing a print of the characteristics of a fingertip or a template of that print with a stored template or print. A study with visually impaired subjects found that[9]:

- The scanner area should be lit internally. The light should only turn on when the reader is awaiting input or the light should start flashing slowly when the reader is awaiting input (but should not be at a frequency which could adversely affect someone with epilepsy).
- Visually the reader should stand out if it is attached to a terminal. The reader could be highlighted by making it a different colour to the surrounding area.
- The reader should not be flush against the rest of the terminal. This will make it more noticeable from both a visual and a tactile point of view. The device as a whole should be raised from the terminal, with the scanner area itself slightly recessed into the raised surrounding casing.
- A simple action should be required to enrol a fingerprint, such as simply pressing a finger on the scanner area and removing it.
- Ideally the user should be able to simply press and hold the finger in place, while the multiple scans are taken in sequence (ie removing the necessity to lift and replace the finger repeatedly). This would cater for people with, for example, reduced manual dexterity or a hand tremor.
- The reader should be so placed on the terminal, so that it is equally accessible for right- and left-handed people.

[9] Identification of Accessibility Issues for Visually Impaired Users of Biometric Technologies: Fingerprint Readers http://www.snapi.org.uk/info/reports/biometrics

- There should be a raised casing around the scanner area. This would allow the user to hold on to the casing, providing support for the repeated removal and replacement of the finger during the registration stage.
- The scanner area should be recessed into the surrounding raised casing, thereby guiding the finger into the correct location.
- Ideally, a tactile marking (consisting of, for example, a circular area with a different texture) in the very centre of the scanner area would allow accurate positioning of the finger, while at the same time not limiting the size of the scanner area, benefiting people with larger fingers.

Other problems can include:

- Certain prescription drugs (as used in chemotherapy) can deteriorate the user's fingerprints.
- A cut on a finger can temporarily make that finger unusable for fingerprint verification.
- Working with certain chemicals, such as cement, can damage fingerprints.
- Many readers have problems with dry fingers such as after a long flight – a solution is to rub the finger over one's forehead.
- Some fingerprint reader systems are sensitive to orientation of the finger which can be problematic for some visually impaired users.

Iris recognition

The iris is the externally-visible, coloured ring around the pupil of the eye. It is a physical feature of a human being that can be measured and thus used for biometric verification. An iris 'scan' is a high-quality photograph of the iris taken under near-infrared illumination. Iris recognition systems generally use narrow-angle cameras and ask the user to position their eyes correctly in the camera's field of view. The resulting photograph is analysed using algorithms to locate the iris and extract feature information, in order to create a biometric template.

For people with disabilities there can be a number of problems including:

- Being able to see the target which is often presented as red dot; red can be problematic for people with conditions such as retinitis pigmentosa, and others may have a loss of central vision (as with macular degeneration) – a white cross would exclude fewer users.
- Some contact lenses (particularly ones which are tinted) can be problematic.
- Aligning with the camera can be difficult for wheelchair users and people of unusual stature since the terminal is normally used in the standing position.

Face recognition

Face recognition refers to an automated or semi-automated process of matching facial images. The image of the face is captured using a scanner and then analysed in order to obtain a biometric 'signature'; different algorithms can be used for this and manufacturers have adopted various proprietary solutions.

These systems typically require the user to adopt a neutral expression; this can be problematic for some people (eg someone with Down's syndrome) who automatically smile when looking at a camera. Smiling is not normally considered a disability but it does affect their ability to use the system.

Other problems can include:

- Facial recognition systems often reject users with dark glasses which may be problematic for someone who is light sensitive.
- Hearing audible instructions for people who are deaf.

Hand recognition

The geometric features of the hand such as the lengths of fingers and the width of the hand are measured to identify an individual. The hand geometry scanner looks for unique features in the structure of the hand. These unique features include the finger thickness, length, and width, the distances between finger joints, the hand's overall bone structure, etc.

For people with disabilities, the problems can include:

- Inability to place hand flat on the surface of the terminal (eg from a broken tendon or rheumatism).
- Severe hand tremor.
- Not being able to see where to place the hand.

Vein recognition

Verification of a person's identity by recognizing the pattern of blood veins in the palm (number of veins, their position and the points at which they cross). The pattern of blood veins in the palm is unique to every individual, and apart from size, this pattern should not vary over the course of a person's lifetime. Using infrared light, this biometric measures the unique blood pattern of veins in the hand. Software then extracts the vein pattern and compares it against patterns already stored in a database. Systems for using other parts of the anatomy exist although the hand is the most common.

Problems include:

- Knowing where to place the hand and in which orientation.
- Holding the hand still.

Further information

Proceedings of Conference on Accessible Biometrics, 18th May 2005, London. http://www.snapi.org.uk/phoneability/accessible_biometrics_proceedings

Appendix 3 Standards and Guidelines

This appendix lists the main standards which are relevant to accessibility of self-service terminals. They have been grouped by:

Access control systems
Audio input / audio output
Biometric systems
Displays
e-Banking
e-Voting
Public access terminals
Smart cards
User interfaces

Access Control System Standards

Access control systems can be defined as any system that controls and/or monitors access to an area. For example, a one door system that allows a door to be electronically locked/unlocked by pushing a button. More complex systems monitor, track and control a number of doors/ gates from various facilities over the internet but also allow for each area to be accessed by individual users with biometric hand recognition readers.

Door and Access Systems Manufacturers Association International

1300 Sumner Avenue, Cleveland, OH 44115-2851, USA.
Tel: +1 216 241 7333; Fax: +1 216 241 0105
Email: dasma@dasma.com; Web: www.dasma.com

- DASMA 303 (2006) Performance criteria for accessible communications entry systems

Audio Input / Audio Output Standards

Audio input devices, for example, microphones, allow a user to send audio signals to a computer for processing, recording, or carrying out commands. A user with a hearing impairment may be able to access audio output by manipulating the volume and/or connecting a hearing aid or other amplification device. Similarly, a user with a visual impairment may wish to manipulate the volume of synthesised speech output to accommodate varied environmental conditions or personal preferences/needs.

International Organisation for Standardisation (ISO)

1, Ch. de la Voie-Creuse, Case postale 56, CH-1211 Geneva 20, Switzerland.
Tel: +41 22 749 0111; Fax: +41 22 733 3430
Web www.iso.ch

ISO/TC 159/SC 5/WG 5 - People With Special Requirements

- ISO/CD 24500 Guidelines for all people, including elderly persons and persons with disabilities - Auditory signals on consumer products
- ISO/CD 24501 Guidelines for all people including elderly persons and persons with disabilities - Auditory signals on consumer products - Sound pressure levels of signals for the elderly and in noisy conditions

International Telecommunications Union (ITU)

Place des Nations, CH-1211 Geneva 20, Switzerland.
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Email: itumail@itu.int; Web: www.itu.int

ITU-T Study Group 12 - Performance and Quality of Service
Chairman: Jean-Yves Monfort

- ITU-T p.85 (1994) A method for subjective performance assessment of the quality of speech voice output devices

European Telecommunications Standards Institute (ETSI)

650 Route des Lucioles, F-06921 Sophia Antipolis Cedex, France.
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Specialist Task Force 326 - Generic spoken command vocabulary for ICT devices and services (official EU and EFTA languages)

- ETSI ES 202 076 - Human Factors (HF); User Interfaces; Generic spoken command vocabulary for ICT devices and services

Japan Business Machine and Information System Industries Association

NP Onarimon Building, 4th Floor, 3-25-33 Nishi-Shimbashi, Minato-ku, Tokyo 105-0003, Japan.
Tel: +81 3 5472 1101; Fax: +81 3 5472 2511
Web: www.jbmia.or.jp/english/index.htm

- JBM S-71 (2004) Auditory signal

Japanese Industrial Standards Committee

1-3-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8901, Japan.
Email: jisc@meti.go.jp; Web: www.jisc.go.jp

S - Domestic Wares

- JIS S 0013 (2002) Guidelines for the elderly and people with disabilities - Auditory signals on consumer products
- JIS S 0014 (2003) Guidelines for the elderly and people with disabilities - Auditory signals on consumer products - Sound pressure levels of signals for the elderly and in noisy conditions

Biometrics Standards

A biometric is a physical or behavioural feature or attribute that can be measured. It can be used as a means of proving that you are who you claim to be, or as a means of proving without revealing your identity that you have a certain right.

International Organisation for Standardisation (ISO)

1, Ch. de la Voie-Creuse, Case postale 56, CH-1211 Geneva 20, Switzerland.
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Web www.iso.ch

ISO/IEC JTC1/SC 37/WG 3 - Biometric Data Interchange Formats

- ISO/IEC 19785-1 (2006) Information Technology: Common Biometric Exchange Formats Framework - Part 1 - Data element specification (supersedes NISTIR 6529A (2004) Common Biometric Exchange Formats Framework)

- ISO/IEC 19785-2 (2006) Information Technology: Common Biometric Exchange Formats Framework - Part 2 - Procedures for the operation of the Biometric Rgistration Authority (supersedes NISTIR 6529A (2004) Common Biometric Exchange Formats Framework)
- ISO/IEC FCD 19785-3.2 Information Technology: Common Biometric Exchange Formats Framework - Part 3 - Patron format specifications (supersedes NISTIR 6529A (2004) Common Biometric Exchange Formats Framework)

British Standards Institute (BSI)

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Email: cservices@bsi-global.com; Web: www.bsi-global.com

IST/44 - Biometrics
Chairman: Dr Peter Waggett; Secretary: Annie Cassidy

- BS ISO/IEC 19794-2 (2005) Information technology. Biometric data interchange formats. Finger minutiae data
- BS ISO/IEC 19794-3 (2006) Information technology. Biometric data interchange formats. Finger pattern spectral data
- BS ISO/IEC 19794-4 (2005) Information technology. Biometric data interchange formats. Finger image data
- BS ISO/IEC 19794-5 (2005) + A1 (2007) Information technology. Biometric data interchange formats. Face image data
- BS ISO/IEC 19794-6 (2005) Information technology. Biometric data interchange formats. Iris image data
- BS ISO/IEC 19794-7 (2007) Information technology. Biometric data interchange formats. Signature/sign time series data
- BS ISO/IEC 19794-8 (2006) Information technology. Biometric data interchange formats. Finger pattern skeletal data
- BS ISO/IEC 19794-9 (2007) Information technology. Biometric data interchange formats. Vascular image data
- BS ISO/IEC 19794-10 (2007) Information technology. Biometric data interchange formats. Hand geometry silhouette data
- BS ISO/IEC 19795-2 (2006) Information technology. Biometric performance testing and reporting. Testing methodologies for technology and scenario evaluation
- BS ISO/IEC 24713-1 (2008) Information technology. Biometric profiles for interoperability and data interchange. Overview of biometric systems and biometric profiles
- PD ISO/IEC TR 24741 (2007) Information technology. Biometrics tutorial

National Institute of Standards and Technology

Public Inquiries Unit, NIST, 100 Bureau Drive, Stop 1070 Gaithersburg, Maryland 20899-1070, USA.
Tel: +1 301 975 6478
Email: inquiries@nist.gov; Web: www.nist.gov

NIST/BC Biometric Interoperability, Performance and Assurance Working Group

- NISTIR 6529 (2001) Common Biometric Exchange Framework Format (CBEFF)
- NISTIR 6529A (2004) Common Biometric Exchange Formats Framework (revised version of NISTIR 6529, superseded by ISO/IEC 19785 series)

Displays Standards

In relation to ICT systems, visual displays include any information that is presented electronically. Examples include screens on ATMs, ticket vending machines and information kiosks, and information displays in stations and airports.

International Organisation for Standardisation (ISO)

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Web www.iso.ch

ISO/IEC JTC1/SC 35/WG 4 - User interfaces for mobile devices
Secretary: Phillippe Magnabosco

- ISO/IEC 24755 (2007) Information technology - Screen icons and symbols for personal mobile communication devices

ISO/TC 159/SC 4 - Ergonomics of human-system interaction
Secretary: Jose Alcorta
Chairperson: Tom Stewart

- ISO 9241-11 (1998) Ergonomic requirements for visual display terminals - Part 11: Guidance on usability

ISO/TC 159/SC 4/WG 2 - Visual Display Requirements

- ISO 13406 (1999-2001) Ergonomic requirements for work with visual displays based on flat panels - Parts 1-2
- ISO 9355-1 (1999) Ergonomic requirements for the design of displays and control actuators - Part 1: Human interactions with displays and control actuators
- ISO 9355-2 (1999) Ergonomic requirements for the design of displays and control actuators - Part 2: Displays
- ISO 9355-3 (2006) Ergonomic requirements for the design of displays and control actuators - Part 3: Control actuators
- ISO/DIS 9355-4 Ergonomic requirements for the design of displays and control actuators - Part 4: Location and arrangement of displays and control actuators

ISO/TC 159/SC 4/WG 5 - Software Ergonomics and Human-Computer Dialogues
Convenor: Dr. Susan Harker

- ISO 9241 (1992-2000) Ergonomic requirements for office work with visual display terminals (VDTs) - Parts 1-9
- ISO 9241 (1997-1999) Ergonomic requirements for office work with visual display terminals (VDTs) - Parts 11-17
- ISO 9241-300 Ergonomics of human-system interaction - Part 300: Introduction to electronic visual display requirements
- ISO 9241-302 Ergonomics of human-system interaction - Part 302: Terminology for electronic visual displays
- ISO 9241-303 Ergonomics of human-system interaction - Part 303: Requirements for electronic visual displays
- ISO 9241-306 Ergonomics of human-system interaction - Part 306: Field assessment methods for electronic visual displays
- ISO 9241-307 Ergonomics of human-system interaction - Part 307: Analysis and compliance test methods for electronic visual displays
- ISO/FDIS 9241-305 Ergonomics of human-system interaction - Part 305: Optical laboratory test methods for electronic visual displays

ISO/TC 159/SC 5/WG 5 - People With Special Requirements

- ISO/AWI 24502 Guidelines for all people including elderly persons and persons with disabilities - Visual signs and displays - Specification of age-related relative luminance and its use in assessment of light

Comité Européen de Normalisation (CEN)

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CEN/TC 122/WG 5 - Ergonomics of Human-Computer Interaction
Convenor: Tom Stewart

- EN 894 (1997) Safety of machinery - Ergonomics requirements for the design of displays and control actuators
- EN ISO 9241 (1997-2000) Ergonomic requirements for office work with visual display terminals (VDTs) - Parts 1-9
- EN ISO 9241 (1997-1999) Ergonomic requirements for office work with visual display terminals (VDTs) - Parts 11-17

Japanese Industrial Standards Committee

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Email: jisc@meti.go.jp; Web: www.jisc.go.jp

S - Domestic Wares

- JIS S 0031 (2004) Guidelines for the elderly and people with disabilities - Visual signs and displays - Specification of age-related relative luminance and its use in assessment of light

e-Banking Standards

The evolution of electronic banking (e-Banking) started with the use of automatic teller machines (ATMs) and has included telephone banking, direct bill payment, electronic fund transfer and online banking. According to some, the future direction of e-banking is the acceptance of mobile telephone (WAP-enabled) banking and interactive-TV banking.

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Web www.iso.ch

ISO/IEC JTC1/SC 17/WG 1 - Physical Characteristics and Test Methods for ID-Cards
Convenor: Uwe Truggelmann

- ISO/IEC 7810 (2003) Identification cards: Physical characteristics

ISO/IEC JTC1/SC 17/WG 4 - Integrated Circuit Cards With Contacts

- ISO 7816-1 (1998) Identification cards: Integrated circuit cards with contacts - Part 1: Physical characteristics

ISO/IEC JTC1/SC 35/WG 1 - Keyboards and Input Interfaces

- ISO/IEC 9995-4: 2002 Information Technology - Keyboard layouts for text and office systems - Part 4: Numeric section

ISO/TC 68/SC 2 - Security Management and General Banking Operations
Secretary: Cynthia L. Fuller
Chairperson: Mark A. Lundin

- ISO 9564: 2002 Banking - Personal Identification Number (PIN) management and security. Parts 1, 2, 3 & 4

ISO/TC 68/SC 7 - Core Banking
Secretary: Mme. Laurence Douvillé
Chairperson: M. Jean-Yves Garnier

- ISO 8583: 2003 Financial transaction card originated messages - Interchange message specifications. Parts 1, 2 & 3

Comité Européen de Normalisation (CEN)

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CEN/TC 224/WG 6 - Man-Machine Interface

- EN 1332-1 Identification card systems - Man-machine interface - Part 1: Design principles for the user interface
- EN 1332-2 Identification card systems - Man-machine interface - Part 2: Dimensions and location of a tactile identifier for ID-1 cards
- EN 1332-3 Identification card systems - Man-machine interface - Part 3: Keypads
- EN 1332-4 Identification card systems - Man-machine interface - Part 4: Coding of user requirements for people with special needs
- EN 1332-5 Identification card systems - Man-machine interface - Part 5: Symbols and icons

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- UK PAYMENTS 70: 2006 Card acceptor to acquirer interface standards
- UK PAYMENTS 71 Bankcard PIN mailer security

Canadian Standards Association

5060 Spectrum Way, Mississauga, Ontario L4W 5N6, Canada.
Tel: +1 416 747 4000; Fax: +1 416 747 2473
Web: www.csa.ca

- CAN/CSA-B651.1-01 (2001) Barrier-free design for automated banking machine

e-Voting Standards

e-Voting is short for "electronic voting" and refers to both the electronic means of casting a vote and the electronic means of tabulating votes. Voting systems such as punched cards and optical scan cards are tabulated using electronic means. There are a wide variety of set-ups for casting a vote electronically, ranging from: Voting machines (e.g. touch screen systems or Direct Recording Electronic (DRE) machines); Internet; Telephones / Mobile telephones; SMS text messaging; Personal Digital Assistants (PDA's) and Digital TV.

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Web: www.ieee.org

- IEEE P1583 (D5.0) (2003) Draft standard for the evaluation of voting equipment

Federal Election Commission

999 E Street, NW, Washington, DC 20463, USA.
Tel: +1 202 694 1100
Web: www.fec.gov

- FEC Voting Standards

Public Access Terminals Standards

A Public Access Terminal (PAT) is an interactive system based on a computer acting as a sale or information point of products and services. The system is designed to be used without the need of personal assistance and it is placed in public areas, indoors or outdoors.

International Telecommunications Union (ITU)

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Email: itumail@itu.int; Web: www.itu.int

ITU-T Study Group 2 - Operational Aspects of Service Provision, Networks and Performance
Chairman: Marie Therese Alajouanine

- ITU-T E.134 (1993) Human factors aspects of public terminals: Generic operating procedures
- ITU-T E.135 (1995) Human factors aspects of public telecommunications terminals for people with disabilities

European Committee for Banking Standards

11 Rue Marie Thérèse, B-1000 Brussels, Belgium.
Tel: +32 2 211 11 29; Fax: +32 2 211 11 99
Email: ecbs@ecbs.org; Web: www.ecbs.org

- EBS100 V3 (October 2004) Keyboard Layout for ATM and POS PIN Entry Devices

European Telecommunications Standards Institute (ETSI)

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Email: helpdesk@etsi.org; Web: www.etsi.org

TCHF - Technical Committee on Human Factors

ETSI EG 202 416 (2006) Human Factors (HF); User Interfaces; Setup procedure design guidelines for mobile terminals and services

- ETSI TC TR 007 (1996) Human Factors (HF); User requirements of enhanced terminals for public use

British Standards Institute

389 Chiswick High Road, London W4 4AL, United Kingdom.
Tel: +44 20 8996 9000; Fax: +44 20 8996 7001
Email: cservices@bsi-global.com; Web: www.bsi-global.com

- BS 8300 (2001) Design of buildings and their approaches to meet the needs of disabled people

Standards Australia

286 Sussex Street, Sydney, New South Wales 2000, Australia.
Tel: +61 2 8206 6000
Email: mail@standards.org.au; Web: www.standards.org.au

IT-007 - Information Technology: Public Access to IT Equipment

- AS 3769 (1990) Automatic teller machines: User access

Canadian Standards Association

5060 Spectrum Way, Mississauga, Ontario L4W 5N6, Canada.
Tel: +1 416 747 4000; Fax: +1 416 747 2473
Web: www.csa.ca

- CAN/CSA-B651.1-01 (2001) Barrier-free design for automated banking machines
- CAN/CSA-B651.2 (2007) Accessible design for self-service interactive devices

Telecommunications Technology Association (TTA)

267-2 Seohyeon-dong, Bundang-gu, Seongnam-City, Gyonggi-do, Korea.
Tel: + 82 31 724 0114
Email: webadmin@tta.or.kr; Web: www.tta.or.kr

- TTAS.KO-09.0040 (2006) Automatic Teller Machine's Accessibility Guidelines 1.0

Smart Cards Standards

Card based systems are permeating key areas of society: they are used for bank services (at ATMs or via telephone), are the key to communications (phone cards, GSM), transport (tickets, toll booths), identity cards, (electronic passports, machine readable visas), health (patient cards, health care professional cards) TV cards, electronic purses and access control for buildings.

International Organisation for Standardisation (ISO)

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Web www.iso.ch

ISO/IEC JTC1/SC 17/WG 1 - Physical Characteristics and Test Methods for ID-Cards
Convenor: Uwe Truggelmann

- ISO/IEC 15457-1 (2001) Identification cards: Thin flexible cards - Part 1: Physical characteristics
- ISO/IEC 7810 (2003) Identification cards: Physical characteristics
- ISO/IEC 7811-1 (2002) Identification cards: Recording Technique - Part 1: Embossing

ISO/IEC JTC1/SC 17/WG 4 - Integrated Circuit Cards With Contacts

- ISO 7816-1 (1998) Identification cards: Integrated circuit cards with contacts - Part 1: Physical characteristics
- ISO 7816-6 (2004) Identification cards: Integrated circuit cards - Part 6: Interindustry data elements for interchange

ISO/IEC JTC1/SC 17/WG 8 - Integrated Circuit Cards Without Contacts

- ISO 7816-6 (2004) Identification cards: Integrated circuit cards - Part 6: Interindustry data elements for interchange
- ISO/IEC 10536-1 (2000) Contactless integrated circuit cards - Close-coupled cards - Part 1: Physical characteristics

Comité Européen de Normalisation (CEN)

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Email: infodesk@cenorm.be; Web: www.cenorm.be

CEN/TC 224 - Personal Identification, Electronic Signature and Cards and Their Related Systems and Operations

- pr CEN/TS 13987-1 (2008) Identification card systems - Interoperable Citizen Services - User Related Information - Part 1: Definition of User Related Information and Implementation

CEN/TC 224/WG 6 - Man-Machine Interface

- CEN/TS 15291 (2006) Identification card system - Guidance on design for accessible card-activated devices
- EN 1332-1 Identification card systems - Man-machine interface - Part 1: Design principles for the user interface
- EN 1332-2 Identification card systems - Man-machine interface - Part 2: Dimensions and location of a tactile identifier for ID-1 cards
- EN 1332-3 Identification card systems - Man-machine interface - Part 3: Keypads
- EN 1332-4 Identification card systems - Man-machine interface - Part 4: Coding of user requirements for people with special needs
- EN 1332-5 Identification card systems - Man-machine interface - Part 5: Symbols and icons

- CWA 14174 (2004) Financial transactional IC card reader (FINREAD) Parts 1 -8

Dansk Standards

Kollegievej 6, DK-2920 Charlottenlund, Denmark.
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DS/S-142/U-17 - Identifikations- og Kreditkort
Danish mirror group for CEN/TC 224

- DS/CEN/TS 15291 (2006) Identification card system - Guidance on design for accessible card-activated devices
- DS/EN 1332-1 (1999) Identification card systems - Man-machine interface - Part 1: Design principles for the user interface
- DS/EN 1332-2 (1998) Identification card systems - Man-machine interface - Part 2: Dimensions and location of a tactile identifier for ID1 cards
- DS/EN 1332-5 (2006) Identification card systems - Man-machine interface - Part 5: Raised tactile symbols for differentiation of application on ID-1 cards

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NA 043 - Information Technology and Selected IT Applications
Contact: Dr. Stefan Weisgerber

- DIN CEN/TS 15291 (2006) Identification card systems - Guidance on design for accessible card-activated devices
- DIN CEN/TS 15480-1 (2007) Identification card system - European citizen card - Part 1: Physical, electrical and transport protocol characteristics

- DIN CEN/TS 15480-1 (2007) Identification card system - European citizen card - Part 2: Logical data structures and card services
- DIN EN 1332-1/A1 (2005) Identification card systems - Man-machine interface - Part 1: Design principles for the user interface, symbols in the form of icons on screens and/or pictogram

Icelandic Standards

Laugavegur 178, IS-105 Reykajavik, Iceland.
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- IST EN 1038 (1995) Identification card systems - Telecommunication applications - Integrated circuit(s) card payphone
- IST EN 1332-1 (1999) Identification card systems - Man-machine interface - Part 1: Design principles for the user interface
- IST EN 1332-2 (1998) Identification card systems - Man-machine interface - Part 2: Dimensions and location of a tactile identifier for ID-1 cards
- IST EN 1332-3 (1999) Identification card systems - Man-machine interface - Part 3: Keypads
- IST EN 1332-4 (1999) Identification card systems - Man-machine interface - Part 4: Coding of user requirements for people with special needs
- IST EN 1332-5 (2006) Identification card systems - Man-machine interface - Part 5: Raised tactile symbols for differentiation of application on ID-1 cards

National Standards Authority of Ireland

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- IS EN ISO/IEC 7810 (1997) Identification cards - Physical characteristics

Ente Nazionale Italiano di Unificazione

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Documentation, automatic and multimedia information

- UNI CEN/TS 15291 (2006) Identification card systems - Guidance on design for accessible card-activated devices
- UNI EN 1332-2 (2003) Identification card systems - Man-machine interface - Dimensions and location of a tactile identifier for ID-1 cards
- UNI EN 1332-3 (1999) Identification card systems - Man-machine interface - Keypads
- UNI EN 1332-4 (2000) Identification card systems - Man-machine interface - Coding of user requirements for people with special needs
- UNI EN 1332-5 (2006) Identification card systems - Man-machine interface - Symbols and icons

Lithuanian Standards Board

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TK 55 - Banking and Related Financial Services
Chairman: D. Grazenas
Secretary: V. Domkus

- LST CEN/TS 15291 (2006) Identification card system - Guidance on design for accessible card activated devices

Polski Komitet Normalizacyjny

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ZIT TC 172 - Kart Identyfikacyjnych
Secretary: Boguslaw Muszynski

- PKN-CEN/TS 15291 (2007) Identification card system - Guidance on design for accessible card-activated devices

Slovenian Institute for Standardization

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- SIST-TS CEN/TS 15291 (2006) Identification card system - Guidance on design for accessible card-activated devices

Japanese Industrial Standards Committee

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X - Information Processing

- JIS X 6310 (1996) Prepaid cards - General specification

User Interface Standards

The user interface is the part of every device that determines how people control and operate that device. When the interface is well designed, it is comprehensible, predictable, and controllable; users feel competent, satisfied and responsible for their actions.

Institute of Electrical and Electronics Engineers

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Web: www.ieee.org

- IEEE 1621 (2004) Standard for user interface elements in power control of electronic devices employed in office/consumer environments

InterNational Committee for Information Technology Standards

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Tel: +1 202 737 8888; Fax: +1 202 638 4922
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V2 - Information Technology Access Interfaces
Chairman: William LaPlant
V2 is the U.S. TAG to ISO/IEC JTC1/SC 35 on "User Interfaces" and its WG6, WG7 and WG8. As such, it provides recommendations on U.S. positions to the JTC 1 TAG.

- ANSI/INCITS 389 (2005) Protocol to facilitate operation of information and electronic products through remote and alternative interfaces and intelligent agents: Universal remote console
- ANSI/INCITS 390 (2005) Protocol to facilitate operation of information and electronic products: User interface socket description
- ANSI/INCITS 391 (2005) Protocol to facilitate operation of information and electronic products through remote and alternative interfaces and intelligent agents: Presentation templates
- ANSI/INCITS 392 (2005) Protocol to facilitate operation of information and electronic products through remote and alternative interfaces and intelligent agents: Target properties sheet
- ANSI/INCITS 393 (2005) Protocol to facilitate operation of information and electronic products through remote and alternative interfaces and intelligent agents: Resource description

International Organisation for Standardisation (ISO)

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ISO/IEC JTC1/SC 35/WG 2 - User Interface Interaction

- ISO/IEC 10741-1 (1995) Information technology - User-system interfaces - Dialogue interaction - Part 1: Cursor control for text editing
- ISO/IEC 14755 (1997) Information technology - Input methods to enter characters from the repertoire of ISO/IEC 10646 with a keyboard or other input device
- ISO/IEC CD 24786-1 Information Technology - User interfaces - Accessible user interface for accessibility setting on information devices - Part 1: General and methods to start

ISO/IEC JTC1/SC 35/WG 6 - User Interfaces for Disabled and Elderly People
Convenor: Wolf Arfvidson

- ISO/IEC FCD 24786 Information technology - User interfaces - Accessible user interface for accessibility settings on information devices
- ISO/IEC TR 19765 (2006) Survey of icons and symbols for use by the elderly and disabled
- ISO/IEC TR 19766 (2007) Information Technology - Guidelines for the design of icons and symbols accessible to all users, including the elderly and persons with disabilities

ISO/TC 159/SC 4/WG 5 - Software Ergonomics and Human-Computer Dialogues
Convenor: Dr. Susan Harker

- ISO 9241-151 (2008) Ergonomics of human-system interaction - Part 151: Guidance on World Wide Web user interfaces
- ISO/TS 16071 (2003) Ergonomics of human-system interaction - Guidance on accessibility for human-computer interfaces (updated in ISO/DIS 9241-171)

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ITU-T Study Group 2 - Operational Aspects of Service Provision, Networks and Performance
Chairman: Marie Therese Alajouanine

- ITU-T E.902 (1995) Interactive services design guidelines

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TCHF - Technical Committee on Human Factors
ETSI EG 202 416 (2006) Human Factors (HF); User Interfaces; Setup procedure design guidelines for mobile terminals and services

- ETSI TS 102 511 Human Factors (HF); AT commands for assistive mobile device interfaces

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INCITS V2 - Information Technology Access Interfaces
Chairman: William LaPlant
V2 is the U.S. TAG to ISO/IEC JTC1 SC35 on "User Interfaces" and its WG6, WG7 and WG8. As such, it provides recommendations on U.S. positions to the JTC 1 TAG.

- ANSI/INCITS 389 (2005) Protocol to facilitate operation of information and electronic products through remote and alternative interfaces and intelligent agents: universal remote console
- ANSI/INCITS 390 (2005) Protocol to facilitate operation of information and electronic products: User interface socket description
- ANSI/INCITS 391 (2005) Protocol to facilitate operation of information and electronic products through remote and alternative interfaces and intelligent agents: Presentation templates
- ANSI/INCITS 392 (2005) Protocol to facilitate operation of information and electronic products through remote and alternative interfaces and intelligent agents: Target properties sheet
- ANSI/INCITS 393 (2005) Protocol to facilitate operation of information and electronic products through remote and alternative interfaces and intelligent agents: Resource description