
**Ergonomics of human-system
interaction —**

Part 20:
**Accessibility guidelines for
information/communication technology
(ICT) equipment and services**

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Ergonomie de l'interaction homme-système —

*Partie 20: Lignes directrices sur l'accessibilité de l'équipement et des
services des technologies de l'information et de la communication (TIC)*

ISO 9241-20:2008

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9241-20 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

ISO 9241 consists of the following parts, under the general title *Ergonomic requirements for office work with visual display terminals (VDTs)*:

- Part 1: General introduction
- Part 2: Guidance on task requirements
- Part 3: Visual display requirements
- Part 4: Keyboard requirements
- Part 5: Workstation layout and postural requirements
- Part 6: Guidance on the work environment
- Part 7: Requirements for display with reflections
- Part 8: Requirements for displayed colours
- Part 9: Requirements for non-keyboard input devices
- Part 11: Guidance on usability
- Part 12: Presentation of information
- Part 13: User guidance
- Part 14: Menu dialogues
- Part 15: Command dialogues
- Part 16: Direct manipulation dialogues

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— *Part 17: Form filling dialogues*

Guidance on software individualization is to form the subject of a future part 129.

ISO 9241 also consists of the following parts, under the general title *Ergonomics of human-system interaction*:

— *Part 20: Accessibility guidelines for information/communication technology (ICT) equipment and services*

— *Part 110: Dialogue principles*

— *Part 151: Guidance on World Wide Web user interfaces*

— *Part 171: Guidance on software accessibility*

— *Part 300: Introduction to electronic visual display requirements*

— *Part 302: Terminology for electronic visual displays*

— *Part 303: Requirements for electronic visual displays*

— *Part 304: User performance test methods*

— *Part 305: Optical laboratory test methods for electronic visual displays*

— *Part 306: Field assessment methods for electronic visual displays*

— *Part 307: Analysis and compliance test methods for electronic visual displays*

— *Part 308: Surface-conduction electron-emitter displays (SED) [Technical Report]*

— *Part 400: Principles and requirements for physical input devices*

— *Part 410: Design criteria for physical input devices*

— *Part 920: Guidance on tactile and haptic interactions*

Framework for tactile and haptic interaction is to form the subject of a future part 910.

Introduction

The number of people using information/communication technologies (ICT) equipment and services, which combine hardware, software and network technologies, is increasing, as is the variety of ICT equipment and services. Our everyday lives are filled by such equipment and services.

This part of ISO 9241 is intended to help developers enable ICT equipment and services (and forthcoming novel or innovative equipment and services) so that they can be used by the widest range of people, regardless of their capabilities or disabilities, limitations or culture.

This part of ISO 9241 is based on the current understanding of the characteristics of individuals who have particular physical, sensory and/or cognitive impairments. However, accessibility is an issue that affects many people. The users of interactive systems are consumers or professionals with roles such as home occupiers, school pupils, engineers, clerks, salespersons and web designers. The individuals in such target groups vary significantly as regards physical, sensory and cognitive abilities and each target group will include people with different abilities. Thus people with disabilities do not form a specific group that can be separated out and then disregarded. The differences in capabilities may arise from a variety of factors that serve to limit the capability to engage in the activities of daily living, and are a “universal human experience”. Therefore, accessibility addresses a widely defined group of users including

- people with physical, sensory and cognitive impairments present at birth or acquired during life,
- elderly people (a growing percentage of the population) who can benefit from new products and services but who experience reduced physical, sensory and cognitive capacities,
- people with temporary disabilities, such as a person with a broken arm or someone without his or her reading glasses, and
- people who experience difficulties in particular situations, such as a person who works in a noisy environment or has both hands occupied by other activities.

This part of ISO 9241 is prepared as guidance to secure and improve accessibility to ICT equipment, software and services when they are used by people within the widest range of capabilities. It presents:

- a) a framework based on the ergonomic concept of context of use, and
- b) principles for the accessibility of ICT equipment and services.

Their presentation is intended to assist the users of this part of ISO 9241 in the consideration of accessibility issues. It also describes major product attributes with design examples, provides information for the planning, design and development of ICT equipment and services and acquisition and evaluation of ICT equipment and services. It recognizes the importance of following general ergonomic guidance as well as the more accessibility-specific guidance found in this and other accessibility-specific standards in achieving full use of ICT equipment, software and services.

While many of the requirements and recommendations in this part of ISO 9241 also apply outside the domain of accessibility, they are especially important to this domain. The checklist of Annex B has also been included to help users examine the accessibility features of ICT equipment and services.

Ergonomics of human-system interaction —

Part 20:

Accessibility guidelines for information/communication technology (ICT) equipment and services

1 Scope

This part of ISO 9241 is intended for use by those responsible for planning, designing, developing, acquiring, and evaluating information/communication technology (ICT) equipment and services. It provides guidelines for improving the accessibility of ICT equipment and services such that they will have wider accessibility for use at work, in the home, and in mobile and public environments. It covers issues associated with the design of equipment and services for people with a wide range of sensory, physical and cognitive abilities, including those who are temporarily disabled, and the elderly.

A detailed design for particular equipment or a service can be developed based on its recommendations. If a specific detailed standard exists concerning the accessibility of equipment or services, then it can be used in conjunction with that more specific standard. Where such standards are not available, this part of ISO 9241 can then form the basis for the design of the accessibility features of ICT equipment and services.

It also provides general guidelines for acquiring and evaluating ICT equipment and services, including both hardware and software aspects of information processing equipment, electronic communication facilities, office machines, and other similar technologies and services, used at work, in the home, and in mobile and public environments.

In addition, it gives important information about context of use. Accessibility is increased by expanding the range of contexts where equipment and services can be used. Context of use can result from the various components of the equipment or service, including user, task and equipment (hardware, software and materials) characteristics, as well as those of physical and social environments. Context of use can be considered when planning, designing, developing, acquiring and evaluating ICT equipment and services.

NOTE This part of ISO 9241 is a high-level standard applicable to all ICT equipment and services, therefore, detailed descriptions specific to equipment or services have been avoided. It can be referred to for the prevention of barriers to trade or the movement of people in respect of each national, regional and international standardization activity in this area. More specific recommendations on software accessibility are contained in ISO 9241-171.

2 Normative references

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

ISO 9241-5, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 5: Workstation layout and postural requirements*

ISO 9241-11:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 11: Guidance on usability*

ISO 9241-12, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 12: Presentation of information*

ISO 9241-13, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 13: User guidance*

ISO 9241-14, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 14: Menu dialogues*

ISO 9241-15, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 15: Command dialogues*

ISO 9241-16, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 16: Direct manipulation dialogues*

ISO 9241-17, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 17: Form filling dialogues*

ISO 9241-110:2006, *Ergonomics of human-system interaction — Part 110: Dialogue principles*

ISO 9241-151, *Ergonomics of human-system interaction — Part 151: Guidance on World Wide Web user interfaces* ¹⁾

ISO 9241-171, *Ergonomics of human-system interaction — Part 171: Guidance on software accessibility* ¹⁾

ISO 9241-300, *Ergonomics of human-system interaction — Part 300: Introduction to electronic visual display requirements* ¹⁾

ISO 9241-302, *Ergonomics of human-system interaction — Part 302: Terminology for electronic visual displays* ¹⁾

ISO 9241-410, *Ergonomics of human-system interaction — Part 410: Design criteria for physical input devices*

ISO 13407:1999, *Human-centred design processes for interactive systems*

ISO 14915 (all parts), *Software ergonomics for multimedia user interfaces*

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3 Terms and definitions

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

3.1 accessibility

(interactive systems) usability of a product, service, environment or facility by people within the widest range of capabilities

NOTE 1 The concept of accessibility addresses the full range of user capabilities and is not limited to users who are formally recognized as having disability.

NOTE 2 The usability-oriented concept of accessibility aims to achieve levels of effectiveness, efficiency and satisfaction that are as high as possible considering the specified context of use, while paying attention to the full range of capabilities within the user population.

3.2 assistive technology

hardware or software, added to or incorporated within a system, which increases accessibility for an individual

1) To be published.

3.3**context of use**

users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used

[ISO 9241-11:1998, definition 3.5]

3.4**information/communication technology****ICT**

technology for gathering, storing, retrieving, processing, analysing and transmitting information

3.5**interactive system**

combination of hardware and software components that receive input from, and communicate output to, a human user in order to support his or her performance of a task

[ISO 13407:1999, definition 2.1]

NOTE The term “system” is often used rather than “interactive system”.

3.6**screen reader**

assistive technology in combination with information available via the operating system that allows users to navigate through windows, determine the state of controls, and read text through Braille or text-to-speech conversion

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3.7**usability**

extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

[ISO 9241-11:1998, definition 3.1] <https://standards.iteh.ai/catalog/standards/sist/281352fa-bf31-4b41-8764-749ac79b005d/iso-9241-20-2008>

3.8**user**

⟨ICT⟩ individual interacting with the ICT equipment or service

NOTE Adapted from ISO 9241-11:1998, definition 3.7 and ISO 9241-110:2006, definition 3.8.

4 Application**4.1 Principles**

Design for accessibility should adhere to the following principles.

a) Suitability for the widest range of use

Suitability for the widest range of use involves designing with the objective of producing solutions that will be useful, acceptable and available to the widest range of users within the user population, taking account of their special abilities, variations in their capabilities, the diversity of their tasks, and their differing environmental, economic and social circumstances.

b) Equitable use

Achieving equitable use will ensure that solutions designed to increase accessibility do not result in loss of privacy, increased risks to personal safety or security, or the stigmatization of individuals, and that solutions provide the same means of use for all users that are identical whenever possible; equivalent when not.

c) Robustness

Robustness involves supporting a wide range of options both in terms of the features provided by ICT equipment or services and in terms of the ability to connect additional ICT equipment, software, and/or services.

NOTE 1 Although it is not feasible to make all ICT operable without add-on assistive technologies, the application of this part of ISO 9241 can help designers develop equipment and services that increases accessibility without the use of assistive technologies. Additionally, by providing the necessary interface information, its application will enable assistive software and devices to operate effectively and efficiently when used.

NOTE 2 ICT can promote integration of assistive technologies by providing information that can be read by those technologies, and by communicating through standard application-to-application communication protocols. For example, systems that provide built-in screen magnification can enable many more users to read the text and see the images that are presented. However, if the necessary integration information is available, users can also attach the screen magnification program of their choice to suit their particular needs.

4.2 Application framework

Accessibility results when ICT equipment and services can be used by all members of a population in which individuals differ in their capabilities. Design solutions that support accessibility are not design for average members of a population but for the widest possible range of users, including those with various disabilities. The goal of these design solutions is to create ICT products and services that can be used by populations including the widest possible range of individual differences. It is recognized (see ISO 9241-11) that the usability of particular ICT equipment and services will vary between users within a population and depending on the context of use. Accessibility, therefore, is not about achieving an equal level of usability for all individuals, but rather about achieving at least some usability by all individuals. The guidance given by this part of ISO 9241 can help achieve accessibility (in general) for diverse populations and help improve the levels of accessibility for many individuals, when combined with an understanding of their context of use.

Design solutions that support accessibility result from understanding and application of specific user requirements, including those user requirements specific to accessibility. These design solutions can benefit from the guidance found in a range of International Standards, including this and other parts of ISO 9241.

Its recommendations are related to information accessibility policy and to user, task, equipment and service, and environmental characteristics. It can be used to provide high level accessibility guidance together with other International Standards, including the more detailed accessibility standard ISO 9241-171. Other ergonomics standards, which may or may not have their own accessibility-related guidance (e.g. ISO 9241-151 and ISO 14915), are also important in ensuring aspects of usability, which is the goal of accessibility when applied to populations of users with differing capabilities.

Figure 1 shows how this part of ISO 9241 can be applied to improve the accessibility of ICT equipment and services, used together with other parts of ISO 9241 and ISO 14915 to identify user requirements for the accessibility of a product or service, and considering the context of use of the product or service. This context of use includes user, task, equipment, service and environmental characteristics.

The resulting set of user requirements for accessibility can be used to form the basis for a design solution of the product or service, which can then be evaluated against the identified user requirements for accessibility.

4.3 Implementing the recommendations

Individual recommendations of Clauses 6 to 10 should be evaluated for their applicability, taking account of context of use.

A recommendation should not be implemented if there is evidence that to do so would cause deviation from the design objectives.

NOTE A design objective is non-discriminatory if it does not exclude users because of diversity of capabilities.

4.4 Conformance

If ICT equipment or services are claimed to have met the provisions of this part of ISO 9241, then the procedures used to establish user requirements and to evaluate the equipment or service shall be specified. The level of detail of the specification is a matter of negotiation between the involved parties. (Annex B provides assistance in documenting conformance.)

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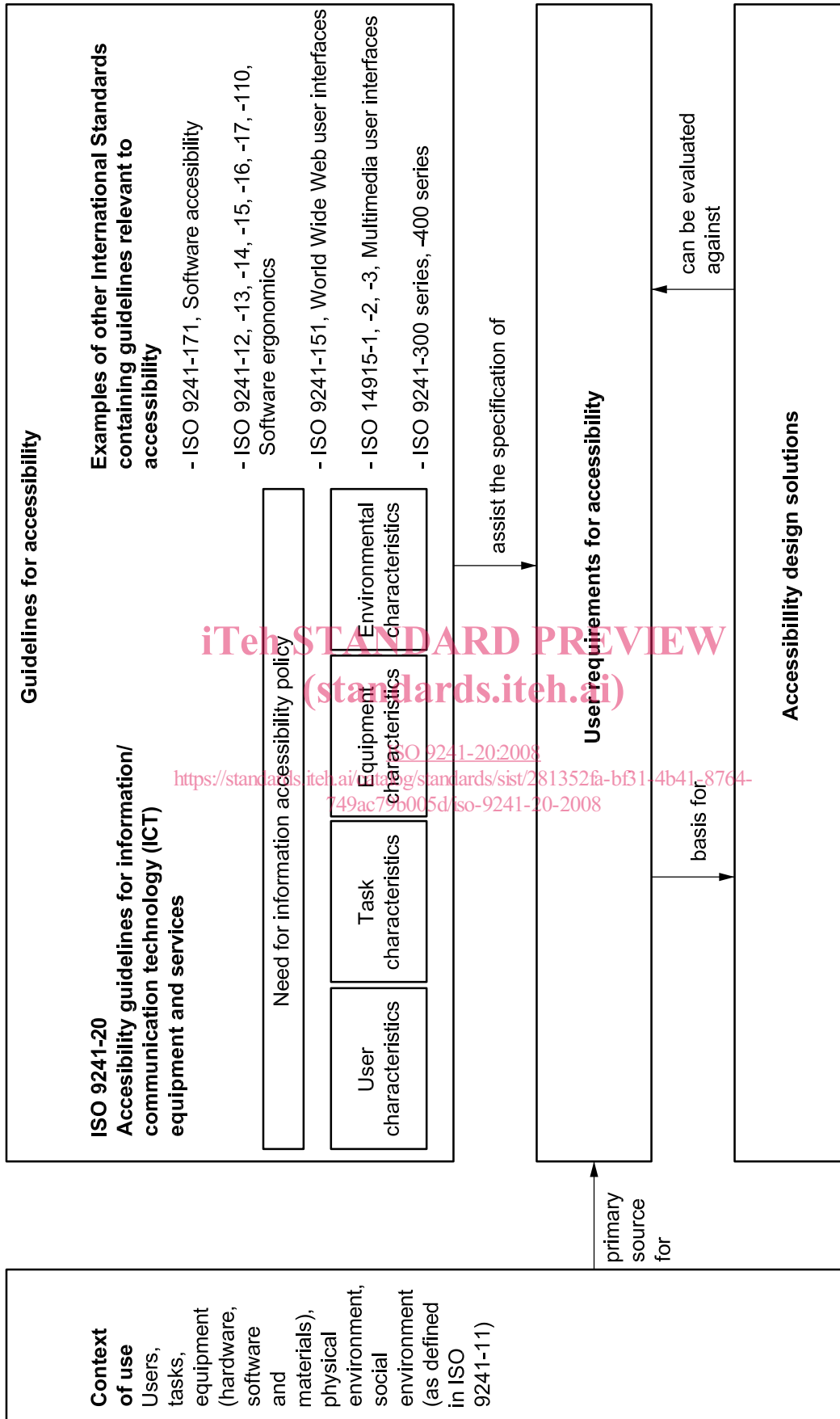


Figure 1 — Application of ISO 9241-20

5 Accessibility

5.1 General

ICT equipment and services are generally designed for a limited range of contexts of use. Accessibility is only achieved when the ICT equipment or service is designed to take sufficient account of the goals, abilities and limitations of users and to support successful interaction. Factors that can limit accessibility arise from one or more components of the context of use (i.e. user, task, equipment and/or environment) as well as interactions between them. ICT equipment and services developed for a limited range of contexts of use risk having more accessibility problems than systems developed for a wider range of context of use.

NOTE ICT equipment and services can be composed of many hardware and software components, including assistive technologies.

Accessibility exists at various levels of equipment and services, within an individual user's specific environment, and can be different for different users. Accessibility can be improved by addressing users, tasks, equipment and services and environment or the fit between these different elements in the context of use.

However, the improvement of individual elements cannot guarantee accessibility or even the improvement of accessibility. What is needed is a holistic approach that seeks to optimize all of the elements. This can involve training users, structuring tasks to suit the users, improving the environment and improving the design of equipment and services.

5.2 Context(s) of use and accessibility

It is important to identify the context or contexts of use, involving users, tasks, social, and physical and technical environments, which applies to the ICT equipment or service being developed or evaluated. Guidance on the identification of the context of use is provided in ISO 9241-11, which shall be consulted when applying this part of ISO 9241.

National accessibility legislation in many countries provides guidance and requirements that are not addressed in this part of ISO 9241 but which should be considered within the context use.

In specifying the user groups, particular attention should be paid to identifying the range of user characteristics that can be found within the user population, since the aim is to meet the needs of the widest possible range of users. The accessibility of the equipment or service increases to the extent of the variation in the user characteristics that is supported where users are able to achieve task goals.

The following approaches should be considered, in order to take account of the variation in user characteristics.

- a) ICT equipment and services are designed for use by the user population without need for any modification or the connection of assistive technologies. This approach is important for ICT equipment and services designed for use by the general public and/or on a "walk up and use" basis.
- b) ICT equipment and services are designed to be configurable to meet individual user needs. This allows users with different capabilities and preferences to select the ways in which they interact with the equipment or service to optimize their effectiveness, efficiency and satisfaction.
- c) Where approaches a) and b) above are not possible or are not appropriate, a range of ICT equipment or services is provided which covers the needs of the whole user population. Each item in the range is designed to meet the needs of subgroups of the user population and can be acquired on an individual basis. This is particularly applicable in non-public situations where people are able to make a personal choice.
- d) While approaches a), b) and c) above can meet the needs of most people, it is possible that some people will still have to use assistive technologies to support their interaction with ICT equipment and services. The ability to connect assistive technologies, while not an accessibility approach on its own, provides the basis for these users to create their own accessibility approaches.

5.3 Process

The following activities should be performed to ensure accessibility:

- understand and specify context of use, paying particular attention to the variation of user characteristics and the impact of task, equipment and environmental characteristics that affect accessibility;
- identify and specify the users' needs for accessibility;
- produce design solutions paying particular attention to accessibility considerations;
- evaluate accessibility design solutions of ICT equipment and services with users whose characteristics reflect the targeted user groups.

For details, ISO 13407 shall be consulted.

NOTE 1 ISO/TR 16982 also provides guidance on usability methods that support human-centred design

NOTE 2 Evaluation of accessibility design solutions includes obtaining user test results and other available forms of user feedback.

NOTE 3 In developments involving multiple parties, the means of achieving accessibility is a matter of negotiation and agreement.

6 Recommendations related to managing development

6.1 Information accessibility policy

General managers and development managers should have an information accessibility policy.

EXAMPLE A company establishes a general information accessibility policy that includes a statement of accessibility goals, a person responsible for ensuring that the company meets these goals, and the identification of particular accessibility standards that it expects to meet.

6.2 Development accountability

General managers and development managers should ensure that the information accessibility policy is followed in the planning, design, development and evaluation of ICT equipment and services.

The best outcome is usually achieved and at lower cost when information accessibility is addressed very early in the design process.

7 Recommendations related to user characteristics

7.1 General

7.1.1 Supporting a range of user characteristics

The range of user characteristics supported by the ICT equipment and services should be sufficient to allow the widest possible range of users to perform the tasks intended in the design.

Specific users may present combinations of disabilities that require specific solutions. A simple combination of the solutions for each individual disability is not adequate. For instance, users who are deaf-blind often do not benefit from auditory output of text like users who are blind nor from text output of audio like users who are deaf.

EXAMPLE A system avoids imposing excessive loads on a user's permanent or temporary memory and learning abilities and limitations.

7.1.2 Supporting multiple interaction mechanisms

ICT equipment and services should support as many alternative means of interaction as possible in order to support the accessibility needs of different groups of users.

When the operation of a particular mental or physical function is difficult for some group of users, an alternative mental or physical function can be used to provide these users with access to the operation performed by that function.

EXAMPLE 1 Voice recognition is provided as an alternative for people with difficulties typing/spelling.

EXAMPLE 2 An assistive technology uses keyboard equivalent input (such as the use of a keyboard or Braille input device instead of a touch screen) for equipment or a service to meet the needs of people within the widest range of capabilities.

EXAMPLE 3 For a graphical interface, users without vision are provided text equivalents for graphic objects through a screen reader.

7.1.3 Supporting simultaneous use of alternate interaction mechanisms

ICT equipment and services should support simultaneous use of alternative means of interaction to meet the accessibility needs of users in different or changing contexts.

This involves the use of multiple interaction channels (see also 7.3.10).

EXAMPLE A screen reader is able to access text output from the operating system and sends it in speech or Braille in addition to a display screen Individualization

7.1.4 Supporting individualization

ICT equipment and services should support individualization by users (7.3.8 and 7.6.7 provide guidance on two specific uses of individualization).

EXAMPLE 1 The user is allowed to select which input and output devices to use for a given task.

EXAMPLE 2 The physical repositioning of individual devices can be easily accomplished by the user.

EXAMPLE 3 The user is allowed to rearrange the layout of components on a display by dragging and dropping.

7.1.5 Changing configurations

A method that does not require users to reconfigure or restart the equipment or service should be provided to allow users to utilize alternative available means of interacting with ICT equipment or services and to select accessibility related settings.

It is important for users to be able to deselect different means of interaction as well as to select them.

EXAMPLE 1 The user is allowed to use a keyboard instead of a mouse to control a screen pointer.

EXAMPLE 2 The user is allowed to select a colour scheme that does not conflict with his/her colour-blindness.

EXAMPLE 3 The user is able to separately adjust the volume on the speaker and on the microphone of a system.

EXAMPLE 4 The user is allowed to adjust physical operational functions, including distances and pressures used by a tactile input device.

EXAMPLE 5 Input from a touch screen is turned off to avoid inadvertent contact by a user who uses a finger to help read the contents of the screen and the functionality normally performed by the touch screen is performed by some other input method.

EXAMPLE 6 An assistive technology can easily be activated or deactivated by a keyboard command that is always available to the user.