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Ergonomics of human-system interaction —

Part 112: Principles for the presentation of information

Ergonomie de l'interaction homme-système —

Partie 112: Principes et lignes directrices relatives à la présentation de l'information

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human–system interaction*.

This first edition of ISO 9241-112, together with ISO 9241-125, cancels and replaces ISO 9241-12:1998.

A list of all parts in the ISO 9241 series can be found on the ISO website.

Introduction

This document presents principles for the presentation of information that apply to the design and evaluation of user interfaces.

The application and use of the principles and general recommendations in this document results in a variety of benefits to users of interactive user interfaces, including improvements in speed, accuracy, mental effort, and user experience. They also help prevent users from experiencing usability problems with presented information. Examples of such problems include the following:

— Users do not detect information, although the information is present.

— Users are distracted from information they are focusing on by other information.

— Users cannot discriminate between pieces of information, since they appear to be identical.

— Users misinterpret information since the meaning of the information is ambiguous.

— Users expend unnecessary time in understanding information since the information is presented is unnecessarily lengthy.

— Users do not understand information due to unknown conventions used in the information.

The principles and general recommendations will help to avoid misinterpretations by providing guidance on the appropriate and effective presentation of information. The guidance in this document does not deal with the identification of the specific information to be presented.

This document contains general recommendations that apply across modalities. ISO 9241-125 provides detailed recommendations relating to the design and evaluation of visual user interfaces.

This document can be used with ISO 9241-110 to provide principles covering interaction with user interfaces, including the presentation of information.

These principles replace the “characteristics of presented information” listed in ISO 9241-12:1998, 4.1. The characteristic “legibility” formerly contained in ISO 9241-12 is not being dealt with specifically in this document since it is specific to visual information, but it is covered in general as part of “Discriminability” and “Interpretability”. “Clarity” and “Comprehensibility” also formerly contained in ISO 9241-12 are now being dealt with as part of “Freedom from distraction” and “Interpretability”.

This document focuses on software aspects of the presentation of information and does not include guidance on the hardware-controlled physical characteristics of information presented in different modalities.

Ergonomics of human-system interaction —

Part 112:
Principles for the presentation of information

1 Scope

This document establishes ergonomic design principles for interactive systems related to the software-controlled presentation of information by user interfaces. It applies to the three main modalities (visual, auditory, tactile/haptic) typically used in information and communication technology. These principles apply to the perception and understanding of presented information. These principles are applicable in the analysis, design, and evaluation of interactive systems. This document also provides recommendations corresponding to the principles. The recommendations for each of the principles are not exhaustive and are not necessarily independent from one another.

While this document is applicable to all types of interactive systems, it does not cover the specifics of particular application domains. This document also applies to outputs from interactive systems (such as printed documents, e.g. invoices).

The guidance in this document for presenting information is aimed at helping the user to accomplish tasks. This guidance is not aimed at the presentation of information for other reasons (e.g. corporate branding or advertising).

It is intended for the following types of users:

— user interface designers, who will apply the guidance during the development process;

— developers, who will apply the guidance during design and implementation of system functionality;

— evaluators, who are responsible for ensuring that products meet the recommendations;

— designers of user interface development tools and style guides to be used by user interface designers;

— project managers, who are responsible for managing development processes;

— buyers, who will reference this document during product procurement.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 9241-171:2008, *Ergonomics of human-system interaction — Part 171: Guidance on software accessibility*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
user
person who interacts with a system, product or service

Note 1 to entry: A person who uses an output or service provided by a system, such as a bank customer who receives a paper or electronic statement, visits a branch, or carries out telephone banking using a call centre, is considered to be a user.

[SOURCE: ISO 26800:2011, 2.10, modified — Change in notes.]

3.2
user interface
all components of an interactive system (software or hardware) that provide information and controls for the *user* (3.1) to accomplish specific tasks with the interactive system

[SOURCE: ISO 9241-110:2006, 3.9]

3.3
user-interface element
user-interface object
entity of the user interface that is presented to the *user* (3.1) by the software

EXAMPLE Text, graphic, control.

Note 1 to entry: User-interface elements can be interactive or not.

Note 2 to entry: Both entities relevant to the task and entities of the *user interface* (3.2) are regarded as user-interface elements. A user-interface element can be a visual representation or an interaction mechanism for a task object (such as a letter, sales order, electronic part, or wiring diagram) or a system object (such as a printer, hard disk, or network connection). It can be possible for the user to directly manipulate some of these user-interface elements.

Note 3 to entry: User-interface elements in a graphical *user interface* (3.2) include such things as basic objects (such as window title bars, menu items, push buttons, image maps, and editable text fields) or containers (such as windows, grouping boxes, menu bars, menus, groups of mutually-exclusive option buttons, and compound images that are made up of several smaller images). User-interface elements in an audio user interface include such things as menus, menu items, messages, and action prompts.

[SOURCE: ISO 9241-171:2008, 3.38]

3.4
attribute
data item that modifies or describes some aspect of an action or an object

Note 1 to entry: An attribute whose value is subject to change can be treated as an object.

[SOURCE: ISO/IEC TR 11580:2007, 2.2, modified — Change of the note.]

3.5
action
user (3.1) behaviour that a system accepts as a request for a particular operation

EXAMPLE Pressing a key, clicking a mouse button, moving the pointer over an object, speaking a command.

[SOURCE: ISO/IEC TR 11580:2007, 2.3]

3.6
operation
predefined system behaviour that a *user* (3.1) initiates

EXAMPLE Sending mail, printing, modifying the data or properties of an object.

Note 1 to entry: A *user* (3.1) performs an *action* (3.5) or a set of actions to initiate an operation.

[SOURCE: ISO/IEC TR 11580:2007, 2.4]

3.7
function
task-specific *operation* (3.6) of an object

Note 1 to entry: Objects can have zero, one, or many functions.

[SOURCE: ISO/IEC TR 11580:2007, 2.5]

3.8
state
status of an object, *action* (3.5), or *attribute* (3.4) which is related to the currently permitted interactions with the object, action, or attribute

[SOURCE: ISO/IEC TR 11580:2007, 2.7]

3.9
selection
explicitly identifying an object, *attribute* (3.4), or *operation* (3.6) that is intended as the target for subsequent *action* (3.5)

Note 1 to entry: When a mouse is used, selection is performed by clicking once on a mouse button, then, a second click is used to initiate the default *function* (3.7) of the selected item.

[SOURCE: ISO/IEC TR 11580:2007, 2.10]

3.10
context of use
*user*s (3.1), tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used

[SOURCE: ISO 9241-11:1998, 3.5]

3.11
modality
mode of interaction referring to one of the human senses

Note 1 to entry: The three modalities most commonly used in information/communication technology (ICT) are: visual, auditory, tactile/haptic.

Note 2 to entry: Modalities are used in interactions between *user*s (3.1) and systems.

3.12
medium, sing.
media, pl.
different specific forms of presenting information to the *user* (3.1)

EXAMPLE Text, video, graphics, animation, audio.

[SOURCE: ISO 14915-1:2002, 3.3, modified — The phrase “human user” has been shortened to “user” as the latter is a term defined as a person.]

3.13
convention
specific design solution that is widely applied within a culture and therefore commonly expected to apply

EXAMPLE Western languages are typically read from left to right.

3.14
group
set of information items or *user interface element*s (3.3) that are semantically related and perceptually distinct

3.15
accessibility
extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of *user* (3.1) needs, characteristics and capabilities to achieve identified goals in identified *contexts of use* (3.10)

Note 1 to entry: Context of use includes direct use or use supported by assistive technologies.

4 Introduction to the presentation of information

4.1 Sources of guidance on presentation of information within the ISO 9241-100 series and their relationship

Guidance on presentation of information is contained in various international standards, as well as in guidelines produced by manufacturers of interactive systems. Whenever the usability of interactive systems is addressed in guidance documents, presentation of information is part of the consideration.

Figure 1 gives an overview on types of source documents which contain guidance on presented information.

NOTE The following description also serves as alternative text for Figure 1.

In ISO 9241-110, principles and general recommendations for the interaction between user and system that apply across application domains and particular technologies are introduced. In particular, the principles of self-descriptiveness and conformity with user expectations are related to the presentation of information. Information, which is not self-descriptive, will mislead the user. Information that is not located where users expect it is likely to be not detected and information that does not conform to other user expectations might be misunderstood.

In ISO 9241-112, principles and general recommendations for the presentation of information are introduced that apply across the three main modalities (visual, auditory, and tactile/haptic) typically used in ICT. These principles and general recommendations also apply across application domains and across technologies.

Other ISO standards contain recommendations and requirements with a specific thematic focus.

— Requirements and recommendations specific to the visual presentation of information can be found in ISO 9241-125.

— Requirements and recommendations specific to dialogue techniques can be found in standards such as ISO 9241-143.

— Requirements and recommendations specific to an application domain can be found in standards such as ISO 9241-151 and ISO 9241-154.

— Requirements and recommendations specific to accessibility can be found in standards such as ISO 9241-20 and ISO 9241-171.

ISO standards contain guidance at the levels of

— principles,

— general recommendations, and

— requirements and recommendations specific to a thematic subject.

They do not prescribe “standardized solutions” in terms of conventions (e.g. “the title bar of a window in focus is coloured blue” or “put anything users usually do not need to see in the lower-left corner or bottom of the window”). Such “standardized conventions” are published by industry sources and can be found in literature. However, the guidance relating to presented information in ISO standards is

intended to be applied when establishing or assessing standardized conventions for user interfaces of interactive systems.

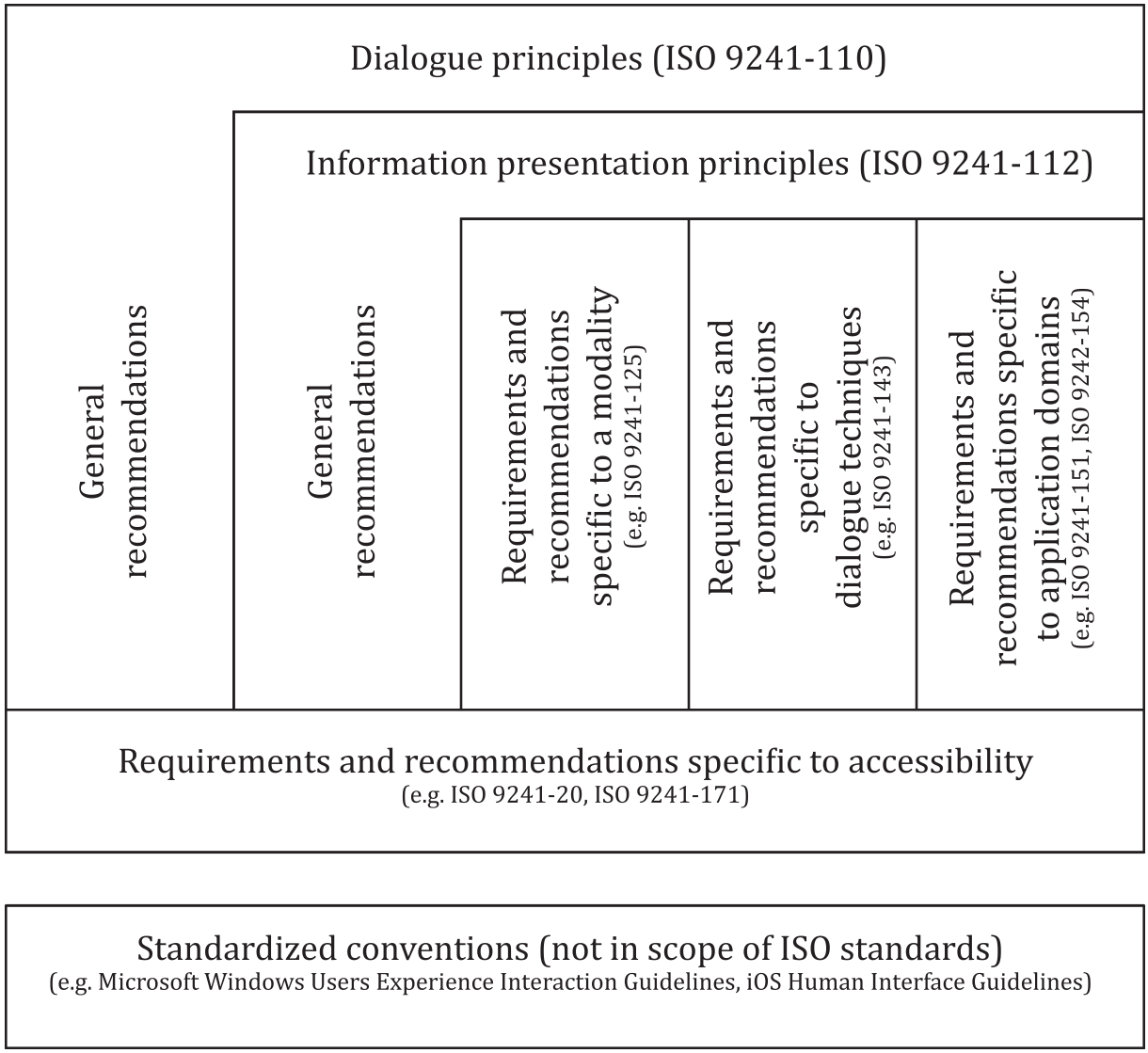

Figure 1 — Relationship between ISO 9241-112 and other sources of guidance on the presentation of information

4.2 Modalities and media

Modalities are based on human senses:

— visual (seeing);

— auditory (hearing);

— tactile/haptic (touching);

— olfactory (smelling);

— gustatory (tasting).

While humans can perceive information based on all modalities, the visual, auditory, and tactile/haptic modalities are the ones commonly used in ICT systems. While the principles apply across all modalities, the three modalities provide the basis for the specific recommendations in this document.

Media are different means of presenting information within one or more modalities [e.g. text (written, spoken, signed, or tactilely presented), images (visual, tactile), sounds, movies, etc.]. Text is the most flexible form of information because it can easily be rendered in each of the visual, auditory, and tactile/haptic modalities. While non-textual information can be more efficient and satisfying in some circumstances, it has the disadvantage of not easily being transformed between modalities. While this document contains some media-specific guidance, it does not deal with all possible guidance on the use of any one medium.

Before users can understand (identify the meaning of) information, they must first perceive (sense) that it has been presented. If users miss perceiving information (due to inattention or due to not being able to utilize the modality in which it is presented), then they will not have it available for understanding. However, users might also perceive the existence of some information that they cannot understand (without further information to help them in this understanding).

4.3 Accessibility

Software presenting information shall use the accessibility services provided by the platform to cooperate with assistive technologies according to ISO 9241-171:2008, 8.5.3.

NOTE 1 ISO 9241-171 provides requirements and recommendations on software accessibility.

NOTE 2 The presentation of the same information in more than one modality/medium increases accessibility.

4.4 Action guidance

Information should be presented in a way that it supports the user's intended actions rather than explaining what the system wants the user to do. It is important that the design of a system guides the user in performing the intended actions, minimizing the need for additional instructive information. However, additional explicit instructive information can be applied wherever identified as necessary.

NOTE Regarding the presentation characteristics of user interface elements, action guidance is also referred to as "affordance" or "cueing the user".

4.5 Information presentation and aesthetics

While aesthetic effects contribute to the user experience, it is important to avoid effects that could reduce overall usability.

NOTE The use of specific effects for aesthetic purposes (such as flashing images, music, or vibration patterns) can cause a variety of problems for users (including distractions and difficulties in perception).

5 Introduction to principles

5.1 Overview

The principles in this document address common usability issues that arise in the presentation of information, when designing user interfaces. They address the ways in which information presented in the design of user interfaces supports effectiveness and efficiency and can lead to increased user satisfaction. These principles are

— detectability,

— freedom from distraction,

— discriminability,

— unambiguous interpretability,

— conciseness, and

— consistency (internal and external).

The individual principles are described and each of the principles is accompanied by a non-exhaustive list of illustrative recommendations at various levels of detail. Designs in accordance with these recommendations will help prevent users experiencing typical usability problems.

The application of a single recommendation does not mean that the application of a principle has been fully satisfied.

5.2 Relationship to other sets of principles in the ISO 9241-100 series

This set of principles focuses on presentation of information that is part of an interactive system. They should be used together with the principles and guidance presented in ISO 9241-110 which focuses on the interaction between the user and the system. It is recognized that the information presented by a system is important in guiding the interactions and intended actions of the user.

This set of principles also works with the principles presented in ISO 9241-171:2008, Clause 5, which focus on designing accessible solutions.

5.3 Relationship between individual principles

The principles are not independent and can semantically overlap. It may be necessary to make "trade-offs" in the relative importance of the principles in order to optimize usability. The applicability and the priority given to each principle will vary with the specific field of application, user groups, and the dialogue technique chosen.

This implies taking into account the

— goals of the organization,

— needs of the intended (end) user group,

— tasks to be supported,

— social and physical environment in which the task is being carried out, and

— available technologies and resources.

The relevance and relative importance of each principle is determined by the particular context of use. Each of the principles needs to be taken into account in analysis, design, and evaluation; however, principles might vary in their relative importance depending on the context of use and other design requirements. In practice, within design situations for an interactive system, compromises will be made.

NOTE The guidance relating to each principle is structured into one or more categories for ease of understanding the breadth of application of the principle. It is possible that more than one requirement or recommendation contained in Clause 6 will lead to the same design decision (thus, design outcomes of one guideline can often be the same as those obtained by applying other guidelines).

6 Principles and recommendations

6.1 Detectability

6.1.1 Principle of detectability

Presented information is detectable if the information is presented so that it will be recognized as present.

Detectability involves guidance related to

a) prominence,

b) timely presentation of information,

c) design the controls to be detectable, and

d) continuity.

6.1.2 Guidance related to using prominence

6.1.2.1 The user's attention should be directed towards information as required.

6.1.2.2 The focus of attention should be set on important information.

EXAMPLE 1 Important information is presented at the top centre of a page of visual information.

EXAMPLE 2 Important information is presented first in an audio announcement slowly and in easily understandable/acceptable languages of the users.

EXAMPLE 3 Important tactile/haptic information is presented using a higher intensity than less important information.

6.1.2.3 The most important information (including critical elements) should be presented to stand out from other presented items of information and secure the user's attention.

EXAMPLE 1 Critical information is presented in larger, bold faced, visually contrasting text in a visual display.

EXAMPLE 2 Pauses are used to call attention to critical information in an audio announcement.

EXAMPLE 3 A special warning vibration precedes the presentation of critical information on a tactile/haptic display.

6.1.3 Guidance related to timely presentation of information

6.1.3.1 Information should be presented at a pace that suits the pace of the user.

NOTE The appropriate pace depends on the modality, the user's needs (e.g. a screen reader user might be able to receive audio text at a much faster rate than a user not dependent on screen reading), and the content (e.g. entertainment versus legal text).

6.1.3.2 The pacing of information presentation should be under user control.

EXAMPLE 1 The user controls scrolling on a page and transitions between pages of visual information.

EXAMPLE 2 The user is able to pause and restart the presentation of auditory information.

EXAMPLE 3 The user has a control for advancing information on a Braille display.

6.1.3.3 The user should be able to have information repeated.

EXAMPLE 1 The user is able to go back to a previous page of visual information.

EXAMPLE 2 The user is able to replay the last section of auditory information.

EXAMPLE 3 The user is able to replay the last sentence presented on a Braille display.

6.1.3.4 The system response time for presenting information should be suitable to user expectations and the needs of the task.

6.1.3.5 The sequence of presentation of information should take into account the logical flow and priority/importance of the information that is being presented.

6.1.3.6 Information that is less important should not interfere with the presentation of important information.

6.1.3.7 For each user input, the system should give an immediate response.

NOTE 1 While the timing of the response might be influenced by connectivity delays, it is important that this response be generated by the system within 0,1 s.

NOTE 2 The minimum response is to acknowledge that the input has been entered. It is recognized that this type of response might precede other more complex responses.

EXAMPLE 1 Information entered into a field on a visual display appears as soon as it is received by the system.

EXAMPLE 2 An audio sound is presented when information is received from the user by the system.

EXAMPLE 3 A particular vibration pattern is presented when information is received from the user by the system.

6.1.3.8 The system should indicate when it is busy.

NOTE It is helpful for this indication to include an estimate of the amount of time that the system will remain busy, where such an estimate is possible.

EXAMPLE 1 The system visually displays an hourglass to indicate that it is currently busy.

EXAMPLE 2 The system produces a low-volume hum to indicate that it is currently busy. The frequency of the hum increases as the estimated time that is remaining decreases.

EXAMPLE 3 The system produces a low-intensity vibration to indicate that it is currently busy. The frequency of the vibration increases as the estimated time that is remaining decreases.

6.1.4 Guidance related to making controls detectable by the user

6.1.4.1 The most frequent and critical controls should always be presented to the user.

6.1.4.2 Controls that are only occasionally used and are also not associated with time-critical activities may be hidden as long as the user can get to them if needed.

EXAMPLE 1 Controls not currently needed are removed from the visual display, but can be returned via a single control action.

EXAMPLE 2 Controls not currently needed are not listed in an audio menu, which also contains an option for presenting additional controls.

EXAMPLE 3 The user of a tactile device has the ability to use a single tactile control for multiple different control actions, depending on the current state of the device.

6.1.4.3 The user should have access to information on what actions are possible.

6.1.4.4 Controls that an individual is never allowed to use should be hidden for the interface for that user.

NOTE This can be done based on various types of information including a user's current role, permissions, and/or profile.

EXAMPLE 1 Controls used only by administrators are not visually displayed to regular users.

EXAMPLE 2 Controls used only by administrators are not provided in an auditory menu to regular users.

EXAMPLE 3 States corresponding to different control actions that are only used by administrators cannot be entered by users of tactile devices.

6.1.4.5 Controls should be designed in a way that they are detectable.

6.1.5 Guidance related to using continuity to aid detectability

6.1.5.1 Where only part of a set of information is presented or where some of the information is partially hidden, the system should make the user aware that more information is available and describe how to access it.

EXAMPLE A scroll bar on a visual display indicates that there is more information than what is currently being displayed.

6.1.5.2 The system should make the user aware of the end of a set of information.

6.2 Freedom from distraction

6.2.1 Principle of freedom from distraction

Presented information is free from distractions if the information is presented so that required information will be perceived without other presented information interfering with its perception. Distractions from a user's point of view can result from both distracting events and information overload.

Freedom from distraction involves guidance related to

a) avoiding distractions, and

b) minimizing distractions.

6.2.2 Guidance on minimizing and avoiding distractions

6.2.2.1 Presented task-relevant information should be clearly distinct from any background or changing information that is added to the presentation for non-task-relevant purposes (e.g. to "enhance" the artistic nature of the presentation).

EXAMPLE 1 An application uses minimal contrast in background images to avoid this background distraction from the main information that is presented.

EXAMPLE 2 Advertisements do not flash or dynamically change to avoid distracting the user reading other portions of the screen.

EXAMPLE 3 An application uses minimal background music for phone-based interactive voice response systems.

6.2.2.2 Where possible, users should be presented a means of eliminating or reducing unnecessary backgrounds that could interfere with task-relevant information.

EXAMPLE 1 The user is provided a means to change the background of a pager of displayed information to one that is less distracting.

EXAMPLE 2 The user is provided a means of cancelling the presentation of background music while listening to spoken output.

EXAMPLE 3 The user is provided a means of minimizing system vibrations while using a Braille output device.

6.3 Discriminability

6.3.1 Principle of discriminability

Presented information is discriminable if

1) the information is presented such that discrete items or groups of items can be accurately differentiated, and

2) the items of information are presented in a manner that supports their association with or differentiation from other items or groups of items.

Discriminability involves guidance related to

a) structuring,

b) presentation attributes,

c) (Gestalt law of) proximity, and

d) (Gestalt law of) similarity.

6.3.2 Guidance related to the structuring of presented information

6.3.2.1 Information should be structured in a consistent manner according to the semantic approach that best suits its use.

NOTE ISO 14915-2:2003, 5.2.1 identifies the following semantic approaches to structuring of information:

a) **Task-based structuring**, where the content structure is determined by the structure of the tasks of the application.

b) **Usage-based structuring**, where the structure is arranged in the order which users are expected to apply the content, e.g. by importance, frequency of use, or individual viewpoints.

    1) **Importance-based structuring**, where the content is structured based on the estimated order of relative importance of different chunks of content to the user.

    2) **Frequency of use structuring**, where the content is structured based on the estimated order of relative frequency of use of different chunks of content to the user.

    3) **Order of use structuring**, where the content is structured based on the estimated order of use of different chunks of content to the user.

    4) **Conventional structuring**, where the content is structured in the traditional way that it is described, taught, presented to people becoming acquainted with it, or in the traditional way that it is organized by researchers in the field.

c) **Time-ordered structuring**, where the content is identified and structured based on times or dates that apply to the content.

    1) **Time-sequenced structuring**, where unique times or dates are involved, a time-ordered structure will be a linear sequence.

    2) **Historical structuring**, where the content is structured based on the order of its development/discovery or causes and effects.

d) **Information-model-based structuring**, where the content structure is determined by a model of the information (e.g. in categories, entities, and attributes, objects, or classes of objects).

    1) **Logical-group structuring**, where the content is structured in clusters based on some set of major logical concepts; individual chunks of content can appear in multiple locations in such a structure.

2) **Alphabetical-order structuring**, where the content is alphabetically structured based on an index of meaningful descriptors.

3) **Generalization granularity structuring**, where content is organized from general to specific or from specific to general.

6.3.2.2 Different semantic approaches may be used to structure different levels of information.

EXAMPLE 1 The two-dimensional nature of visual displays makes it possible to use two different semantics at the same time for structuring in the X and Y dimensions (e.g. in a graph the X dimension is used for time and the Y dimension is used for distance).

EXAMPLE 2 Auditory coding can involve using volume for encoding one semantic (e.g. strength) and using frequency for another semantic (e.g. time).

EXAMPLE 3 In tactile user interfaces, surface textures can represent one semantic (e.g. type of terrain on a map), while distances can represent another semantic.

6.3.2.3 In addition to the structuring of information on a single display, structuring also involves linking of information between different presentations on a single display (e.g. different Web pages) and between different display devices.

6.3.3 Guidance related to using presentation attributes

6.3.3.1 Items of information that are logically dissimilar should be presented differently (e.g. using different presentation attributes) to make their differences obvious.

NOTE This can involve locations, visual shapes, sizes, colours, typefaces, etc.; auditory order of presentation, volumes, tones, frequencies, etc.; tactile locations, shapes, vibrations, pressures, etc.

6.3.3.2 There should be more than one means of encoding properties of information.

NOTE 1 It is inappropriate to use colour as the only means of visually coding properties of information because some people cannot distinguish between colours.

NOTE 2 It is inappropriate to use frequency as the only means of auditory coding properties of information because some people cannot distinguish between frequencies.

NOTE 3 It is inappropriate to use vibration amplitude as the only means of tactile coding of information because some people cannot distinguish between amplitudes.

6.3.4 Guidance related to grouping using proximity

6.3.4.1 Information should be presented in groups which can be recognized as distinct from one another.

6.3.4.2 Where large amounts of information are presented, structuring of and separating the information may be used to help separate individual items of information from one another and to separate groups of information from one another.

6.3.4.3 Items of information that belong together should be presented in physical/temporal proximity to one another.

6.3.4.4 Items of information with similar properties should be presented in physical/temporal proximity to one another.

6.3.4.5 Objects in spatial, temporal, or acoustic proximity to one another should be sufficiently separated to avoid accidental activation of the wrong object.

EXAMPLE 1 Objects on a visual display are separated by 50 pixels to make it easier for users to select them on a touch screen.

EXAMPLE 2 Voice commands are acoustically distinct to avoid the speech recognition system from mistaking the user's intention.

EXAMPLE 3 Tactile controls are separated by 1 cm to avoid users reaching for one accidentally activating the other as well.

6.3.4.6 Where grouping of information is used to structure information for ease of use, the number of items or chunks of information in a group should be limited to ensure information discriminability by the user. Where more items are present than can be discriminated, sub-groups should be used to keep the number of items discriminable.

NOTE 1 Typically, users have difficulty discriminating between seven or more items or chunks of information. The number of items users can discriminate between drops as the complexity of information increases.

NOTE 2 The number of items or chunks of information that are discriminable depends on the modality (e.g. the auditory modality typically has a maximum of three to five items).

6.3.4.7 Where large amounts of information are available, the user should be able to filter the information to limit the presentation of information to that information which is currently relevant to the user's task.

6.3.4.8 Where values of an attribute are used (as coding) to discriminate between different groups of information items, the number of different values of an attribute should be kept to a discriminable number of values. If more groups are required, sub-grouping should be used to keep the number of values of any single attribute to a discriminable number of values.

6.3.4.9 Physical and/or temporal spaces should be used to separate groups of information.

6.3.5 Guidance related to using similarity

6.3.5.1 Items of information (including controls) that are logically similar should be presented using similar attributes to draw attention to their similarities.

NOTE This can involve visual shapes, sizes, colours, typefaces, etc.; auditory volumes, tones, frequencies, etc.; tactile shapes, vibrations, pressures, etc.; and aspects of proximity (see 6.3.4).

6.3.5.2 Items of information (including controls) that are logically dissimilar should be presented using one or more different attributes to draw attention to their dissimilarities.

6.3.5.3 Items in a group of information that are ordered should be presented using one or more different attributes that imply ordering to help users to easily orient themselves among preceding or following.

NOTE ISO 9241-14:1997, 5.3 provides guidance on sequencing of options within groups.

6.4 Interpretability

6.4.1 Principle of interpretability

Presented information is interpretable if it will be comprehended as intended.

Interpretability involves guidance related to

a) comprehensibility,

b) unambiguous meaning,

c) closure,

d) textual coherence,

e) selection and use of media/modality, and

f) user capabilities.

6.4.2 Guidance related to ensuring comprehensibility

6.4.2.1 Information should be complete (e.g. containing all information items relevant for completing a task).

6.4.2.2 Items of information should be semantically distinct from one another.

6.4.2.3 Information on the current states that affect interactions and processing should be available.

6.4.2.4 Menu items evoking a function should be worded with an active verb to identify the action and, where appropriate, a noun to identify the object of the action.

EXAMPLE In English language systems, items initiating actions begin with a verb that unambiguously represents the outcome of the command to be performed by selecting the item.

NOTE The sequence of presentation might be different in different languages.

6.4.2.5 Menu items leading to objects should use nouns and suitable modifiers that unambiguously identify the object represented.

6.4.2.6 Choices representing states should be titled using adjectives (e.g. active/inactive) that unambiguously represent the state.

6.4.3 Guidance related to ensuring unambiguous meaning

6.4.3.1 Information should be presented with vocabulary that the user is familiar with.

NOTE It is also important to be able to recognize the difference between user entries, defaults, and previously entered data.

6.4.3.2 Information should be expressed in a way which will facilitate the user's understanding.

6.4.3.3 Simple linguistic constructions and word forms should be used whenever possible.

NOTE In general, positive verbalized expressions are more understandable than expressions containing negations.

6.4.3.4 Presented information should be unambiguous.

6.4.3.5 Controls should be designed in a way that the effort to explore them and learn their use and meaning is minimized.

NOTE This can involve separate means of selecting, activating, and obtaining information on a given control.

6.4.3.6 The meaning of abbreviations, acronyms, symbols, and symbolism (including metaphors) should be clear to the user.

NOTE This can involve ensuring that common conventions familiar to the intended user group are used.

EXAMPLE 1 The first time an acronym is used in a large piece of text where it will be used repeatedly, it is preceded in the text by the complete set of words that it represents.

EXAMPLE 2 Positioning the mouse over an acronym found in a displayed text has the system present the complete set of words that it represents.

EXAMPLE 3 An audio presentation uses the full names of items rather than abbreviations for them each time it comes to them.

EXAMPLE 4 A tactile presentation explains the set of symbols that it is using before they are used.

6.4.4 Guidance related to using closure appropriately

6.4.4.1 Presented information should make use of user anticipation to optimize human information processing by reducing the quantity of information presented.

NOTE Users tend to complete their interpretation of information that is partially complete by anticipating information that is missing.

6.4.4.2 Where presented information is intentionally incomplete, this incompleteness should be clearly indicated.

EXAMPLE 1 When a piece of text is not complete, it is followed by three dots to indicate this incompleteness.

EXAMPLE 2 In order to ensure that users do not misinterpret a set of data in a text field as being complete, either a scroll bar is used or only the upper half of the last row is displayed.

6.4.4.3 The presentation of information should avoid misleading indications of closure.

EXAMPLE 1 In the auditory presentation of information, misuse of inflection can leave the user to anticipate more auditory information is to follow.

EXAMPLE 2 If a tactile knob continues to rotate, the user might not realize that an end point to the input has been reached.

6.4.4.4 If the system is able to automatically complete entries when inputting data,

a) it should perform this auto-completion (unless previously instructed not to do so),

b) its actions should be obvious to the user,

c) its actions should be under user control, and

d) the system should allow the user to correct the auto-completion.

EXAMPLE While the user is typing, the system displays a suggestion for the most likely completion of the text based on past entries by the user or the general population using the system.

6.4.5 Guidance related to textual coherence

6.4.5.1 Where large volumes of textual content are presented, the purpose of the content should be made clear before presenting the details of the content.

EXAMPLE A section of text includes headings before presenting the detailed content.

6.4.5.2 Short sentences should be used, where possible.

NOTE Comprehension in English decreases dramatically when sentence length exceeds 12 words.

6.4.5.3 Sentence structure should follow the preferred ordering of the language being used.

EXAMPLE In English, the ordering of subject-predicate-object improves readability.

6.4.6 Guidance related to selection and use of media/modality

6.4.6.1 The presentation modality and media optimally suited to the type of information should be used.

6.4.6.2 While the choice of the main modality and media can be made to provide the greatest effect for the majority of users, the system should ensure that all content and functionality is available to assistive technologies.

NOTE This can include the provision of alternative text for visual images, audio descriptions for moving images, captions for audio output, and text alternatives for tactile output.

6.4.6.3 Information should be presented in one or more modalities/media/formats (format) to support the accessibility needs of diverse users (e.g. alt-text).

6.4.6.4 Where it is necessary to present dynamic media concurrently in a single modality (e.g. two audio tracks, two video presentations), they should be managed or configurable so that the user can obtain the primary information by focusing on only one of the media at a time.

6.4.6.5 Where dynamic media are presented, the system should also provide controls for the user to control the media object (including to play, to pause, to rewind, and to rewind to the start of the media object).

6.4.7 Guidance related to user capabilities

6.4.7.1 Information should be presented using terminology and language from the user's domain of expertise.

6.4.7.2 Information should be presented to be understood by all cultures within the intended user community.

EXAMPLE 1 In societies that are multilingual, the system provides information in the main languages.

EXAMPLE 2 There are different formats for dates, time, and telephone numbers in different parts of the world. The system provides information on the format being used along with the data that are presented in the format.

6.4.7.3 Information presentation should be within the cognitive abilities of users.

NOTE There are a variety of cognitive abilities that might be important in dealing with information presentation including: language, thinking styles, memory, motivation, reading level, etc. There can be a diversity of abilities and levels of each ability across users.

6.4.7.4 Cognitive workload may be reduced by

a) focusing on the goal(s) and task(s) in a manner unambiguous for the users,

b) providing the users with strategies for accomplishing goals and tasks,

c) providing support for the users' task(s),

d) providing all necessary information in a manner unambiguous for the users,

e) reducing memory demands on the users, and

f) providing information in a manner that best suits the users' individual needs (e.g. individualization based on stored user preferences)

NOTE Some users prefer information presented in a step-by-step manner, while other users prefer the concepts presented before presenting the details (e.g. in a step-by-step manner).

6.5 Conciseness

6.5.1 Principle of conciseness

Information presentation is concise if only the necessary information is presented.

NOTE The absence of additional unnecessary information is referred to as "minimalism" in the clauses below.

Conciseness involves guidance related to

a) conciseness of content, and

b) conciseness of actions.

6.5.2 Guidance related to conciseness of content

6.5.2.1 Minimalism and simplicity should be used to present information concisely.

6.5.2.2 Presentation should avoid excess information (e.g. excessive wordiness, unnecessary visual attributes, unnecessary background music, unnecessary tactile stimulations).

NOTE 1 Excessive information can create problems with discriminability and the ability to remember important information.

NOTE 2 Certain decorative elements might be desirable for reasons involving the overall user experience, as long as they do not interfere with the user's effectiveness and efficiency.

6.5.2.3 Additional information that does not support the user's tasks should be avoided.

6.5.2.4 Redundant information should be minimized unless it supports understanding.

6.5.2.5 Cognitive complexity should be minimized.

6.5.2.6 Minimalism and simplicity should not limit completeness of required information or the accessibility of this information.

6.5.2.7 The user should be presented with information that supports the recognition of which possible tasks can be accomplished at this point in the interaction.

6.5.2.8 The system should enable users to access different amounts of information in order to meet their individual needs.

NOTE New users might have additional information needs (e.g. for guidance on how to use the system) that experienced users do not have.

6.5.3 Guidance related to conciseness of actions

6.5.3.1 Where possible, the system should provide users with concise alternative means of operation.

EXAMPLE Shortcuts, partial automation like autocomplete, and use of preconfigured templates can be used to create concise alternative means of operation.

6.5.3.2 The system should provide the user with means of navigating and searching through information to identify the information that is important to the current task.

6.5.3.3 The system should provide the user with the capability of easily referring back to information that was previously encountered.

6.6 Consistency (internal and external)

6.6.1 Principle of consistency

Presented information is consistent if items of information with similar intent are presented similarly and items of information with different intent are presented in different style and form within and across the interactive systems and the user's environment.

Guidance on internal consistency is related to the consistent use of conventions within the interactive system.

Guidance on external consistency is related to conventions known to the user from external sources. These external sources include conventions known from platforms, other interactive systems, or conventions related to experiences of tasks and the social and physical environments.

Internal consistency involves guidance related to consistency across pieces of information and logical consistency.

External consistency involves guidance related to consistency with conventions known to the user.

6.6.2 Guidance related to consistency across pieces of information

6.6.2.1 Terminology should be consistent throughout the interactive system, including terminology for

a) object names,

b) classes of objects,

c) actions and events,

d) command/control names,

e) control options and attributes,

f) abbreviations,

g) instructions and prompts,

h) feedback and error messages, and

i) status reports.

6.6.2.2 Where named choices (e.g. links) lead to pieces of information (e.g. separate sections or Web pages), the name of the original choice (e.g. link) should be the same as the name of the piece of information (e.g. section or Web page) which that choice leads to.

EXAMPLE A link named "Help" on a Web page takes the user to a page titled "Help" rather than to a page named "Information".

6.6.2.3 Where attributes are used to encode properties of pieces of information, they should be used consistently throughout the interactive system, or at least throughout a single state of the interactive system.

NOTE 1 These attributes include data formats, visual locations, shapes, sizes, colours, fonts (including variations such as bold and italics), capitalization, etc.; auditory order of presentation, volumes, tones, frequencies, etc.; tactile locations, shapes, vibrations, pressures, etc.

NOTE 2 Where encoding attributes are used differently in different states of an interactive system, it is important that changes to the state of the interactive system that also change the encoding are made clear to the user.

6.6.2.4 The grammatical format (e.g. verb tense) of similar items of information should be consistent.

6.6.2.5 Units of measurement should be consistent within an interactive system and where they can be changed, this change should be applied throughout the interactive system.

6.6.2.6 The meaning of gestures should be consistent throughout the interactive system.

6.6.3 Guidance related to logical consistency

6.6.3.1 The behaviour of components should be consistent throughout the interactive system.

6.6.3.2 The relative positioning and layout of different groups of user interface elements should be consistent throughout the interactive system.

6.6.3.3 The operations of user interface elements should be consistent within a single state of an interactive system. Where different operations are appropriate to different states, information on the current state should be made available to the user.

6.6.3.4 The results of any individualization action should

a) have a consistent behaviour throughout the interactive system, and

b) be consistent with the context of use of the individualization.

NOTE Further guidance on individualization is provided in ISO 9241-129.

6.6.4 Guidance related to consistency with conventions known to the user

6.6.4.1 Information presentation should follow established conventions.

6.6.4.2 Information should be presented in syntax and terminology of the user's domain.

6.6.4.3 Attributes used for coding information should be used consistently with common conventions.

6.6.4.4 The system should notify the user if it is breaking with conventions.

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