INTERNATIONAL STANDARD

ISO 9241-129

First edition
2010-11-15

Ergonomics of human-system interaction —

Part 129: Guidance on software individualization

Ergonomie de l'interaction homme-système —

Partie 129: Lignes directrices relatives à l'individualisation des logiciels

Reference number
ISO 9241-129:2010(E)

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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 9241-129 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 4: Keyboard requirements*

— *Part 5: Workstation layout and postural requirements*

— *Part 6: Guidance on the work environment*

— *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*

— *Part 17: Form filling dialogues*

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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 100: Introduction to standards related to software ergonomics* [Technical Report]

— *Part 110: Dialogue principles*

— *Part 129: Guidance on software individualization*

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

— *Part 171: Guidance on software accessibility*

— *Part 210: Human-centred design for interactive systems*

— *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 for electronic visual displays*

— *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 309: Organic light-emitting diode (OLED) displays* [Technical Report]

— *Part 310: Visibility, aesthetics and ergonomics of pixel defects* [Technical Report]

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

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

— *Part 420: Selection of physical input devices*

— *Part 910: Framework for tactile and haptic interaction*

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

The following parts are under preparation:

— *Part 143: Form-based dialogues*

— *Part 154: Design guidance for interactive voice response (IVR) applications*

Requirements, analysis and compliance test methods for the reduction of photosensitive seizures and evaluation methods for the design of physical input devices are to form the subjects of future parts 391 and 411.

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Introduction

Individualization is used in a wide variety of ways to enhance applications both for users and for branding of the applications themselves. The wide variety of different implementations includes many instances where individualization creates considerable challenges for the users that it ought to be helping. This becomes an even greater challenge when users have to deal with different individualization approaches in each of the several applications that they use.

The purpose of this part of ISO 9241 is to provide guidance on the application of software individualization in order to achieve as high a level of usability as possible. Thus it addresses individualization as the modification of interaction and presentation of information to suit individual capabilities and needs of users. Individualization enables support of a wide range of users, tasks, and contexts of use. It is particularly useful in increasing accessibility (which is discussed in ISO 9241-171).

On the one hand, ISO 9241-110 provides general guidance on individualization, identifying it as one of the seven dialogue principles that are important for the design and evaluation of interactive systems. On the other hand, this part of ISO 9241 provides considerably more detail on the ergonomic use of individualization.

This part of ISO 9241 addresses both user-initiated and system-initiated individualization. It encompasses the concepts of configuration, customization, adaptivity, adaptation, profiling, and internationalization.

It serves the following types of users:

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

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

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

— system administrators responsible for implementing solutions to meet end-user needs;

— buyers, who will reference this part of ISO 9241 during product procurement;

— evaluators, who are responsible for ensuring that products are in accordance with this part of ISO 9241.

The ultimate beneficiary of this part of ISO 9241 will be the end-user of the software. Although it is unlikely that end-users will read this part of ISO 9241, its application by designers, developers, buyers and evaluators ought to provide user interfaces that are more usable through the use of individualization. This part of ISO 9241 concerns the development of software for user interfaces. However, those involved in designing the hardware aspects of user interfaces may also find it useful when considering the interactions between software and hardware aspects.

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Ergonomics of human-system interaction —

Part 129: Guidance on software individualization

1 Scope

This part of ISO 9241 provides ergonomics guidance on individualization within interactive systems, including recommendations on

— where individualization might be appropriate or inappropriate, and

— how to apply individualization.

It focuses on individualization of the software user interface to support the needs of users as individuals or as members of a defined group.

It does not recommend specific implementations of individualization mechanisms. It provides guidance on how the various aspects of individualization are made usable and accessible, but does not specify which individualizations are to be included within a system.

NOTE Individualizations depend on the specific context of use for which an interactive system is to be designed and/or used, and need to be developed for that specific context of use.

This part of ISO 9241 is not intended to be used in isolation. It deals only with individualization within the context of designing a complete software system. It is intended to be used with ISO 9241-110 and any other parts in the ISO 9241 series applicable to the design of the intended system.

Some of its guidance can also be applied to hardware user interfaces and user interfaces that combine software and hardware.

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

ISO/IEC 24786, *Information technology — User interfaces — Accessible user interface for accessibility settings*

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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 a 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.

[ISO 9241-20:2008, 3.1]

3.2
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, 3.5]

3.3
individualization
modification of interaction and presentation of information to suit individual capabilities and needs of users

[ISO 9241-171:2008, 3.17]

3.4
preconfiguration
configuration of software prior to first use of the software

3.5
predefined user profile
profile based on a stereotype or combination of stereotypes

NOTE 1 Stereotypes used as the basis of a predefined user profile could include a role, a job function or a group membership.

NOTE 2 Predefined user profiles are often used to define access privileges to specific web content.

[ISO 9241-151:2008, 3.20]

3.6
profile
user profile
set of attributes used by the system that are unique to a specific user/user group

[ISO 9241-151:2008, 3.19]

3.7
reconfiguration
changing the configuration of software that has already been configured

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3.8
usability
extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

[ISO 9241-210:2010, 2.13]

3.9
user interface
all components of an interactive system (software or hardware) that provide information and controls for the user to accomplish specific tasks with the interactive system

[ISO 9241-110:2006, 3.9]

3.10
user interface element
user interface object
entity of the user interface that is presented to the user by the software

EXAMPLE Text, graphic, control.

NOTE 1 User-interface elements can be interactive or not.

NOTE 2 Both entities relevant to the task and entities of the user interface 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 User-interface elements in a graphical user interface 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.

[ISO 9241-171:2008, 3.38]

4 Conformance

If it is claimed that a system or service has met the provisions of this part of ISO 9241, then the procedures used to establish user requirements, to develop individualization capabilities and to evaluate the individualizations shall be specified. The level of detail of the specification is a matter of negotiation between the involved parties. Annex C provides assistance in documenting conformance.

5 Framework for applying this part of ISO 9241

The following clauses range from general high-level guidance (applicable to all uses of individualization) to specialized detailed guidance (applicable to specific instances of individualization).

Clauses 6 and 7 provide general guidance related to the use and goals of individualization. They provide information that applies throughout the development of a system.

Clauses 8, 9, and 10 provide guidance related to choice of individualization mechanisms, individualization of configurations and support of individual users.

Clauses 11, 12, and 13 provide guidance related to particular interfaces, components, and actions that might be involved in specific cases of individualization.

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Figure 1 shows the framework in which this part of ISO 9241 can be applied to assist in the analysis, design and evaluation of interactive systems. The arrows illustrate the flow of information between various elements in the figure.

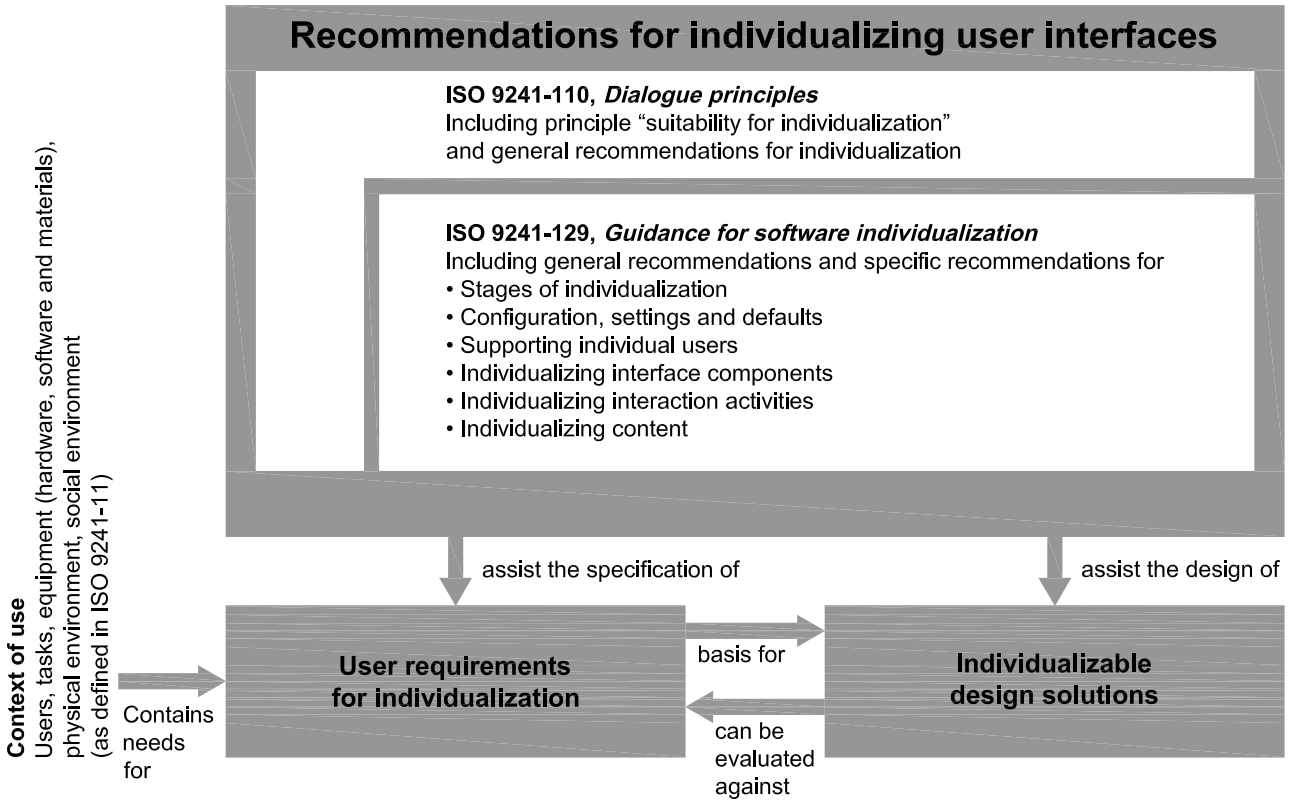

Figure 1 — Framework for the application of this part of ISO 9241

6 Introduction to individualization

6.1 The role of individualization

Individualization involves modifying the behaviour of the interactive system and the presentation of its user interface elements, prior to use or while it is in use, to better meet characteristics of its context of use for an individual or a group of users.

The capability to individualize should be built into an application in response to the identification of user requirements, i.e. different users can have different needs and/or individual users can have different needs at different times.

Individualization refers to modifications that are achievable without reprogramming the application, because individualization capabilities have already been built into the application.

NOTE More details on factors to consider when designing individualization can be found in Annex B.

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6.2 When to provide the capability for individualization

Individualization capabilities may be provided to accommodate one or more of the following, when a single design solution is not sufficiently usable.

a) Variation in user characteristics

1) Differences in user characteristics (capabilities and preferences) that will increase accessibility

   i) within a user group, or

   ii) between user groups

   EXAMPLE 1 A user group includes people with limited vision. Individualization can provide these users with bigger fonts.

2) Temporary or permanent changes in user characteristics (resulting from learning, illness, etc.)

   EXAMPLE 2 A user of media player software is losing her hearing capabilities. Individualization can provide her with an option for activating captioning of videos.

b) Different user needs and goals

1) Enhancing user understanding

2) Meeting needs of infrequent, intermittent, or discretionary users

   EXAMPLE 3 Individualization can provide additional description of the task to be performed be the user.

3) Meeting the needs of users who are least adaptable to new ways of working

c) Variation in task characteristics

1) Characteristics of different tasks (complexity, difficulty, frequency, information content, time constraints, etc.)

2) Temporary or permanent changes in task characteristics (involving internationalization, accommodating different jurisdictions, etc.)

d) Different equipment used by a single user

EXAMPLE 4 A web application reconfigures its interface layout and structure based on recognition of the capabilities of the current device (e.g. desktop computer vs. mobile phone vs. kiosk) currently used by a user. Individualization can provide additional description of the task to be performed by the user.

e) Different environments experienced by a single user

EXAMPLE 5 A user is able to change the colour scheme on a mobile device to a high contrast scheme when going from a dark environment (e.g. indoors) to a brighter environment (e.g. outdoors).

NOTE The existence of variability in these factors is not usually sufficient to justify providing individualization without objective data that suggest that individualization will result in the improvement of usability.

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6.3 Limitations on the provision of individualization

Providing individualization capabilities may not be appropriate under the following circumstances.

a) Where used as a substitute for ergonomically designed dialogues.

EXAMPLE 1 Initial system-provided defaults are used to avoid requiring the user to configure a system before it can be used.

b) Where performance might be degraded or human error might occur in safety-critical and mission-critical systems.

EXAMPLE 2 In a power plant, individual modifications to the control room interface could lead to a delay in responding to critical information.

c) Where procedures are streamlined for organizational or customer considerations.

EXAMPLE 3 In call centres, individualization could lead to unacceptable increases in processing times.

NOTE 1 If individualization provides access to a system that was previously inaccessible to a person with disabilities, then individualization is appropriate even if the process takes longer.

d) Where individualization would be likely to lead to usability or accessibility problems for the intended users.

NOTE 2 Even where individualization is provided, it is important to limit the extent of individualization choices to avoid foreseeable usability problems.

EXAMPLE 4 Changing text font colour such that it is so similar to the background colour as to make the text unreadable.

EXAMPLE 5 The volume level of user-configured auditory feedback is limited to avoid disturbing other users in the same work space.

6.4 Initiation of individualization

Individualization may be initiated by

a) an individual user, someone assisting the user, or a system administrator (human-initiated modification), or

b) the system itself, in response to user interactions or changes of context (system-initiated modification).

NOTE Individualization capabilities are seldom included in an application to support a particular user. Rather, individualization capabilities are usually provided to meet different attributes and needs within a population of users.

7 General guidance on individualization

7.1 Accessibility

A system which provides capability for individualization shall be in accordance with ISO 9241-171 and ISO/IEC 24786.

NOTE 1 A user might require accessibility features in order to be able to perform individualization-related actions.

NOTE 2 It is important that the system, after any individualization, maintain accessibility for the current user.

NOTE 3 ISO 9241-20 provides high level guidance that can be helpful in achieving accessible individualizations.

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7.2 Controllability

7.2.1 Maintaining user control after individualization

The user should remain in control of the interaction after individualization has occurred.

7.2.2 User activation or deactivation of individualization

Users should be provided with mechanisms to activate and deactivate individualization features:

a) for the whole of the user interface or parts of the user interface;

b) before interactions commence or after a specific individualized state has been reached.

7.2.3 Limitation of use of individualization features

Where the use of an individualization feature might result in usability problems for the current user, the system should notify the user of the potential problem(s) and allow the user to accept or reject the individualization, or to select between various possibilities that could result from the individualization.

EXAMPLE 1 Where an individualization feature could change both the foreground and background colour to the same value, the user is warned that the result will be unreadable and is asked whether or not to allow this change.

EXAMPLE 2 The current user is known to be colour blind and the system has an individualization feature that can change both the foreground and background colours. If the selected combination is considered to be unreadable to the user (such as red against green), then the user is warned that the result will be unreadable and is asked whether or not to allow this change.

7.2.4 Reversibility

Users should be given the ability to “undo” the individualization.

EXAMPLE 1 If a user changes the colour scheme to a set of individual colours, the original colour scheme can be reset.

EXAMPLE 2 If a user dismisses a warning message (“don’t show this message again”), the message can be recalled.

EXAMPLE 3 Where a user-selected template results in unsuitable automatic formatting results, the user is able to reverse the automatic formatting.

7.2.5 Privacy

The user's permission should be obtained before personal context information and/or individualization settings are shared with other applications or users.

NOTE Permissions can be stored with context information so that they do not need to be obtained each time they are used.

7.2.6 Safety and security

The system should not allow users to turn off or set inappropriate values for safety-critical or security-critical functions.

NOTE This includes both situations affecting a single user and situations affecting multiple users.

EXAMPLE 1 The system does not allow individualizations that would affect the full synchronization of information that is shared between users in critical applications (e.g. air traffic control).

EXAMPLE 2 The system does not allow the user to turn off features that prevent hacking.

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7.3 Detectability

7.3.1 Making users aware of individualization capabilities

The system should provide information on the availability of individualization capabilities.

7.3.2 Non-disruptive information on individualization capabilities

The information on individualization capabilities should be provided in an accessible manner that is least disruptive to the user's task.

7.3.3 Providing additional information about individualization options

The systems should provide the users with additional information about the following, on request:

a) the circumstances under which particular individualizations are efficient and easy to use;

b) any risks connected with the individualization;

c) how to use/control the individualization.

NOTE Users might not make use of individualization capabilities if they are unaware of them.

7.3.4 Making settings available

The current value of settings used for individualization should always be available to the user.

7.3.5 Making user profiles available

If predefined user profiles or user-specified profiles are used for individualizing, information about the profile currently used should be available to the user.

NOTE If profiles are used, it is important to provide users with information about this concept and its implications. This information can include the user group designation associated with the profile and/or the individuals' settings provided by the profile.

7.3.6 Making individualization evident

Changes to the appearance and or behaviour of an interactive system resulting from individualization should be made evident to the user.

NOTE 1 Where one or more changes resulting from individualization are not immediately evident to, or might not be anticipated by, the user, a message can be used to notify the user of their occurrence.

NOTE 2 Messages that notify the user are especially important in situations where individualization is invoked by the system or might be accidentally invoked by the user.

7.3.7 Explaining rationale for changes resulting from individualization

When changes result from individualization, the reason(s) for their occurrence should either be obvious to users or else the users should be provided with a mechanism for obtaining the reason(s) from the system.

NOTE 1 A list of changes and the reasons for these changes could be made available on request.

NOTE 2 An overview of completed individualizations — new or changed functions, new or changed system dynamics, new or changed system presentation — could be made available on request.

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7.4 Consistency

7.4.1 Internal consistency

The results of the use of an individualization feature should be internally consistent.

NOTE This means that individualizations always lead to stable states.

7.4.2 Consistency with the context

The results of the use of an individualization feature should be consistent within the context.

NOTE This means that multiple uses of the same individualization feature within the same context have the same results.

7.4.3 Consistency with user interface conventions

The results of the use of an individualization feature should be consistent with the interface conventions, whenever possible.

NOTE This means that the individualization results are consistent with the styles and interaction methods already used in the system.

7.5 Usability of individualization results and features

7.5.1 Usability of system-initiated individualization results

System-initiated individualization should not result in a foreseeable decrease in the overall usability of the user interface for the intended user.

7.5.2 Usability of individualization features

The individualization features available to the user should have a high level of usability.

NOTE 1 It is important that individualization features have a high level of usability or it is likely that they will not be used.

NOTE 2 Usability of individualization features can be increased by allowing systems to share a user's individualization settings.

NOTE 3 It is desirable that individualization features do not interfere with assistive technologies and do not reduce the level of accessibility.

8 Stages of individualization

8.1 Initiation of individualization

8.1.1 Human-initiation

If human-initiated individualization is provided:

a) an easy-to-use mechanism should be provided for initiating the individualization;

b) the user action to initiate the individualization should be clear and unambiguous.

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8.1.2 System-initiation

If system-initiated initialization is provided:

a) user actions and context changes should be monitored to detect where these might trigger an individualization;

b) where detected, they should either automatically trigger an individualization or be evaluated by the system to see if they exceed some threshold before they are used to trigger an individualization.

NOTE 1 Thresholds can be used to limit the frequency of changes (e.g. by requiring some minimum number of actions to occur before triggering and individualization).

NOTE 2 Where a threshold is not made explicit, each occurrence of a context change can trigger individualization processing.

8.2 Deciding on individualization actions

8.2.1 Identification of alternative individualization actions

Where initiations can lead to alternative actions, each of the alternatives should be identified before a decision is made regarding the individualization action or actions to be taken.

NOTE This can involve comparing context, including configuration settings and/or user profiles, with information about the initiation.

EXAMPLE 1 The user is provided with alternate permitted values before changing screen resolution.

EXAMPLE 2 The system identifies that a user action it detected could lead to two different possible modifications.

8.2.2 Selecting between alternatives

Alternatives should be evaluated by the initiator of the individualization in order to decide on the action or actions to be taken.

EXAMPLE 1 The user selects a permitted value for changing screen resolution.

EXAMPLE 2 The system decides to do one or the other or both of two different possible modifications.

8.2.3 Approving system-initiated decisions

Where a system-initiated individualization might create foreseeable difficulties for the user, the system should ask the user for approval before making the decided upon changes.

NOTE 1 The likelihood that a particular individualization will lead to difficulties can be identified in a user needs analysis.

NOTE 2 This does not presume that the system can decide whether or not to ask a particular user for approval. However, where there is sufficient information available about the particular users, allowing the system to decide whether or not to ask particular users for approval might enhance usability.

8.2.4 Evaluating human-initiated decisions

The system should evaluate whether a human-initiated individualization decision is compatible with its information about the user context, before it allows the change.

EXAMPLE The system checks its stored user-attribute information to determine if the user is known to have difficulties perceiving the difference between red and green. If this is found to be the case, the system does not allow changing the text colour to red on a green background without first confirming this change with the user.

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NOTE System evaluation of human-initiated individualization decisions can lead to

a) allowing the change to occur,

b) warning about possible difficulties and asking for confirmation before allowing the change to occur,

c) preventing the change from occurring and providing information about why it was prevented.

8.3 Changing system and context

8.3.1 Applying changes

Once the decision has been made, and if necessary approved, the decided changes should be made to the system.

8.3.2 Storing changes

The applied changes should be reflected in changes to the system's stored information about the user context, where appropriate.

9 Configuration, settings and defaults

9.1 Configuration and reconfiguration

9.1.1 Storing and using configuration settings

Configuration settings should be stored by the system and used every time the system is started.

9.1.2 Supporting configuration

Software should not require, but may permit, configuration of various settings before its first use.

9.1.3 Persons performing configuration

Where configuration is required or permitted, configuration may be performed by users, system administrators or persons assisting the users.

9.1.4 Supporting reconfiguration

If configuration is required or permitted, reconfiguration should also be permitted.

9.1.5 Persons performing reconfiguration

The software may provide system administrators with the capability to limit or prohibit reconfiguration by users.

9.1.6 Accessing configuration settings

Where configuration settings can be accessed, there should be a single configuration function able to be used to access all settings.

NOTE There can also be additional functions that can access particular groups of settings.

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9.2 Usability of configuration and reconfiguration

9.2.1 Initial configuration settings for preconfiguration and reconfiguration

Where possible, software should have a complete set of initial (preconfigured) configuration settings.

9.2.2 Providing guided configuration

If full preconfiguration cannot be achieved, some means of guided configuration should be provided, taking into consideration the needs of all users (especially the young, elderly or persons with disabilities).

NOTE For guidance on guided configuration see 9.3.

9.2.3 Minimizing the need for configuration

The need to perform configuration should be kept to a minimum.

NOTE It is preferable that software can be used without requiring initial configuration.

9.2.4 Minimizing the effort to perform configuration

Where configuration or reconfiguration is permitted, the means of accomplishing these actions should require a minimum of user effort.

NOTE 1 If software cannot be easily configured, then it may not be fully usable by its intended users.

NOTE 2 Any additional number of steps or complexity within each step introduces the potential for errors.

EXAMPLE 1 The system keeps configuration requirements to the minimum number of steps.

EXAMPLE 2 The system presents optional parameters in a way that does not increase the minimum number of steps necessary to perform the configuration.

EXAMPLE 3 The system provides appropriate default settings for use in configuring and in reconfiguring.

EXAMPLE 4 The system provides auto-completion, where appropriate, and allows the user to disable this feature.

EXAMPLE 5 The system does not ask for unnecessary confirmations.

EXAMPLE 6 The system does not provide extraneous information during the setup process.

9.2.5 Provide reversal or confirmation of configuration actions

Software should provide a mechanism that enables users to reverse configuration actions and/or cancel actions during a confirmation step.

9.2.6 Protecting access to basic functions

The software should prevent configuration actions from changing settings which would prevent access to the basic functions required for completion of the user's task.

EXAMPLE 1 When an application has an exit function, this function is never hidden.

EXAMPLE 2 When the software hides less-used menu items, it retains a function that allows them to be made available on request.

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9.2.7 Providing fail-safe completions

If the reconfiguration procedure fails or is aborted,

a) the state of the configuration settings should revert to those applying at the start of the reconfiguration procedure, and

b) the user should be notified of the failure and the consequences of that failure, i.e. the configuration has been converted to its previous state.

9.2.8 Restarting configurations

If a configuration or reconfiguration procedure is interrupted, the user should have the possibility of continuing the setup process from the point of interruption.

9.2.9 Saving and restoring configuration settings

Before a reconfiguration (including resetting), the system should provide a means of saving the current configuration settings and a means for later restoring this configuration.

9.2.10 Transferring configuration settings

Transfer of configuration settings from one system to another should not modify the contents on the first system.

9.2.11 Avoiding the need to restart the system

Where possible, reconfiguration should not require restarting the system.

9.2.12 Providing user control over system restarts

The system should ask the user for permission and receive explicit permission from the user before performing any system restarts to install system-related updates.

NOTE This prohibits the system from notifying the user that it needs to restart the system to install (even “security-critical” updates) and giving the user the option of restarting immediately or having the system automatically restart in a system-specified time (whether or not the user is ready for such a restart).

9.2.13 Temporary and permanent configuration setting changes

When confirming changes to configuration settings, it should be possible to select whether the changes are temporary (lasting only as long as the current software is running) or permanent (also applying at future times when the software is restarted).

9.2.14 Reverting to default configuration settings

In situations where multiple users are allowed to change the configuration settings of software used by all the users and where individual profiles are not used, the software should revert to the default configuration settings each time it is restarted.

NOTE It is highly preferable to use individual profiles, so as to avoid the accessibility and usability difficulties that can result from reverting to default configuration settings.

9.2.15 Reversing unwanted language changes

A procedure for reversing an unwanted language selection that does not require knowledge of the language currently set should be provided by the system.

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9.2.16 Anticipating access problems for other applications

If changing a configuration setting prevents access to other applications of some common functionality, the user should be notified of the potential impact before a change to the value of the configuration setting is applied.

EXAMPLE Because a setting that prevents access to some functionality in a particular application also prevents access to the same functionality in other applications, the user is asked to confirm the change of setting before it is applied.

9.3 Guided configuration and reconfiguration

9.3.1 Preparing for configuration or reconfiguration

Users should be informed of the information they need to have available during the configuration procedure, and if necessary, how to obtain it.

9.3.2 Minimizing information required to configure or reconfigure

External information required to configure or reconfigure should be minimized.

9.3.3 Usability and accessibility of guided configuration

During guided configuration or reconfiguration, the system should provide a usable and accessible means of establishing and changing configuration settings.

9.3.4 Understandability of guided configuration

During guided configuration or reconfiguration, the system should provide understandable guidance, including

a) consistent terminology across all sources of configuration information,

b) configuration information in the user's language with the minimum of technical concepts, and

c) explanations, upon request, of concepts that need to be understood by the user during configuration.

9.3.5 Structure of guided configuration

During guided configuration or reconfiguration, the system should provide a structure that can guide the configuration, including

a) a logical and consistent order of the configuration steps,

b) a clear overview of the steps of the configuration sequence,

c) an indication of the progress of the configuration procedure to the user, and

d) natural entry points into the configuration procedure and suitable navigation between them.

9.3.6 Configuring individual settings

During guided configuration or reconfiguration, the system should provide assistance in configuring individual settings, including

a) an indication of what settings need to be configured and what effect configuring a setting will have,

b) information on settings that are preconfigured but that can be changed,

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c) an indication and differentiation of the setting and the setting current value,

d) guidance on permitted values and required formats,

e) any available defaults, and

f) access to related information that can assist in selecting appropriate values.

9.3.7 Configuration information and feedback

During guided configuration or reconfiguration, the system should provide information and feedback on its progress and success, including

a) feedback on the current progress of the configuration,

b) help in understanding and correcting errors,

c) information on remaining settings that still require configuration, and

d) feedback on the end of the configuration procedure, an indication of its success or failure and, if it failed, why it failed.

9.3.8 Ongoing monitoring

If, during operations after the completion of the configuration, the software recognizes that it is not configured properly, it should inform the user and present the opportunity to perform a guided reconfiguration.

9.4 Default settings

9.4.1 Providing defaults

Default values should be provided for configuration settings, wherever possible.

9.4.2 Overriding default values

Where a default value is provided, it should be easy to select or input an alternative value for a configuration setting.

EXAMPLE Fields containing default settings are preselected but allow the user to select from various other possible values quickly and easily.

9.4.3 Resetting to initial system-provided settings

Where a set of initial (preconfigured) configuration settings is provided by the system, it should be possible to reset the system to this initial set.

NOTE 1 Resetting to the initial (preconfigured) configuration settings is a special case of reconfiguration.

NOTE 2 Resetting can be very helpful in situations where it is difficult to understand the result of a large number of reconfigurations.

9.4.4 Distinction between settings and defaults

Changes to current configuration settings should not also change default settings.

NOTE These are two separate actions.

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9.4.5 User control of default settings

The system may allow users and/or system administrators to define, change or remove default values for any configuration setting.

NOTE 1 This is especially useful where a suitable default value cannot be predetermined.

NOTE 2 This capability might be dangerous in mission-critical and safety-critical applications.

10 Supporting individual users

10.1 User profiles

10.1.1 User profiles supporting individualization

User profiles should be used to record user preferences, privileges and/or dynamic user characteristics that can be used for individualization.

NOTE 1 A hierarchical series of user profiles could exist. At the high level, profiles can be provided by system administrators to provide basic privileges and functionalities to groups of users and/or individual users. At a lower level, profiles can be developed by a user or someone assisting the user to reflect user capabilities and preferences.

NOTE 2 User profiles are particularly important for persons with disabilities.

NOTE 3 The activation of a user profile might create temporary changes to the configuration of a system.

10.1.2 Saving commonly used information

User profiles should be used to store commonly used information that can help the user save time in completing tasks, including

a) account names and passwords for connecting to other systems, if permitted by the user,

b) “cookies”, if permitted by the user, and

c) information on the current state of processing that can be used to return to that state when the user returns to the system.

10.1.3 Avoiding inconsistencies in profiles

The design of a system should preclude the creation of foreseeable inconsistencies in profiles.

10.1.4 Identifying and resolving inconsistencies in profiles

When an inconsistency in a user profile is discovered by the system, the system should warn the creator of the profile and provide an appropriate mechanism for resolving the inconsistency.

10.1.5 Storing user profiles

User profiles should be stored securely, in order to maintain their availability and the privacy of the information they contain.

NOTE Legislation might govern the transmission of profiles outside the control of the individual described by the profile.

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10.1.6 Using stereotype-based user profiles

Stereotype-based profiles may be provided:

a) for use where a user does not have a personal profile;

b) as a basis for creating a personal user profile.

NOTE 1 Using stereotypes or personas based on the user's role or subject area can save the user's time and can support individualization without the need to create individual user profiles.

NOTE 2 A stereotype-based profile only represents a tendency in preferences, because individual needs and requirements are diverse and can be difficult to anticipate.

NOTE 3 Personal user profiles are preferable to stereotype-based profiles and are particularly important for persons with disabilities. They can be evolved from copies of stereotype-based profiles.

NOTE 4 Stereotype-based profiles are generally created by system administrators or experts who have knowledge of the needs and preferences of different groups of users.

NOTE 5 It is important to not antagonize users by making incorrect assumptions.

10.2 User management of profiles

10.2.1 Activating user profiles

Where a user account includes a single user profile, the user's default profile should be automatically activated when the user activates (signs on to) the account.

Where user profiles are used without user accounts, a mechanism should be provided for loading and activating a stored user profile.

NOTE The ability to load a stored user profile is especially important in situations where creating a profile is beyond the cognitive capabilities of the user.

10.2.2 Selecting a default profile

Where a user account includes multiple user profiles, the system should provide a mechanism for selecting which profile should be automatically loaded as the user's default profile.

10.2.3 Identifying the current user profile

The system should provide a mechanism for identifying which, if any, user profile is currently activated.

10.2.4 Changing between profiles

Where a user account includes multiple user profiles, a mechanism should be provided for changing user profiles without having to deactivate and reactivate the account.

NOTE Manual activation/change can override an automatically activated profile.

10.2.5 Deactivating user profiles

The system should provide a mechanism to deactivate the current user profile.

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10.2.6 Allowing users to manage user-specified profiles

If user-specified profiles are used, the system should provide a mechanism that allows users to

a) view the contents of the profile at any time,

b) understand the (purpose of the) usage of the profile data,

c) add, change or delete data in the profile,

d) add or delete profiles, where multiple profiles can be used,

e) indicate the profile data that can be used, the service provider or product that can use them and the particular period of time, interaction or purpose for which they can be used,

f) authorize third party access to parts or all of the profile, where such access is possible.

10.2.7 Implementing changes to profiles

When user changes to an active profile are made, these should act as triggers to initiate any associated individualization.

10.2.8 Organization of multiple profiles

If multiple user-specified profiles are used, the system may provide a mechanism that allows the organization of profiles and templates in a hierarchical way.

10.2.9 Recovering profiles

The system should provide mechanisms for archiving and restoring profiles.

NOTE This is an important means of protection in case profile data are deleted or corrupted.

10.3 Automatic profile acquisition

10.3.1 Using automatic profile acquisition

Automatic profile acquisition may be used to develop and modify user profiles.

NOTE 1 The results of automatic profile acquisition might not provide information on their own sufficient to fully create profiles of new users and casual users.

NOTE 2 Automatic profile acquisition can minimize the frequency with which the user needs to explicitly modify his or her profile.

10.3.2 Providing user control of automatic profile acquisition

Where automatic profile acquisition is used, the system should

a) inform the user that automatic profile acquisition is active,

b) provide, on request, information on the potential effects of the automatic profile acquisition,

c) provide a mechanism for disabling and re-enabling the automatic profile acquisition,

d) provide a mechanism for selecting whether the automatic profile acquisition applies only to the currently active profile, when a user has multiple profiles,

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e) provide a mechanism for selecting components of the user profile that are subject to automatic profile acquisition,

f) provide a mechanism for reviewing, confirming, correcting and deleting automatically acquired profile information,

g) provide a mechanism for explicitly deactivating and reactivating any individualization related to profile changes.

10.4 Portability of profiles

10.4.1 Providing capability to use profiles across compatible applications/systems

Systems using user profiles should provide a mechanism for transferring user profiles easily to compatible applications/systems.

NOTE 1 Portability is important for users with disabilities because they could find a system difficult or impossible to use without the preferences set to meet their interaction needs. The overhead and effort required to create profiles can be a significant hindrance to system usability if it has to be repeated at every location.

NOTE 2 This includes making profiles available to multiple computers on a single network.

EXAMPLE 1 A user visiting a different building on a company network logs in and the system automatically locates and uses his or her network personal profile.

EXAMPLE 2 A user loads a profile from an external drive into a new system.

10.4.2 Synchronizing profiles

Where users are likely to use a profile on multiple applications/systems, a synchronization mechanism should be provided to ensure that when changes are made to profile data, copies of the profile used on different applications/systems remain consistent.

10.4.3 Providing capability to share profile information

Where users are likely to use multiple profiles, a mechanism should be provided for transferring information from a profile to other profiles that are used in the same and/or other systems.

NOTE This can help users avoid having to provide profile information more times than is necessary.

10.4.4 Providing security of transmitted profiles

If profile data are transmitted, non-authorized persons should not be able to read or modify the profile data.

10.5 Providing training and help on use individualization

Where individualization is available for systems used within an organization, the organization should provide

a) guidance/training to the users so that they can appropriately make use of the individualization,

b) on-line help to describe the individualization features.

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11 Individualizing interface components

11.1 General guidance on individualizing interface components

11.1.1 Using user interface styles/themes/skins

The system may provide the user with a choice of alternative interface styles.

NOTE 1 Alternative interface style choices are often referred to as “skins”. The ability to personalize user interfaces through the use of interface skins is a feature of many operating systems and applications.

NOTE 2 The use of interface skins is generally made possible by one of two means: firstly, by user selection of any or all of the available user interface elements or their attributes for modification (e.g. icons, colours, fonts) from a library of choices (user interface elements/component modification); secondly, by the selection of an entire user interface skin that replaces the existing one (skin replacement).

11.1.2 Individualizing the user interface elements present in an interface

If appropriate to the task(s), a mechanism should be provided for individualizing the contents of an interface to hide or to reveal user interface elements.

NOTE Many interfaces are designed to serve a large number of tasks. A user might prefer to remove user interface elements (including elements that provide content and/or controls) that are not required for the user's tasks.

11.1.3 Supporting user creation of tools

If appropriate to the task(s), mechanisms should be provided for creating, revising, saving and deleting tools and/or tool bars that make use of existing controls.

11.1.4 Adjusting presentation attributes of user interface elements

If appropriate to the task(s) and/or users, mechanisms should be provided for changing the presentation attributes of user interface elements without changing their meaning.

NOTE 1 This includes choosing from available media to be used to present the element. The other attributes (e.g. attributes that format the medium) to be adjusted depend on the medium of the user interface element.

NOTE 2 This can be used to enhance accessibility.

NOTE 3 This might be problematic in mission-critical or safety-critical applications.

11.1.5 Individualizing media choices for input/output

If there are choices of input/output media, the system should provide a mechanism for selecting the use of one or more media.

NOTE 1 Providing alternative media is important in supporting accessibility.

NOTE 2 This capability aids users with different abilities working together on the same system.

EXAMPLE 1 The user is able to output information in either or both audio and/or video presentations.

EXAMPLE 2 A person who is blind inputs only through the keyboard, using keyboard substitutes for mouse actions. A sighted user working on the same system can use the mouse and type in text.

EXAMPLE 3 One user clicks on the print icon on a screen while another user speaks the command, “Print”, into a microphone used for voice recognition.

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11.1.6 Switching of input/output alternatives

If the user is able to switch input/output alternatives, this should be possible without reconfiguring or restarting the system.

11.2 Individualizing visual media

11.2.1 Adjusting size of displayed elements

If appropriate to the task(s) and/or users, the system should provide mechanisms for adjusting the size of displayed elements, including

a) the magnification (or enlargement) of portions of the screen or display,

b) the size of displayed text, task-related character fonts, icons, and other user interface objects, and

c) the size of individual windows and objects that act like windows (including dialogue boxes).

NOTE 1 Magnification applies to a portion of a display regardless of the user interface objects and/or parts of user interface objects contained in this portion of the display.

NOTE 2 Changes in magnification or in the size of displayed elements can create severe problems in using fixed layouts.

11.2.2 Adjusting contrast and colours of displayed elements

Mechanisms should be provided for adjusting contrast- and colour-related display characteristics, including

a) the contrast of displayed user interface elements,

b) the colour schemes used, including background and foreground colour combinations, and

c) the colours used to indicate the selection, process and the types, states and status of user-interface elements.

NOTE 1 It is preferable to allow users to choose between effective sets of colours than to arbitrarily choose individual colours.

NOTE 2 ISO 9241-303 provides guidance on the use of colour.

11.2.3 Adjusting the layout of displayed elements

If appropriate to the task(s), mechanisms should be provided for adjusting the layout of displays, including

a) repositioning user interface elements, and groupings of user interface elements,

b) requiring and turning off the requirement that a window always remain on top of other windows, and

c) determining whether a window that receives pointer or keyboard focus is automatically placed on top of all other windows or remains with its stacking position unchanged.

NOTE The changing of a window not on top so that it has keyboard focus has a negative impact on accessibility for screen reader users.

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11.3 Individualizing auditory media

11.3.1 Providing audio volume controls

Controls should be provided for adjusting the volume of audio input and output.

NOTE Audio devices often have their own volume controls that further adjust the volume presented with them. Providing software controllability ensures that volume can be adjusted only within the range currently permitted by the audio device.

11.3.2 Adjusting other audio characteristics

If appropriate to the task(s), mechanisms should be provided for adjusting sound characteristics, including

a) the frequency of non-speech sounds, and

b) the speed of voice presentation/input.

11.3.3 Providing independent controls for different audio channels

Where multiple channels of audio are available, mechanisms should be provided for adjusting the volume of each channel separately.

NOTE Background sounds (e.g. sound effects, music) can mask speech audio or make it difficult to be distinguished by those who are hard of hearing or by voice recognition software.

11.3.4 Muting audio channels

A mechanism should be provided that mutes any audio input or output channel and makes available information on whether or not a channel is muted.

11.4 Individualizing tactile media

11.4.1 Individualizing tactile parameters

Where possible and appropriate to the task(s), mechanisms should be provided for adjusting tactile/haptic parameters.

NOTE 1 This adjustment is important to prevent discomfort, pain or injury to users and to ensure that information transmitted via tactile devices is able to be perceived.

NOTE 2 Different users have different levels and thresholds of sensation and pain. Furthermore, over a user's lifespan, thresholds of sensation and pain will change (e.g. spatial and temporal acuity degrades with age).

NOTE 3 The amount of force that can overpower or be "too strong" varies between users.

EXAMPLE The users are allowed to control the amplitude range of vibrations.

11.4.2 Adjusting force feedback

The user should be able to adjust the value of any force feedback.

NOTE The maximum force that a user can exert will limit the maximum possible force for force feedback.

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11.5 Individualizing temporal aspects of media

11.5.1 Adjusting speed of interaction

The user should be able to set up the speed of dynamic inputs and outputs to match his/her individual needs, where appropriate and possible.

EXAMPLE 1 The sensitivity of a pointing device can be adjusted to individual user needs.

EXAMPLE 2 The user is able to control the rate at which an automated presentation advances.

EXAMPLE 3 A user of a screen reader increases the rate at which it reads.

11.5.2 Enable user control of timed responses

Unless limits placed on the timing of user responses are essential to maintaining the integrity of the task or activity, or are based on real life-time constraints (e.g. an auction), software shall allow users to adjust each software-specified user response time parameter in one or more of the following ways:

a) the user is allowed to deactivate the time-out;

b) the user is allowed to adjust the time-out over a wide range, which is at least ten times the length of the default setting;

c) the user is warned before the time expires, allowed to extend the time-out with a simple action (e.g. “hit any key”) and given at least 20 s to respond.

EXAMPLE A log-on prompt requires the user to enter their password within 30 s. The remaining time is shown on the screen and a control provided to stop the time decrementing.

[Excerpted from ISO 9241-171:2008, 8.2.7.]

NOTE 1 A time-out is a limited time available for the user to perform some action.

NOTE 2 In certain contexts of use, the task itself can dictate the pace of interaction, e.g. in testing situations where time constraints are part of the test.

NOTE 3 The setting of time-out durations can be restricted by company policy, e.g. the system is set to log off after 2 h of inactivity.

12 Individualizing interaction activities

12.1 Supporting user creation and use of stored interaction sequences

If appropriate to the task(s) and user(s), a mechanism should be provided for creating, revising, saving and deleting sequences of interactions that can be reused by the user.

NOTE 1 This is often referred to as a macro-creation capability.

NOTE 2 Where sequences can be anticipated during the development of the system, it is preferable that they be included within the system rather than the user being relied upon to create them.

NOTE 3 Providing this capability can increase the efficiency of processing when a sequence of interaction that is not already supported by the system will be frequently repeated.

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12.2 Providing user control of security options

When appropriate, mechanisms should be provided for specifying

a) the degree of control that is to be had over security-related applications/services such as virus protection, spam detection and firewalls,

b) how much information on ongoing activity the users are given (e.g. notification of virus detection/removal), and

c) the extent of control users have over the application/service's ability to manage its own effectiveness (e.g. to automatically upload new virus detection/removal updates).

NOTE In multi-user environments, these mechanisms can be controlled by administrators or permitted by administrators to be controlled by individual users.

12.3 User guidance

12.3.1 Context-sensitive user guidance

Where possible, on-line user guidance should be context-sensitive.

NOTE See ISO 9241-13 for information on various types of on-line user guidance.

EXAMPLE On-line help selects the most likely topic on the basis of the interface and/or user interface element that was active when the user selected “Help”.

12.3.2 User-sensitive user guidance

Where user profiles are available, user guidance should be user-sensitive and should present content at the appropriate level for the current user.

EXAMPLE Error messages are worded so as to be appropriate to a user’s task and level of knowledge.

12.4 On-line help

12.4.1 Consistency with the user guidance standard

The individualization of on-line help should be consistent with the guidance given in ISO 9241-13:1998, Clause 10.

12.4.2 Selecting the characteristics of on-line help

Individualization of on-line help should include the following information:

a) how the support is initiated (by the user or by the system);

b) the level of detail of the information to present;

c) the method of presentation;

d) whether the help system individualizes itself or not.

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12.4.3 By-passing system-initiated help

A mechanism should be provided that allows the user to by-pass, deactivate and reactivate non-critical types of system-initiated help.

NOTE System-initiated help might slow an experienced user.

12.4.4 Providing user control of triggering of non-critical notifications

Where appropriate, a mechanism should be provided that allows the user to define the conditions (in terms of variables and values) that will result in the automatic generation of notifications.

12.4.5 Providing user control of timing of non-critical notifications

A mechanism should be provided to allow the user to choose when non-critical notifications are to be delivered.

NOTE These choices can include interruptions that are

a) delivered at the soonest possible moment (immediate delivery),

b) delivered when support can be given for the person to explicitly control when then they will handle the interruption (negotiated delivery), or

c) held and delivered at a prearranged time (scheduled delivery).

13 Individualizing content

13.1 General

13.1.1 Providing methods for individualizing organization and presentation of content

If appropriate to the task(s), mechanisms under user control should be provided to aid organization and presentation of content, including

a) summarizing/filtering/hiding,

b) sorting,

c) searching, and

d) annotating/highlighting.

NOTE Unwanted system-initiated use of these mechanisms can annoy the user.

13.1.2 Maintaining integrity of content

Individualizing the presentation of content should not destroy the original content.

NOTE Excess individualization might destroy the readability of the currently presented content; however, maintaining the integrity of the original content allows the user to return to a meaningful presentation.

EXAMPLE When a picture is resized for display purposes, its full resolution is still available so that the resizing can be reversed without loss of detail.

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13.1.3 Providing user control of the individualization of content

When content has been individualized by summarization, filtering or hiding, the user should be notified that this has occurred and provided with a mechanism to reverse this individualization.

EXAMPLE 1 A system provides the user with a mechanism for presenting and again hiding optional chunks of text that are normally hidden, as well as an indication that they are hidden.

EXAMPLE 2 In *stretchtext*, a “hot word” is presented in a different format from regular text. By activating the hot word, it (or a phrase including the hot word) can simply be replaced by the related text, thereby extending the text of the current page. Then a reverse operation can cause this extended text to be “collapsed” back to a hot word.

13.1.4 Taking account of the users’ tasks and information needs

When providing different access paths or navigation structures for different user groups, the system should individualize them to meet the task and information needs of those groups.

EXAMPLE In a corporate intranet, users from the financial department find links to currency exchange rate information directly on the home page, while developers are provided with links leading to technical news on that page.

13.1.5 Creating user-defined links

Where appropriate to the task, the system should provide a mechanism for creating user-defined links to the current location in the system, to aid in returning to that location.

13.1.6 Sharing user-defined links

Where user-defined links are supported, the system should provide mechanisms that support sharing (exporting and importing) links between users.

13.2 Cultural and linguistic variations

13.2.1 Differentiating between system and data language

When the user chooses a different language for data entry, this choice should not change the default language setting for the application.

When a user changes the default language for the application, he/she should be asked whether the language for data entry is to be changed.

NOTE ISO/IEC TR 19764 contains guidance on regional conventions, e.g. date formats.

13.2.2 Personalizing vocabularies

Where appropriate to the task(s), mechanisms should be provided to the user for incorporating an individualized vocabulary to establish individual naming for files, objects and actions.

EXAMPLE In a business application, users are able to rename menu options to reflect terminology typical of their industry sector.

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Annex A
(informative)

Overview of the ISO 9241 series

The annex presents an overview of the structure of ISO 9241. For an up-to-date overview of its structure, subject areas and the current status of both published and projected parts, please refer to:

ISO 9241 series

The structure reflects the numbering of the original ISO 9241 standard; for example, displays were originally Part 3 and are now the 300 series. In each section, the “hundred” is an introduction to the section; for example, Part 100 gives an introduction to the software-ergonomics parts.

Table A.1 — Structure of ISO 9241 — Ergonomics of human-system interaction

Part	Title
1	Introduction
2	Job design
11	Hardware and software usability
20	Accessibility and human-system interaction
21-99	Reserved numbers
100	Software ergonomics
200	Human-system interaction processes
300	Displays and display-related hardware
400	Physical input devices — Ergonomics principles
500	Workplace ergonomics
600	Environment ergonomics
700	Control rooms
900	Tactile and haptic interactions

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Annex B
(informative)

Factors to consider when designing individualizations

B.1 Individualization basics

B.1.1 Individualization involves change

Individualization involves

a) knowledge of the current interface configuration,

b) knowledge of the desired interface configuration,

c) a method for transforming the interface from the current to the desired configuration, and

d) a method for validating the legitimacy of the desired interface configuration.

Every system has its own limits to the individualizations that it can perform.

B.1.2 Factors to consider in designing individualizations

Factors to consider in designing individualizations include the following.

a) Goals of the individualization (see 6.2)

NOTE 1 Individualization can be an important means of achieving accessibility.

b) Contexts in which the individualization will occur

c) Mechanism of individualization (see Clause 8)

1) Responsibility for individualization

2) Mechanism

3) Information involved in triggering the individualization

4) When the individualization should occur

d) Effects of the individualization (see Clauses 7 to 13)

NOTE 2 Individualization can involve changes in presentation and/or functionality.

B.1.3 Individualization effects both systems and users

When any individualization changes the system, the way the user interacts with the system might also change. The user might take time to learn how to use the changed system. Where change occurs at a speed close to, or faster than, the amount of time required for learning, confusion can result, and usability could decrease significantly. In the case of system-initiated individualization, it is important that individualizations occur at appropriate times within the interaction, taking into account the natural and suitable breaks in an interaction at

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which they can be effective and efficient with respect to the tracking of user task needs and the interpretation of user actions.

B.1.4 Common characteristics of individualizations

All types of individualization

a) can achieve individualization goals,

b) select from available options,

c) operate on system settings, and

d) can change the interface appearance and functionality.

The above can apply to one or more

— single users,

— groups of users, or

— sets of all users on a system.

It can remain in effect until explicitly changed, either

— temporarily, for the remainder of this session, or

— permanently, for all sessions.

B.2 Context

B.2.1 Limits to the context of individualization

Individualization relates a system to its context of use.

B.2.2 Changing contexts

Designing individualizations involves designing changes in the context of use.

a) Since individualization creates changes, it is important to consider how a particular individualization changes the context of use.

b) The context can change abruptly or can evolve over time.

c) A history of context changes can be useful in helping to determine the individualization that is appropriate and when it is appropriate.

NOTE It is not a simple matter to understand the context of use: static user interface guidelines do not provide answers to dynamic, complex design questions.

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B.2.3 Factors of context of use relevant to individualization

Factors to consider for each user and for all users in the context of use include the following:

a) user characteristics, such as
   - knowledge, skills, learning styles, and abilities,
   - interests, preferences, and motivations, and
   - flexibility and the ability to adapt and learn;

b) task characteristics, including
   - pre-conditions and post-conditions,
   - whether the task is performed for professional or personal reasons,
   - whether the task is scheduled, on a priority interrupt basis, or is able to be carried out when convenient,
   - whether the task is performed individually or collectively, and
   - relationships between tasks and users;

c) data characteristics, including
   - the structure and distribution of the data,
   - alternative representations of the data, and
   - relationships between data and users;

d) environmental characteristics, including
   - the physical environment and whether it supports or inhibits performing the task,
   - the social environment, including communication and privacy considerations,
   - the technical environment, including available technologies and their interconnections, and
   - relationships between environment and users;

e) system characteristics, including
   - system structure,
   - system functions,
   - user interface components, and
   - configuration settings;

f) dynamic usage characteristics, including
   - the current location within the system and/or within the information space,
   - the history of navigating through the system and of operations within the system,
   - frequency, timing and patterns of interaction with components of the system,

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— frequency, timing and patterns of use of errors, and

— relationship between usage and users.

NOTE Dynamic usage characteristics can only be estimated during development. They can be monitored and recorded during actual usage.

B.2.4 Complexity of contexts

Due to the complexity of contexts, it is not feasible to anticipate all possible configurations of complex systems. A system can keep a model of the current and of previous states of the context of use to support a variety of purposes, including helping to manage individualization.

B.2.5 Stored information about context

Systems can store and use various types of context information.

a) Configurations are used to provide general individualization of a system to a particular installation. Configuration settings contain individualization choices (subject to possible change) that are stored and used by the system when it is started up (see Clause 8).

b) User accounts typically contain information necessary for accessing some system resources (including the ability to access or modify some or all configuration settings).

   1) Users can have one or more user accounts or can make use of a common “guest” account if one is available.

   2) User accounts are typically created by a system administrator and might not be modifiable by the user.

   3) A user account can also contain one or more (if there is some mechanism available for users to select between) user profiles.

c) User profiles are used to provide specific individualization to a configured system for an individual or a group of individuals during their use of the system. User profiles typically contain various types of context related to preferred configuration settings, user privileges and/or dynamic usage characteristics. They can also contain other types of context information.

   1) Profiles can be based on stereotypes, personae, user inputs and/or system-acquired information.

   2) Information in a profile might or might not be modifiable by the user.

   3) Information in a profile might be able to be shared with another person, device or service (see Clause 10).

B.3 Human-initiated individualization

B.3.1 Characteristics of human-initiated individualization

Human-initiated individualization:

a) is also known as

   1) *adaptability*,

   2) *customization*, or

   3) *tailoring*;

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b) is initiated by

   1) the user,

   2) someone assisting the user, or

   3) a system administrator;

c) could be done

   1) during system setup/initialization,

   2) when a user opens/starts an application,

   3) when a user creates a new set of data within an application, and/or

   4) any time during the use of an application;

d) might (optionally) make use of system context;

e) is relatively static, requiring explicit human actions to initiate.

NOTE In respect of c), above, individualization might be needed (for accessibility purposes) prior to a user being able to access the software.

B.3.2 Operation of human-initiated individualization

Human-initiated individualization

a) involves the system providing (customization) mechanisms,

b) relies on the user to use those mechanisms, and

c) can be controlled or limited by the system, so as to maintain consistency or to enforce other individualization goals or principles.

B.3.3 Concerns with human-initiated individualization

Concerns with human-initiated individualization include

a) usability of mechanisms has a major impact on their use,

b) users might be afraid to make changes, and

c) users might be unaware of what changes they can make and/or how they will affect their work.

B.3.4 Managing the use of human-initiated individualization (need to move elsewhere)

Within organizational/group settings, there could be a need to control who has authorization to make or control changes to a system.

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B.4 System-initiated individualization

B.4.1 Characteristics of system-initiated individualization

System-initiated individualization

a) is also known as *adaptation*,

b) is based on monitoring interactions and identifying trigger conditions,

c) makes use of changing system contexts that are dynamically inferred/detected,

d) is dynamic, in that the system continually monitors conditions that can trigger new change, and

e) can be focused on providing

   1) the most appropriate user interface for the particular end-user, or

   2) the most appropriate user interface for the particular situation of use.

B.4.2 Operation of system-initiated individualization

System-initiated individualization

a) involves the system monitoring interactions,

b) can ask the user for approval prior to making a change, and

c) can provide the user with mechanisms to limit or reverse change.

B.4.3 Concerns with system-initiated individualization

Concerns with system-initiated individualization include

a) changes that can confuse the user,

b) the possibility that user might not recognize the need to change in order to accommodate system-created changes, and

c) the possibility that control might be taken from the user.

B.4.4 Strategies for system-initiated individualization

All system-initiated individualization is based on rules that create changes in response to the system's perception of changes in its context. System-initiated individualization can be categorized on increasingly sophisticated strategies used to better achieve the goals of the individualization. These strategies use increasing amounts and types of stored information about context. Every instance of system-initiated individualization has its own sufficiency conditions that limit the particular stored information about context that is available for it to use. Different systems will exhibit different computational complexities with respect to a problem; this defines the limits to which a system can make sense of this stored information about context.

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B.4.5 Levels of system-initiated individualization

a) Simple system-initiated individualization

This level produces a fixed change in output based on, and triggered by, an input and/or any changes to the system's settings caused by the input. The resulting change is always predictable. Simple system-initiated individualization is possible without the system storing any contextual information.

b) Self-regulating individualization

This level produces a change in output that depends on an analysis of stored information about context and/or interaction history, after being triggered by an input and/or any changes to the system's settings or context caused by the input. It is self-regulating in that it “learns” over time which changes will likely be most successful. Self-regulating individualization typically utilizes stored task, system, data and dynamic context information.

c) Self-mediating individualization

This level utilizes a model of the user and/or the environment to evaluate alternative possible changes before making or after being triggered by an input and/or any changes to the system's settings or context caused by the input. Self-mediating individualization typically utilizes stored user, environment, task, system, data and dynamic context information.

d) Self-modifying individualization

This level involves the system reasoning about its context of use and proactively changing its internal rules accordingly.

B.5 Shared control of individualization

B.5.1 Range of individualization possibilities

There are a range of possibilities for initiating and controlling individualization, including

a) user-initiated with no system control (e.g. via selecting or changing various system settings);

b) user-initiated with system control (e.g. to maintain overall consistency);

c) system-suggested, user-selected (e.g. where user is asked for approval each time before an individualization takes place);

d) system-initiated where pre-allowed by the user (e.g. user pre-selects where system-initiated individualization will be allowed, before allowed individualizations take place automatically);

e) system-initiated with user control (e.g. to accept and/or reverse after individualizations have taken place);

f) system-initiated with no user control.

B.5.2 Evaluating individualization designs

The guidance in this part of ISO 9241 can provide a starting point for the design and evaluation of individualizations within software systems. However, due to the complex nature of the resulting possibilities, user testing is important in fully evaluating the success of the individualizations.

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B.6 Stages of individualization

Individualization processing involves the following stages:

a) initiation of individualization;

b) identification of alternative initialization actions;

c) deciding on initialization actions;

d) modifying the system and the context.

These stages can be implemented separately or in any suitable combination.

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Annex C
(informative)

Sample procedure for assessing applicability and conformance

C.1 General

This annex provides an example of a checklist (see Table C.1) that can be used to determine whether the applicable recommendations in this part of ISO 9241 have been followed.

The checklist can be used either during product development or for evaluation of a completed product.

The checklist contains all recommendations from this part of ISO 9241, presented in sequence.

It should be noted that the procedure described is provided as guidance and is not an exhaustive process to be used as a substitute for the standard itself.

Use of the checklist provides a basis for

— determining which of the recommendations are applicable,

— determining whether applicable recommendations have been followed, and

— providing a systematic listing of all the applicable recommendations that have been followed.

Many recommendations are applicable to instances of individualization in all software user interfaces and increase usability. Some recommendations are specific to certain types of individualization and only apply where those types of individualization are utilized within a software user interface.

However, usability depends upon the context of use (the users, tasks, environment and technology). Where a conditional “if” appears in a recommendation, it is necessary to determine whether or not the context of use in which the software user interface is, or is intended to be, used is included within the conditions covered by the “if” statement. For each context-dependent recommendation, information on applicable circumstances is given in the clause/subclause. If the conditional statement does not apply and thus the recommendation is not applicable, this should be noted in the relevant column in the applicability section of Table C.1, and a brief explanation should be provided in the “Reason not applicable” column.

The next step involves determining whether the software being evaluated conforms to each recommendation (as applicable). The exact method for making this decision could vary from an inspection-based judgment of whether a feature is or is not present to testing the software with users. Whatever the method of evaluation considered most appropriate, the proposed checklist provides space to give an indication of the level of conformity, and comments on the method used or the judgment made under the “Comments” column.

The completed checklist can be used in support of statements relating to conformance of software with this part of ISO 9241. It provides a list of all of the recommendations for which conformance has been achieved.

C.2 How to use the table

Table C.1 summarizes all the headings contained in Clauses 6 to 13.

— Rows in the table with a white background each represent an individual requirement or recommendation that is to be assessed and reported on using the checklist.

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— Rows in the table with a grey background represent headings that are included to provide structural information that is used within this part of ISO 9241 to group a number of individual recommendations. Since rows with grey backgrounds do not add any additional recommendations (beyond the recommendations in rows with white backgrounds) they do not need to be assessed or reported on.

Clause/subclause numbers and titles are presented in the first two columns of Table C.1.

The third column is used to indicate whether the recommendation in each clause or subclause is applicable or not applicable. Those recommendations that have no conditions attached to them already have Y (for “yes”) inserted in column 3, showing that they are applicable.

All the other clauses/subclauses need to be checked in relation to the design context of the specific software system being developed or assessed. It should be noted that some recommendations for which there is a conditional statement will need to have column 3 completed.

In addition, the applicability of all the recommendations should be checked and Y or N (for “no”) entered in column 3, as appropriate.

Where a recommendation is not applicable, a brief note giving the reasons should be inserted in column 4. When checking whether a recommendation has been satisfied it will be necessary to review all those items which are shown to be applicable in column 3.

There should be an entry in the relevant place in column 5, 6 or 7, showing whether each applicable recommendation has been satisfied (Y), partially satisfied (P) or not satisfied (N). Any clause/subclause judged either to be partially satisfied or not satisfied should be accompanied by a brief note explaining the reasons why this is the case.

C.3 Copying the checklist

Users of this part of ISO 9241 may freely reproduce the table contained in this annex for use in demonstrating conformance with this part of ISO 9241.

An editable version of the checklist is provided in a sub-folder to the public information folder called “ISO-9241-129-tables” at:

Table C.1

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Table C.1 — Example checklist

Clause/ subclause	Guideline	Applicability		Conformance			
		Yes/No	Reason not applicable	Yes	Partially	No	Comments
6	**Introduction to individualization**						
6.1	Capability to individualize built into application						
6.2	When to individualize						
6.2.a	variation in user characteristics						
6.2.b	different user needs and goals						
6.2.c	variation in task characteristics						
6.2.d	different equipment used by a single user						
6.2.e	different environments by a single user						
6.3	Limitations on individualization						
6.3.a	as substitute for ergonomic design						
6.3.b	threats to safety critical or mission critical						
6.3.c	where procedures streamlined						
6.3.d	leading to usability or accessibility problems						
6.4	Initiation of individualization						
6.4.a	by an individual						
6.4.b	by the system						
7	**General guidance**						
7.1	Accessibility	Y					
7.2	Controllability						
7.2.1	Maintaining user control						
7.2.2	User activation or deactivation						
7.2.2.a	for the whole or parts						
7.2.2.b	before or after						
7.2.3	Limitation of use of individualization features						

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Table C.1 (*continued*)

Clause/ subclause	Guideline	Applicability		Conformance			
		Yes/No	Reason not applicable	Yes	Partially	No	Comments
7.2.4	Reversibility						
7.2.5	Privacy						
7.2.6	Safety and security						
7.3	Detectability						
7.3.1	Making users aware of capabilities						
7.3.2	Non-disruptive information						
7.3.3	Providing additional information						
7.3.3.a	circumstances						
7.3.3.b	risks						
7.3.3.c	how to use/control						
7.3.4	Making settings available						
7.3.5	Making user profiles available						
7.3.6	Making individualization evident						
7.3.7	Explaining rationale for changes						
7.4	Maintaining consistency						
7.4.1	Internal consistency						
7.4.2	Consistency with the context						
7.4.3	Consistency with the interface conventions						
7.5	Usability of individualization results & features						
7.5.1	Usability of system-initiated individualization results						
7.5.2	Usability of individualization features						

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Table C.1 (*continued*)

Clause/ subclause	Guideline	Applicability		Conformance			
		Yes/No	Reason not applicable	Yes	Partially	No	Comments
8	**Stages of individualization**						
8.1	Initiation of individualization						
8.1.1	Human-initiation						
8.1.1.a	easy to use mechanism to initiate						
8.1.1.b	action clear and unambiguous						
8.1.2	System-initiation						
8.1.2.a	user actions and context changes monitored						
8.1.2.b	either automatically trigger or trigger if exceed some threshold						
8.2	Deciding on individualization actions						
8.2.1	Identification of alternative actions						
8.2.2	Selecting between alternatives						
8.2.3	Approving system-initiated decisions						
8.2.4	Evaluating human-initiated decisions						
8.2.4.a	approving the change						
8.2.4.b	asking for confirmation						
8.2.4.c	preventing the change						
8.3	Changing the system and the context						
8.3.1	Applying changes						
8.3.2	Storing changes						
9	**Configuration, settings and defaults**						
9.1	Configuration and reconfiguration						
9.1.1	Storing and using configuration settings						
9.1.2	Supporting configuration						
9.1.3	Persons performing configuration						

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Table C.1 (*continued*)

Clause/ subclause	Guideline	Applicability		Conformance			
		Yes/No	Reason not applicable	Yes	Partially	No	Comments
9.1.4	Supporting reconfiguration						
9.1.5	Persons performing reconfiguration						
9.1.6	Accessing configuration settings						
9.2	Usability of configuration and reconfiguration						
9.2.1	Initial configuration settings						
9.2.2	Providing guided configuration						
9.2.3	Minimizing the need of configuration						
9.2.4	Minimizing the effort to perform configuration						
9.2.5	Making configuration actions reversible						
9.2.6	Protecting access to basic services						
9.2.7	Providing fail-safe completions						
9.2.8	Restarting configurations						
9.2.9	Saving and restoring configuration settings						
9.2.10	Transferring configuration settings						
9.2.11	Avoiding the need to restart the system						
9.2.12	Providing user control over system restarts						
9.2.13	Temporary and permanent changes						
9.2.14	Reverting to default configuration settings						
9.2.15	Reversing unwanted language changes						
9.2.16	Anticipating problems for other applications						
9.3	Guided configuration and reconfiguration						
9.3.1	Preparing for configuration or reconfiguration						
9.3.2	Minimizing information required						
9.3.3	Usability and accessibility of configuration						

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Table C.1 (*continued*)

Clause/ subclause	Guideline	Applicability		Conformance			
		Yes/No	Reason not applicable	Yes	Partially	No	Comments
9.3.4	Understandability of guided configuration						
9.3.4.a	consistent terminology						
9.3.4.b	user's language						
9.3.4.c	explanations, upon request						
9.3.5	Structure of guided configuration						
9.3.5.a	logical and consistent order						
9.3.5.b	clear overview						
9.3.5.c	indication of the progress						
9.3.5.d	natural entry points and navigation						
9.3.6	Configuring individual settings						
9.3.6.a	what settings need to be configured						
9.3.6.b	information on settings that can be changed						
9.3.6.c	setting current value						
9.3.6.d	permitted values and formats						
9.3.6.e	available defaults						
9.3.6.f	access to related information						
9.3.7	Configuration information and feedback						
9.3.7.a	feedback about progress						
9.3.7.b	help to correct errors						
9.3.7.c	information on settings requiring configuration						
9.3.7.d	feedback on success or failure						
9.3.8	Ongoing monitoring						

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Table C.1 (*continued*)

Clause/ subclause	Guideline	Applicability		Conformance			
		Yes/No	Reason not applicable	Yes	Partially	No	Comments
9.4	Default settings						
9.4.1	Providing defaults						
9.4.2	Overriding default values						
9.4.3	Resetting to initial system-provided settings						
9.4.4	Distinction between settings and defaults						
9.4.5	User control of default settings						
10	**Supporting individual users**						
10.1	User profiles						
10.1.1	User profiles to support individualization						
10.1.2	Saving commonly used information						
10.1.2.a	account names and passwords						
10.1.2.b	cookies						
10.1.2.c	state information						
10.1.3	Avoiding inconsistencies in profiles						
10.1.4	Identifying and resolving inconsistencies						
10.1.5	Storing user profiles						
10.1.6	Using stereotype-based user profiles						
10.1.6.a	users without personal profiles						
10.1.6.b	as the basis of a personal profile						
10.2	User management of profiles						
10.2.1	Activating user profiles						
10.2.1.a	where user has single profile						
10.2.1.b	where profiles used without accounts						
10.2.2	Selecting a default profile						

Table C.1 (*continued*)

Clause/ subclause	Guideline	Applicability		Conformance			
		Yes/No	Reason not applicable	Yes	Partially	No	Comments
10.2.3	Identifying the current user profile						
10.2.4	Changing between profiles						
10.2.5	Deactivating user profiles						
10.2.6	Allowing users to manage profiles						
10.2.6.a	view the contents						
10.2.6.b	understand the usage						
10.2.6.c	add, change or delete data						
10.2.6.d	add or delete profiles						
10.2.6.e	indicate which profile data can be used						
10.2.6.f	authorize third party access						
10.2.7	Implementing changes to profiles						
10.2.8	Organization of multiple profiles						
10.2.9	Recovering profiles						
10.3	Automatic profile acquisition						
10.3.1	Using automatic profile acquisition						
10.3.2	Providing user control of profile acquisition						
10.3.2.a	informing that acquisition is active						
10.3.2.b	information on the effects of acquisition						
10.3.2.c	disable / enable acquisition						
10.3.2.d	determine profiles acquisition applies to						
10.3.2.e	selecting components subject to acquisition						
10.3.2.f	review and revise acquired profiles						
10.3.2.g	deactivate / reactivate individualization related to profile changes						

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Table C.1 (*continued*)

Clause/ subclause	Guideline	Applicability		Conformance			
		Yes/No	Reason not applicable	Yes	Partially	No	Comments
10.4	Portability of profiles						
10.4.1	Use of profiles across compatible applications/systems						
10.4.2	Synchronizing profiles						
10.4.3	Sharing profile information						
10.4.4	Providing security of transmitted profiles						
10.5	Training and help on use individualization						
10.5.a	guidance/training						
10.5.b	on-line help						
11	**Individualizing interface components**						
11.1	General guidance on interface components						
11.1.1	Using user interface styles/themes/skins						
11.1.2	Individualizing user interface elements						
11.1.3	Supporting user creation of tools						
11.1.4	Adjusting presentation attributes						
11.1.5	Individualizing media choices for input/output						
11.1.6	Switching of input/output alternatives						
11.2	Individualizing visual media						
11.2.1	Adjusting size of displayed elements						
11.2.1.a	magnification of portions						
11.2.1.b	size of user interface objects						
11.2.1.c	size of individual windows						

Table C.1 (*continued*)

Clause/ subclause	Guideline	Applicability		Conformance			
		Yes/No	Reason not applicable	Yes	Partially	No	Comments
11.2.2	Adjusting contrast and colours						
11.2.2.a	contrast						
11.2.2.b	colour schemes						
11.2.2.c	colours used to indicate						
11.2.3	Adjusting the layout of displayed elements						
11.2.3.a	repositioning user interface elements						
11.2.3.b	window always remain on top						
11.2.3.c	automatically placing window receiving focus						
11.3	Individualizing auditory media						
11.3.1	Providing audio volume controls						
11.3.2	Adjusting other audio characteristics						
11.3.2.a	frequency						
11.3.2.b	speed of voice						
11.3.3	Independent controls for audio channels						
11.3.4	Muting audio channels						
11.4	Individualizing tactile media						
11.4.1	Individualizing tactile parameters						
11.4.2	Adjusting force feedback						
11.5	Individualizing temporal aspects of media						
11.5.1	Adjusting speed of interaction						

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Table C.1 (*continued*)

Clause/ subclause	Guideline	Applicability		Conformance			
		Yes/No	Reason not applicable	Yes	Partially	No	Comments
11.5.2	Control of timed responses						
11.5.2.a	deactivating time-out						
11.5.2.b	adjusting time-out						
11.5.2.c	warning before time-out & extending time						
12	**Individualizing interaction activities**						
12.1	Supporting user creation and use of stored interaction sequences						
12.2	Providing user control of security options						
12.2.a	the degree of control						
12.2.b	how much users are informed						
12.2.c	how much user control over the application's ability to manage itself						
12.3	User guidance general						
12.3.1	Context-sensitive user guidance						
12.3.2	User-sensitive user guidance						
12.4	On-line help						
12.4.1	Consistency with the user guidance standard						
12.4.2	Selecting the characteristics of on-line help						
12.4.2.a	how support is initiated						
12.4.2.b	level of detail						
12.4.2.c	method of presentation						
12.4.2.d	whether the help system individualizes itself						
12.4.3	By-passing system-initiated help						

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Table C.1 (*continued*)

Clause/ subclause	Guideline	Applicability		Conformance			
		Yes/No	Reason not applicable	Yes	Partially	No	Comments
12.4.4	Triggering of non-critical notifications						
12.4.5	Timing of non-critical notifications						
13	**Individualizing content**						
13.1	Individualizing content - general						
13.1.1	Providing methods for individualizing organization and presentation of content						
13.1.1.a	summarizing/filtering/hiding						
13.1.1.b	sorting						
13.1.1.c	searching						
13.1.1.d	annotating/highlighting						
13.1.2	Maintaining integrity of content						
13.1.3	User control of the individualization of content						
13.1.4	Users' tasks and information needs						
13.1.5	Creating user-defined links						
13.1.6	Sharing user-defined links						
13.2	Cultural and linguistic variations						
13.2.1	Differentiating between system and data language						
13.2.1.a	changing language for data entry						
13.2.1.b	changing language for the application						
13.2.2	Personalizing vocabularies						

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