BRITISH STANDARD

BS EN ISO 9241-151:2008

Ergonomics of human-system interaction —

Part 151: Guidance on World Wide Web user interfaces

ICS 13.180; 35.240.99

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Full document details: BS EN ISO 9241-151:2008

National foreword

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The UK participation in its preparation was entrusted to Technical Committee PH/9, Applied ergonomics.

A list of organizations represented on this committee can be obtained on request to its secretary.

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2008

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ISBN 978 0 580 53858 2

Amendments/corrigenda issued since publication

Date	Comments

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 9241-151

May 2008

ICS 13.180; 35.240.99

English Version

Ergonomics of human-system interaction - Part 151: Guidance on World Wide Web user interfaces (ISO 9241-151:2008)

Ergonomie de l'interaction homme-système - Partie 151: Lignes directrices relatives aux interfaces utilisateurs Web (ISO 9241-151:2008)

Ergonomie der Mensch-System-Interaktion - Teil 151: Leitlinien zur Gestaltung von Benutzungsschnittstellen für das World Wide Web (ISO 9241-151:2008)

This European Standard was approved by CEN on 8 May 2008.

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Ref. No. EN ISO 9241-151:2008: E

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Foreword

This document (EN ISO 9241-151:2008) has been prepared by Technical Committee ISO/TC 159 "Ergonomics" in collaboration with Technical Committee CEN/TC 122 “Ergonomics” the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2008, and conflicting national standards shall be withdrawn at the latest by November 2008.

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Endorsement notice

The text of ISO 9241-151:2008 has been approved by CEN as a EN ISO 9241-151:2008 without any modification.

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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.

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ISO 9241-151 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

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

— *Part 1: General introduction*

— *Part 2: Guidance on task requirements*

— *Part 3: Visual display requirements*

— *Part 4: Keyboard requirements*

— *Part 5: Workstation layout and postural requirements*

— *Part 6: Guidance on the work environment*

— *Part 7: Requirements for display with reflections*

— *Part 8: Requirements for displayed colours*

— *Part 9: Requirements for non-keyboard input devices*

— *Part 11: Guidance on usability*

— *Part 12: Presentation of information*

— *Part 13: User guidance*

— *Part 14: Menu dialogues*

— *Part 15: Command dialogues*

— *Part 16: Direct manipulation dialogues*

— *Part 17: Form filling dialogues*

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

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

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

— *Part 110: Dialogue principles*

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

— *Part 171: Guidance on software accessibility*

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

— *Part 302: Terminology for electronic visual displays*

— *Part 303: Requirements for electronic visual displays*

— *Part 304: User performance test methods*

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

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

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

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

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

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

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

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

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

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Introduction

It is widely accepted that usability is a key factor in successful website design but until now there has been no internationally agreed standard that specifically addressed the usability of World Wide Web (WWW or Web) user interfaces.

World Wide Web user interfaces pose particular usability problems:

— their users are diverse in knowledge, capabilities, language and other factors — for example, a World Wide Web user interface that works well for subject-matter experts may be sub-optimal for ordinary users;

— users' goals vary considerably — for example, a site optimized for one set of tasks (such as e-commerce transactions) could be sub-optimal for users whose tasks are different (such as information gathering);

— different Web browsers or user agents often render Web content in different ways — for example, the layout of individual pages can change, sometimes quite dramatically.

Users of the World Wide Web will have experienced the problems of inconsistency between websites and often even within the same website. For example, something as straightforward as a link may be denoted by underlining on one page, by a mouse-over on a second page and by nothing at all on a third page.

A number of guidelines for good practice exist, many on the Web itself, but these guidelines sometimes conflict and can also be difficult to put into practice. While not addressing Web user interfaces specifically, a number of International Standards are available that provide useful guidance on usability and the design of user interfaces: ISO 9241-11 to ISO 9241-17 and ISO 9241-110 provide ergonomic guidance on the design of software user interfaces in general, ISO 13407 on achieving usability by incorporating user-centred design activities throughout the life cycle of interactive computer-based systems, and the ISO 14915 series of standards on the design of multimedia and hypermedia aspects of user interfaces.

The recommendations and guidelines provided in this part of ISO 9241 apply primarily to the design of the content of a website or, more generally, a Web application, the user's navigation and interaction, as well as the presentation of the content. The user interface of different types of user agents (such as Web browsers) or additional tools such as Web authoring tools are not the subject of this part of ISO 9241, although some guidelines could apply to those systems as well. Aspects of the technical implementation of the recommendations are also not within its scope.

An important objective for developing Web user interfaces is to make them accessible to the widest possible range of users, including persons with disabilities. While some guidance provided in this part of ISO 9241 is also important for the accessibility of Web user interfaces, it does not aim at covering accessibility in a comprehensive manner. Common guidance on securing and improving accessibility to ICT (information and communication technology) equipment, software and services can be found in ISO 9241-20, and detailed guidance on the accessibility of software user interfaces in general can be found in ISO 9241-171, while the World Wide Web Consortium's *Web Accessibility Initiative* provides guidance specifically for Web content, user agents and authoring tools.

ISO 9241 was originally developed as a seventeen-part International Standard on the ergonomics requirements for office work with visual display terminals. As part of the standards review process, a major restructuring of ISO 9241 was agreed to broaden its scope, to incorporate other relevant standards and to make it more usable. The general title of the revised ISO 9241, "Ergonomics of human-system interaction", reflects these changes and aligns the standard with the overall title and scope of Technical Committee ISO/TC 159, SC 4. The revised multipart standard is structured as series of standards numbered in the "hundreds": the 100 series deals with software interfaces, the 200 series with human centred design, the 300 series with visual displays, the 400 series with physical input devices, and so on.

See Annex A for an overview of the entire ISO 9241 series.

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Ergonomics of human-system interaction —

Part 151:
Guidance on World Wide Web user interfaces

1 Scope

This part of ISO 9241 provides guidance on the human-centred design of software Web user interfaces with the aim of increasing usability. Web user interfaces address either all Internet users or closed user groups such as the members of an organization, customers and/or suppliers of a company or other specific communities of users.

The recommendations given in this part of ISO 9241 focus on the following aspects of the design of Web user interfaces:

— high-level design decisions and design strategy;

— content design;

— navigation and search;

— content presentation.

The user interfaces of different types of user agents such as Web browsers or additional tools such as Web authoring tools are not directly addressed in this part of ISO 9241 (although some of its guidance could apply to these systems as well).

Web user interfaces are presented on a personal computer system, mobile system or some other type of network-connected device. While the recommendations given in this part of ISO 9241 apply to a wide range of available front-end technologies, the design of mobile Web interfaces or smart devices could require additional guidance not within its scope; neither does it provide detailed guidance on technical implementation nor on issues of aesthetic or artistic design.

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

ISO 9241-12:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 12: Presentation of information*

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

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

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

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

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

ISO 9241-20, *Ergonomics of human-system interaction — Part 20: Accessibility guidelines for information/communication technology (ICT) equipment and services*

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

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

ISO 9241-303, *Ergonomics of human-system interaction — Part 303: Requirements for electronic visual displays*

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

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

WCAG 1.0, *Web Content Accessibility Guidelines 1.0*, W3C Recommendation, World Wide Web Consortium (W3C) (MIT, INRIA, Keio)

WCAG 2.0, *Web Content Accessibility Guidelines 2.0*, World Wide Web Consortium (W3C) (MIT, ERCIM, Keio) [1)]

3 Terms and definitions

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

3.1
boolean search
search formulation using logical operators

3.2
browser
user agent allowing a person to retrieve and read hypertext, to view the contents of hypertext nodes (usually Web pages), to navigate from one node to another, and to interact with the content

NOTE A browser also offers a set of operations, e.g. for navigating websites or for changing the visual appearance of the content displayed.

3.3
conceptual content model
abstract model describing the concepts of an application domain, the relationships among those concepts and the operations to be performed on the concepts or relationships

1) Working draft. Intended to supersede WCAG 1.0 in its final published version.

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3.4
content
web content
⟨Web user interface⟩ set of content objects

3.5
content object
interactive or non-interactive object containing information represented by text, image, video, sound or other types of media

3.6
dynamic navigation link
computed link
link that is computed dynamically by the system based, for example, on the content of a database

3.7
frame
mechanism for dividing a browser window into independent windows, each displaying a different document, or different parts of the same document

3.8
frameset
collection of frames and a corresponding layout structure that is presented in the same browser window

3.9
global navigation
set of navigation links available on all pages of a website

3.10
home page
start page
top page
main page through which users typically enter a website and whose URL is typically published or linked as the main Web address of an organization or an individual

NOTE The term *home page* can be used differently in different contexts. Some groups will call a complete website a home page.

3.11
interaction object
component of the Web user interface accepting user input

EXAMPLE Links, buttons, input fields, check boxes or selection lists.

3.12
Internet
worldwide interlinked computer systems and computer networks connected via gateways that enable the transfer of data between them

3.13
intranet
computer network using Internet standards, the access to which is limited to members of a particular organization such as a company

3.14
landmark page
landmark
main page in the navigation structure that can be directly accessed from many other pages

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3.15
link
hyperlink
⟨World Wide Web⟩ reference from some part of one document to (some part of) another document or another part of the same document

NOTE Links are also called hyperlinks because hypertext and hypermedia systems make extensive use of this concept. Links are used for activating navigation. They are represented, for instance, as element tags in the hypertext markup language (HTML). The concept of links is also described in ISO 14915-2 in the context of multimedia user interfaces.

3.16
link cue
textual or graphical presentation of a link showing information about the link target

3.17
media object
component of a Web document that is implemented by a single media type

EXAMPLE 1 A text object presenting a discussion about some topic.

EXAMPLE 2 An image object presenting a picture of some person.

EXAMPLE 3 A sound object presenting a song.

NOTE Adapted from ISO 14915-2:2003, definition 3.3.

3.18
navigation component
group of navigation elements placed together

3.19
profile
user profile
set of attributes used by the system that are unique to a specific user/user group

3.20
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.

3.21
rendering
act whereby the information in a document is presented

NOTE This presentation is done in the form most appropriate to the environment (e.g. aurally, visually, in print).

3.22
navigation
Web navigation
⟨World Wide Web⟩ movement between or within Web pages or the movement within some presentation segment presented on a page (e.g. the movement within a particular media object) that users perform to find a specific function or piece of information

NOTE 1 In this part of ISO 9241, *navigation* is used as a convenient short form for *Web navigation* (see also ISO 14915-2).

NOTE 2 Navigation steps are often initiated by activating some link.

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3.23
navigation structure
Web navigation structure
⟨World Wide Web⟩ structure composed of elementary or composite presentation segments (such as Web pages or media objects contained in a page) and links, determining all possible paths on which users can move around in a Web user interface

3.24
screen reader
assistive technology that allows users to operate software without needing to view the visual display

NOTE 1 Output of screen readers is typically text-to-speech or Braille.

NOTE 2 Screen readers rely on the availability of information from the operating system and applications.

3.25
site map
textual or graphical overview of the complete navigation structure of a website

3.26
splash screen
temporary page shown prior to the homepage when a website is first accessed

3.27
tool tip
small pop-up window that appears when the mouse pointer is moved over an interaction object and that shows explanatory text or help information

3.28
transaction
action that involves inserting, updating or deleting information

3.29
Web user agent
user agent
front-end software that enables users to interact with a remote system through Internet protocols

NOTE A *browser* is a specific type of user agent.

3.30
uniform resource locator
URL
mechanism for identifying resources on the Internet (such as Web pages) by specifying the address of the resource and the access protocol used

NOTE The official technical term as specified by the IETF is *uniform resource identifier* (URI), of which *URL* is a subset.

3.31
Web page
coherent presentation of a content object or set of content objects and associated interaction objects through a user agent

3.32
Web service
Web resource providing content and/or functionality that can be accessed remotely through standardized protocols and software interfaces

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3.33
website
site
coherent collection of interlinked Web resources (for example, Web pages or Web services) that is located on one or several computers connected to the Internet, and that can usually be accessed through the same domain specification part of a URL

3.34
Web application
World Wide Web application
application providing functionality to the user through a browser or other type of user agent using Web formats and protocols

NOTE Web applications in the sense of this part of ISO 9241 comprise websites that only deliver content, that combine content delivery with application-specific functionality or that provide only specific application functionality such as a particular Web service.

3.35
Web user interface
World Wide Web user interface
all aspects of a website or Web application related to content, functionality, navigation, interaction and presentation that are relevant for using a website or Web application

3.36
within-page link
link leading to a target on the same page

4 Application

4.1 Intended user groups

The following groups are intended users of this part of ISO 9241:

— developers and designers of Web user interfaces who will apply it during the development process;

— content providers who generate and maintain the content of a website or application;

— developers of content authoring tools who will integrate the mentioned recommendations into their authoring tools;

— usability evaluators who will check that Web user interfaces meet its recommendations;

— buyers who wish to ensure the ergonomic quality of a software product or development.

4.2 Applying the recommendations

Each individual recommendation in this part of ISO 9241should be evaluated for its applicability and, if judged to be applicable, should be implemented, unless there is evidence that to do so would cause deviation from the design objectives or would result in an overall degradation in usability. In some cases, the designer may need to trade off one principle or recommendation in favour of another to achieve an optimal design.

4.3 Conformance

If a claim of product or application conformity with this part of ISO 9241 is made, the procedure used in establishing requirements for developing and/or evaluating World Wide Web user interfaces shall be specified. The level of specification of the procedure is a matter of negotiation between the involved parties. Annex B provides a basis both for determining and recording the applicability of all the recommendations and a means for reporting that they have been followed. Other, equivalent, forms of reporting are acceptable.

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5 A reference model for human-centred design of World Wide Web user interfaces

The usability of a World Wide Web user interface is dependent upon many different but strongly related factors. Giving structure to the complexity of Web user interface development, the reference model shown in Figure 1 distinguishes between design, process and evaluation aspects. Addressing these three aspects in an integrated manner is necessary to achieve human-centred Web user interface design. Since process and evaluation aspects are covered in other International Standards, this part of ISO 9241 focuses on the design aspects, with design guidance and recommendations.

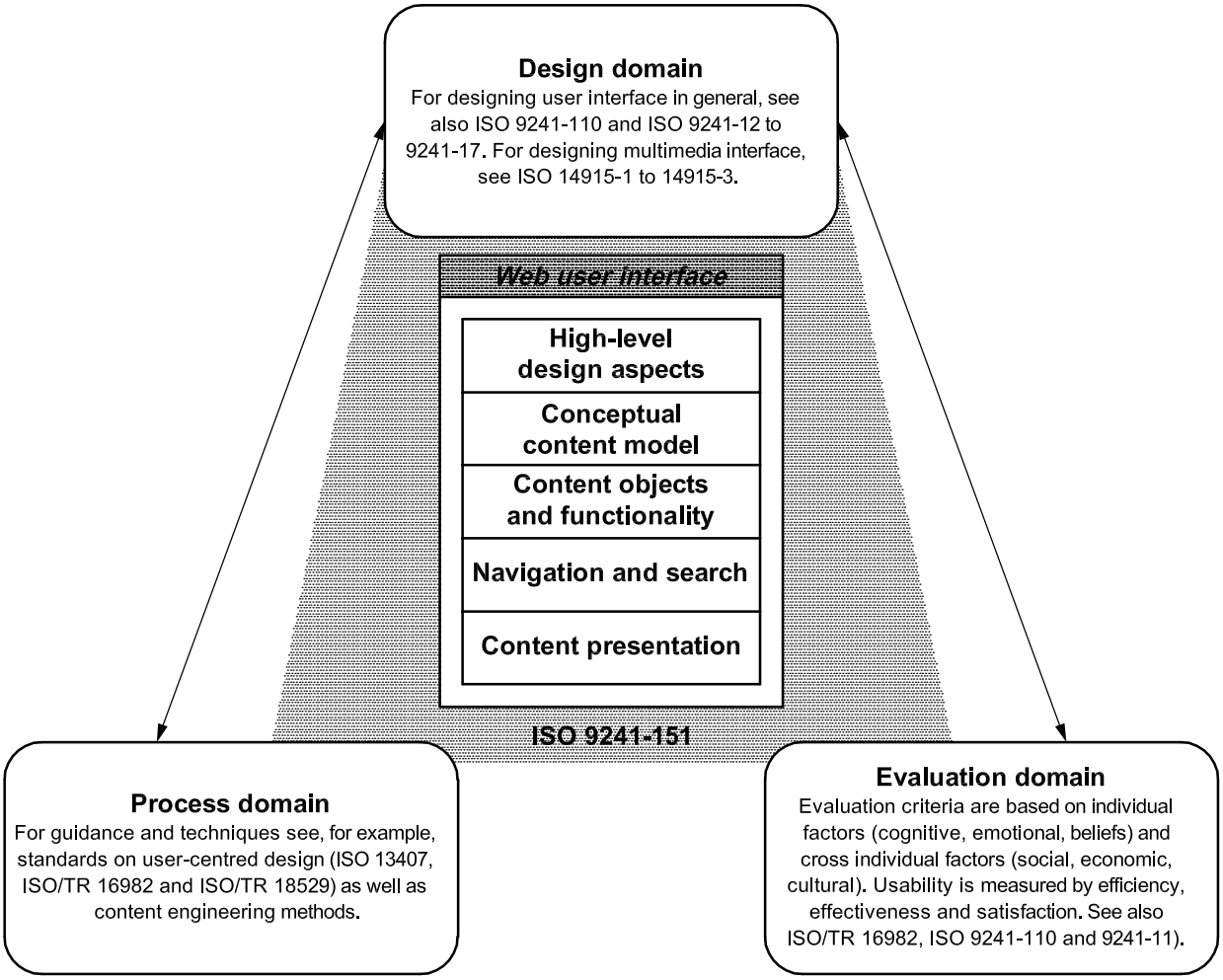

Figure 1 — Reference model

In the reference model shown in Figure 1, Web user interface design is structured in five major areas or levels, which have been used to structure this part of ISO 9241:

— high-level design aspects;

— conceptual content model;

— content objects and functionality;

— navigation and search;

— content presentation.

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These areas can be seen as representing different levels in the overall design. While the levels do not imply a particular sequence or process, higher-level issues should usually be addressed before lower-level design decisions are made.

In addition, the following International Standards shall be consulted:

— for guidance related to software user interfaces, ISO 9241-110, ISO 9241-11, ISO 9241-12, ISO 9241-13, ISO 9241-14, ISO 9241-15, ISO 9241-16 and ISO 9241-17;

— for guidance related to multimedia user interfaces, ISO 14915.

The other two parts of the model representing the process domain and the evaluation domain constitute important additional aspects for the user-centred development of Web user interfaces. They are, however, not elaborated in this part of ISO 9241.

The process domain represents the procedural aspects of developing Web user interfaces. The design of Web user interfaces — as for the design of interactive software systems in general — should follow a human-centred design process, including an appropriate analysis of the intended user groups and their tasks or goals. ISO 13407 shall be consulted for guidance on human-centred design processes.

The evaluation domain refers to methods and criteria for assessing the usability of Web user interfaces. In addition to perceptual and cognitive factors, emotional and belief-related issues such as the attractiveness or trustworthiness of a website can be important when evaluating a Web user interface. Similarly, it can be important to assess the organizational and social effects of an application. Specific evaluation criteria and procedures will have to be specified for each of these different aspects, but are outside the scope of this part of ISO 9241.

6 High-level design decisions and design strategy

6.1 General aspects

Websites take on an increasing variety of forms, ranging from conventional websites as collections of interlinked Web pages to specialized Web services, possibly accessed through specific devices. Content provision is frequently integrated with application functionality that is potentially delivered by a variety of remote resources. These developments often blur the distinction between websites and conventional applications, leading to the more general notion of Web applications. Web applications serve a wide spectrum of purposes, such as, for example, public information websites, e-commerce applications, intranet applications, location-adaptive services and many others. A clear definition of the purpose and strategic goal of the Web application to be developed is therefore a critical high-level design decision that influences many other design aspects.

Web applications and their context of use often have specific characteristics, which differentiate them from conventional software applications. While conventional applications, for example, are frequently developed for specific user groups, tasks or organizational contexts, public websites address a wide range of users with different interests, information needs and tasks. Also, users are no longer bound to one specific system, but may freely move to other websites with similar offerings.

In the process of designing a website, there are typically a large number of different stakeholders who eventually will have to agree upon the purpose and design of the website. For this reason, issues such as defining the target audience, selecting appropriate business models or the definition of a suitable genre and design style for the site need to be explicitly stated and discussed among the stakeholders. When analysing and defining the target user groups, it is critical to consider the diversity of the users expected and the range of capabilities and disabilities they may have. An important design goal is to make Web user interfaces accessible for the widest possible range of users, particularly taking into account potential user limitations in perceiving, operating or understanding the Web user interface.

Depending on the purpose of a Web application, different design goals may be prioritized. For instance, design goals such as “fun” or credibility may have different relevance for a banking website compared with an

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entertainment website. Prioritizing these goals with respect to the prospective users and their needs constitutes an important aspect of designing a Web user interface.

6.2 Determining the purpose of a Web application

The purpose for which a Web application is developed should be explicitly defined in order to provide a clear basis for developing appropriate content and functionality and for determining further design objectives.

NOTE Defining the purpose can involve, for example, developing the company image, promoting products or supporting e-business. The purpose of a website could be narrowly defined as, for example, in an online ticket-sales system, or more open-ended, a web site providing a platform for a community of users. Websites are often developed to serve a number of different purposes at the same time. In such cases, aspects such as the ability of users to easily obtain an overview of the scope of the content and functionality provided are important.

6.3 Analysing the target user groups

In the process of defining the purpose of a Web application, the target user groups should be identified.

NOTE General guidance on considering users and their tasks can be found in ISO 9241-2 and ISO 9241-11.

6.4 Analysing the users' goals and tasks

The goals and tasks of the intended users should be analysed.

6.5 Matching application purpose and user goals

The purpose of the Web application (determined according to 6.2) should be compared and, if necessary, matched with the users' goals and tasks to ensure that users can accomplish their goals.

Frequently, there are conflicts between the goals of the provider of a website and user goals, for example, if advertizing is one of the purposes of a website at the same time as users desire to use an information service efficiently. In such cases, it is important to design the system so that the user is not negatively affected by the goals of the provider.

6.6 Recognizing the purpose of a Web application

The intended purpose(s) of a Web application should be easily recognized by the user.

EXAMPLE 1 An online shopping website is recognizable by the title, description and graphical visual design of the home page.

EXAMPLE 2 A short descriptive sentence (*tagline*) is used on an e-commerce website to convey what a company does and how it differs from its competitors.

If a website has more than one purpose, it is important that the site's content and navigation support users to discriminate among the purposes.

Web applications have over time evolved into different types, e.g. online news channels, electronic shops or educational websites. These application types or genres often use specific, recurring forms and structures for delivering content that may be tailored to different user groups. Employing these design patterns can be valuable for making the purpose of a Web application easily identifiable and for providing consistent Web user interfaces. However, it should also be noted that the boundaries between different genres are not well defined, that they may overlap and that new genres can rapidly evolve due to the flexibility of the online medium.

6.7 Prioritizing different design goals

If there are different competing design goals they should be prioritized with respect to the most likely frequent and/or critical tasks and needs of the users.

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Different design goals, such as, “present detailed information”, “design attractive pages” and “keep users engaged” can conflict with one another. If that is the case, it is important that these design goals be prioritized with respect to the user’s most frequent or critical tasks and to find suitable trade-offs.

6.8 ICT accessibility

ISO 9241-20 shall be consulted for guidance on ICT accessibility. Web user interfaces should meet its requirements and recommendations.

6.9 Software accessibility

ISO 9241-171 shall be consulted for guidance on software accessibility. Web user interfaces should meet its requirements and recommendations.

6.10 Web content accessibility

WCAG 1.0 and, superseding this, WCAG 2.0 when published in its final version, shall be consulted for guidance on web content accessibility.

6.11 Identifying the website and its owner

The identity of a website and the website owner should be presented clearly and accurately and should be displayed on all relevant pages. If the site owner is a business entity, appropriate information about the company or organization should be provided.

EXAMPLE A corporate logo is available on all pages as a link to the home page where further information on the website owner is presented.

NOTE 1 Identifying the website can include elements to both define and contact that organization, including business name and contact channels that are open (address, e-mail, fax, phone, messenger, etc.).

NOTE 2 Adding suitable metadata is an additional means for making a website identifiable.

6.12 Coherent multi-site strategy

If the information or services provided by an organization or different parts of that organization are distributed over different websites or subsites, a coherent strategy should be developed and implemented that allows users to navigate consistently between the different sites and to locate relevant information or services without prior knowledge of the purpose, interrelationship and content of the different sites.

NOTE A style guide might be of assistance to the user interface designer or developer in multi-site situations in implementing a coherent strategy.

7 Content design

7.1 Conceptual content model

7.1.1 General

A conceptual model of the Web user interface describing the concepts and relations of the application domain is an important basis for defining the content and the navigation structure. Such a conceptual model can be developed by analysing the tasks and mental models of the prospective users, as well as existing information structures such as subject hierarchies (taxonomies). Also, different user roles (e.g. consumer vs. business customer) or expectations resulting from using other systems can influence the design of an appropriate conceptual model.

Documents
Document Sharing Hub
Full document details: BS EN ISO 9241-151:2008