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BSI Standards Publication

Systems and software engineering — Engineering and management of websites for systems, software, and services information

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National foreword

This British Standard is the UK implementation of ISO/IEC/IEEE 23026:2015. It supersedes BS ISO/IEC 23026:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee IST/15, Software and systems engineering.

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INTERNATIONAL STANDARD

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Systems and software engineering — Engineering and management of websites for systems, software, and services information

Ingénierie des systèmes et du logiciel — Ingénierie et gestion de sites web pour les systèmes, logiciels et services d'information

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CH-1211 Geneva 20
Switzerland
E-mail inmail@iec.ch
Web www.iec.ch

Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York
NY 10016-5997, USA
E-mail stds.ipr@ieee.org
Web www.ieee.org

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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The main task of ISO/IEC JTC 1 is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

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ISO/IEC/IEEE 23026 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*, in cooperation with the Systems and Software Engineering Standards Committee of the IEEE Computer Society, under the Partner Standards Development Organization cooperation agreement between ISO and IEEE.

This first edition of ISO/IEC/IEEE 23026 replaces and supersedes ISO/IEC 23026:2006, which was the adoption of IEEE Std 2001 (TM)-2002, IEEE Recommended Practice for the Internet — Website Engineering, Website Management, and Website Life Cycle. The IEEE contributed IEEE Std 2001-2002 as a source for this standard.

Introduction

The increase in use of the World Wide Web for every type of communication, and the accelerating development of new technical protocols, products, and services, for website development and hosting, have both simplified and complicated the engineering and management of websites. Because of the ready availability of commercial website providers, it has become simpler for information and communications technology (ICT) enterprises of all sizes to launch websites to present technical information. The growth in global communities of interest in software, systems, and services has expanded the creation of information from many sources. To a large extent, use of digital communications, particularly those accessible through the Internet or Intranets, has supplanted printed publications for conveying technical information. This trend applies to systems and user documentation as well as to service management and operational plans, policies, and procedures.

Other factors have also affected the design and operation of websites since the original publication of ISO/IEC 23026–IEEE Std 2001-2002, a source for this International Standard. The prevalence of automated search engines to locate technical information results in new considerations for website design. The increasing sophistication of information security threats to technical enterprises and their information, as well as concerns for the privacy of Internet users, have markedly complicated the process of delivering ICT information over the Web. This revision of ISO/IEC 23026 therefore has increased emphasis on information security and privacy concerns.

The diversity of websites for commercial marketing and social networking purposes reflects different interests and media choices from those websites that deliver ICT reference information. This revision of ISO/IEC 23026 applies primarily to websites whose purpose is to deliver information about ICT systems, software, and services. It includes increased emphasis on the human factors concerns for making information easily retrievable and usable for the intended audience. It recommends practices for websites based on World Wide Web Consortium (W3C®) and related industry guidelines, which have changed significantly since the original version of this International Standard. With rapid changes in technology, users may seek current technical guidance to fulfill the intent of this International Standard. It continues to address the entire life cycle of website strategy, design, and ongoing sustainment that are the responsibility of the website owner.

Systems and software engineering — Engineering and management of websites for systems, software, and services information

1 Scope

This International Standard defines system engineering and management requirements for the life cycle of websites including strategy, design, engineering, testing and validation, and management and sustainment for Intranet and Extranet environments.

This International Standard applies to those using web technology to present information and communications technology (ICT) information, such as user documentation for systems and software, life-cycle documentation for systems and software engineering projects, and documentation of policies, plans, and procedures for IT service management. This International Standard provides requirements for website owners and website providers, managers responsible for establishing guidelines for website development and operations, for software developers and operations and maintenance staff who may be external or internal to the website owner's organization. It applies to websites for public access and for limited access, such as for users, customers, and subscribers seeking information on IT products and services.

The goal of this International Standard is to improve the usability of informational websites and ease of maintenance of managed Web operations in terms of:

a) locating relevant and timely information,

b) applying information security management,

c) facilitating ease of use,

d) providing for consistent and efficient development and maintenance practices.

This International Standard is not intended for websites used primarily for marketing or sales, or to deliver instructional material, or to provide Graphical User Interfaces (GUI) for business or consumer transactional application processing. However, this International Standard may provide useful insights for managing such sites.

This International Standard focuses on vendor- and product-independent considerations. It does not include specifications for application development tools, programming languages used for archiving site content or for presentation of content on the web, metadata tags, or protocols for web page design based on World Wide Web Consortium (W3C®) and related industry guidelines. It does not address tools or systems used for management or storage of information content (data, documents) that may be presented on websites.

This International Standard does not address the design and architecture of software supporting the Internet.

2 Conformance

Throughout this International Standard, "shall" is used to express a provision that is normative, "should" to express a recommendation among other possibilities, and "may" to indicate a course of action permissible within the limits of this International Standard.

Use of the nomenclature of this International Standard for the parts of a website is not required to claim conformance to the International Standard.

EXAMPLE Referring to the home page as the landing page or main page.

Conformance to this International Standard may only be claimed by an organization if all of the requirements in the standard are met by the organization or by its suppliers.

EXAMPLE When conformance is claimed for a website for which one organization provides the site content and another supplier is responsible for website presentation and operation, the site owner may claim conformance if each of the requirements are met by an identified party.

This International Standard may be included or referenced in contracts or similar agreements when the parties (called the acquirer and the supplier) agree that the supplier shall deliver services in accordance with the standard. This International Standard may also be adopted as an in-house standard by a project or organization that decides to develop and maintain a website in accordance with the standard.

3 Normative references

There are no normative references for this International Standard. The user is encouraged to consult the latest edition of the referenced documents (including any amendments) listed in the Bibliography.

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC/IEEE 24765 (www.computer.org/sevocab) and the following apply.

4.1
archival page
content that is preserved as a record and not expected to change

Note 1 to entry: Due to technology upgrades, some archival pages cannot be readily rendered unless they are upgraded along with active pages.

4.2
audience
category of users sharing the same or similar characteristics and needs (for example, purpose in using the documentation, tasks, education level, abilities, training, and experience) that determine the content, structure, and use of the intended documentation

Note 1 to entry: There may be a number of different audiences for a software product's documentation (for example, management, data entry, maintenance).

4.3
body metadata
elements in the body of an HTML document providing administrative and/or navigational facilities for the user or administrator

4.4
breadcrumb trail
navigational aid with a displayed series of hyperlinks which lead from the home page to the current page, allowing the user to return to previously viewed pages

4.5
browser
application allowing a person to retrieve and read hypertext, to view the contents of hypertext nodes (Web pages), to navigate from one Web page to another, and to interact with the content, such as changing the visual appearance of the displayed content

4.6
content (object)
interactive or non-interactive object containing information represented by text, image, video, sound, or other media

4.7
cookie
small file that is stored in and retrieved from user web storage to maintain state information, including identification of users and transaction coherency

4.8
faceted search
progressive search which allows users to narrow the results by selecting values for one or more attributes

4.9
feature
functional or non-functional distinguishing characteristic of a system, usually an enhancement to an existing system

4.10
frame
mechanism for dividing a browser window into independent windows for displaying different content or different parts of the same content (document)

4.11
global navigation
set of navigation links available on all pages of a website

4.12
home page
page of a website through which users typically enter the website, and whose URL is typically published or linked as the main web address of the site or organization

Note 1 to entry: Synonym: center page, front page, index page, main page, start page, top page.

4.13
Internet
worldwide interlinked computer systems and networks connected by gateways that enable the transfer of data between them

4.14
intranet
managed network operating within an organization with controlled and limited access

4.15
link
reference from some part of one document to some part of another document or another part of the same document

Note 1 to entry: Synonym: hyperlink

4.16
managed network
network or set of networks established and controlled by one or more organizations to meet specific organizational or business needs

4.17
managed website
site created and maintained based on organizational guidelines

4.18
mirror site
duplicate copy of a website maintained on a different host typically to provide redundancy, higher performance, or local access

4.19
navigation
process of accessing on-screen information by moving between different locations in a website or electronic document

4.20
orphan page
page on a website with no link from the home page or other page on the website

4.21
persistent
for a URL, describing a reference that does not need to change at the link in a document, and can still reach the desired object even though that object may have changed locations

4.22
responsive web design
method for web page construction to detect the user's screen size and orientation and dynamically change the layout accordingly

4.23
site map
textual or graphical overview of the navigation structure of a website

4.24
thumbnail
miniature image file displayed for quick identification of a larger image or video file

4.25
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 1 to entry: The term as specified by the IETF is uniform resource identifier (URI) of which URL is a subset.

4.26
user profile
set of attributes that are unique to a specific user or user group, such as job function or subscription to a service, used to control the parts of the system or web page that users can access

4.27
webmaster
person or group responsible to the website owner for ongoing maintenance of the site's presentation and availability

4.28
web page
coherent presentation of a set of content objects and associated interaction objects delivered to users through a browser in accordance with Internet protocols

Note 1 to entry: A Web page may be generated dynamically from the server side, and may incorporate multimedia, applets or other elements active on either the client or server side.

4.29
website
collection of logically connected web pages managed as a single entity

Note 1 to entry: A website may contain one or more subordinate websites.

4.30
website owner
organization responsible for the site content and site design

Note 1 to entry: The website owner may select a supplier as the website provider or may also be the website provider.

4.31
website provider
organization responsible for operation of the website and delivery of site content to users

Note 1 to entry: The website provider may also be the site owner, webmaster, site designer, or the internet service provider for the site.

5 Abbreviated terms

3D	three-dimensional
CI	Configuration Item
CSS	Cascading Style Sheets
CVE	Common Vulnerabilities and Exposures
CVSS	Common Vulnerability Scoring System
DNS	Domain Name Service
DOI	Digital Object Identifier™
DTD	Document Type Definition (for XML or SGML specifications)
FTP	File Transfer Protocol
GIF	Graphics Interchange Format
GUI	Graphical User Interface
HREF	HTML reference designator
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
ICT	information and communications technology
IETF	Internet Engineering Task Force
IP	Internet Protocol
IPR	Intellectual Property Rights
JFC	Java Foundation Class
JPEG	Joint Photographic Experts Group (image format)
JPG	Joint Photographic Group
MAC	Media Access Control
OTP	One-time password
PII	Personally Identifiable Information
PIN	Personal Identification Number
PNG	Portable Network Graphics
RDF	Resource Description Framework
RWD	Responsive Web Design
SGML	Standard Generalized Markup Language
SSL	Secure Sockets Layer
TCP	Transport Control Protocol
TLS	Transport Layer Security
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
UTC	Coordinated Universal Time
WAI	Web Accessibility Initiative (W3C)
WAP	Wireless Application Protocol
WCAG	Web Content Accessibility Guidelines

W3C World Wide Web Consortium
XHTML Extended HyperText Markup Language
XML Extensible Markup Language

6 Planning websites for systems, software, and services documentation

6.1 Defining the purpose, users, and context of the website

This International Standard addresses websites that have the general purpose of providing information about ICT systems, software, or service management. Within this scope, a broad range of purposes, audience (users), and resulting types of content can be included, such as policies, plans, specifications, operating procedures and instructions (user manuals), service descriptions, service agreements, knowledge management articles, help desk scripts, test plans, technical reports, and descriptions of concepts.

The website owner shall document the purpose and intended users of the website.

This information may be placed in a plan, charter, or policy and represented by use cases or scenarios. It influences the decisions on what information content belongs on the website and how to organize and present the content. This governing document or another explicit statement of purpose, suitable for use by possible stakeholders, should be posted as part of the website. The owner of the website should consider how the company's technical and strategic direction should influence code and feature choices that are extensible or scalable for future use.

The users of the website can include internal management and technical staff, external customers, or the general public. Thus, the website content could include general user information or procedures and specialized technical information for reference by trained technical users. Websites may be intended for a specific group, such as internal helpdesk or external customers. Some websites may allow users to add content as part of a collaborative community, or to post comments in a wiki. Some sites include both technical information for existing customers and marketing presentations for prospective customers. Some sites can be hosted by the owner of the technical information; other sites can run on services offered by unrelated website providers, who may have their own marketing information and third party advertisements displayed alongside the website owners' technical content. Sites can be intended for local or global use and offered in one or multiple languages.

Websites are often developed to serve a number of purposes and users of different technical backgrounds. Therefore, the site should be designed to allow users to easily gain an overview of the scope of the content and functionality provided. The introductory pages of the site should include a description of the purpose and intended uses of the website, with links to topics accessible within one link or search which satisfy the information needs of casual users. Global navigation features and search functions should allow more technical users to quickly reference needed information.

The effective communication of the content to the user is the primary purpose of an informational website. Ease of access to information by targeted-user communities is an example of one of the possible design goals. A website may address one or more diverse sets of users. Representatives of these user communities, which may include persons with disabilities, should be included in the design process and the ongoing evaluation of the site.

The target user community may have a wide diversity of connection speeds, display devices, or selected presentation formats within the display windows; this may establish some presentation constraints (consider displaying Web pages to small screens on mobile devices). Websites may consist of static pages, system generated pages, and dynamic pages, and may include user-generated content. Furthermore, any of these options may be combined for the purpose of providing the intended information to the website's users.

6.2 Establishing the informational website design strategy

If the website includes marketing material or advertising for other organizations not part of the website owner's organization, the home page shall include or link to disclosures relating to separation of editorial content and advertising, and the presence of sponsored content and sponsored links.

The designer shall consider the need of users to use content on mobile devices or to print content. Considering the needs of search engines and differently abled users, the designer shall provide a text equivalent or label for graphical, video, and audio content.

Site documentation for websites presenting ICT information shall have an identified set of measures to evaluate whether the website is meeting its goals. The plan shall include the set of measures to be collected and analyzed, the methods that will be used for the evaluation, and the acceptance criteria for approval of the website design.

The designer shall document the targeted computing environments for the website for future sustainment. The selection of implementation tools (e.g., servers, generators, and release levels or versions of HTML, CSS, XML, and scripting) shall be based on the evaluation of the target client communities and plans for site maintenance.

Responsive Web Design (RWD) is a method for web page construction to detect the user's screen size and orientation and dynamically change the layout accordingly, so the site produces output which is viewable and navigable with the devices and web software of the intended site users. It employs the use of flexible layouts (columns), scalable images, and CSS media queries. For content to be responsive to various devices and browser viewport sizes, layouts and content should adhere to the following principles:

- Page element sizing of the site should be built with a flexible grid system that uses relative units such as percentages for width/height and em's for font size.
- Flexible images that are used in the design should be in relative units or make use of appropriate CSS (e.g. using CSS property overflow: hidden).

Different views should be enabled in different contexts by employing media queries. Media queries allow designers to build multiple layouts using the same HTML documents by selectively serving stylesheets based on the user agent’s features, such as the browser window’s size, orientation (landscape or portrait), screen resolution, and color. Navigation elements should scale and dynamically be placed so as to not obscure information and degrade the user's experience. For mobile devices, navigation icons may be hidden with appropriate visual cues for the user that indicate interaction.

Organizational effectiveness, competitive success, and even meeting legal obligations and avoiding liabilities can depend on timely access to critical information within an organization. Intranet/Extranet design should consider these factors, particularly as the Internet is used to displace other methods for information delivery. Usability testing and other methods of obtaining user feedback should be actively pursued as part of this process.

Separation of content and presentation management is a primary design principle.

EXAMPLE Use of cascading style sheets (CSS) to take care of the presentation management needs and use of content templates to take care of structure management can simplify site management.

The website should exhibit consistency of design (uniform look and feel for the site). The website designer should adopt, adapt, or develop a style guide to assist in implementing a coherent strategy.

In situations where related organizations own related and interconnected websites, a coherent strategy should be implemented to allow consistent global navigation, search and information retrieval, security, and identification of site ownership among the related sites.

Websites should adopt and conform to a policy regarding the separation of informational content from advertising and marketing content.

NOTE 1 The American Society of Magazine Editors’ editorial guideline for digital media, available at http://www.magazine.org/asme/editorial-guidelines is a baseline industry standard for issues relating to the distinct treatment of editorial content, advertising, and special advertising sections.

The website designer should select the types of media needed to best present the informational content for the intended audience (text, graphics, video, animation).

NOTE 2 Some search tools cannot access content presented within frames.

The website designer should consider performance considerations affecting site and data store design: the expected number and persistence of users, type and volume of information to be viewed or retrieved, and use of static or dynamic information.

The website designer should consider the characteristics of the client and server environment and its impact on access to the presented material by the target-user community. Plans should include contingencies for technical obsolescence and growth.

The website design should be documented. Website design documentation should include statements about the page formats generated, including HTML version (and in some cases excluded functionality), CSS version, XML version and XML DTD(s), graphics formats, scripting and/or byte code executable versions and/or limitations, human-language considerations (as well as character sets), bandwidth considerations, and other characteristics from this standard or as identified during the design phase. The documentation should be updated based on actual experience. Specification in terms of vendor-specific products not under the control of the website owner should be avoided along with the associated loss of product independence.

If the website is hosted by a website provider, that provider may provide site documentation or specifications for available design and navigation features applicable to the Web pages for an entire network, and encourage or enforce conformance to these.

The website design should consider the needed levels of access control for the site, including whether all or some content is available to the worldwide public and some is limited to internal users, customers or subscribers, or prospective customers who provide their contact information.

The website owner should use methods and tools to collect and analyze site usage data as an aid to improving the usability of the site content.

EXAMPLE Measures may include user comments and ratings, or trends in the number of help desk calls related to services or software functions documented on the website.

6.3 Developing a strategy for website lifecycle management

The developer of a website for information reference shall prepare a project plan, or follow an existing plan, covering the entire life cycle of the site. The life cycle includes implementation (strategy, design, development, testing, and configuration) and maintenance (release management, updates, and retirement.)

The plan for the informational website should define when, how, and by whom specific activities are to be performed, including options and alternatives. The plan should include the following items:

a) Website owner,

b) Website purpose, scope, and intended user communities,

c) Intended lifespan of the website and frequency of change to the content,

d) Applicable standards and policies, including privacy, information security, and intellectual policy,

e) Applicable organizational guidance, including style guides,

f) Roles and responsibilities for site development and content development,

g) Roles and responsibilities for validating website content and usability, achieving performance targets, and conducting performance testing,

h) Constraints on website platform or infrastructure,

i) Schedules and resource estimates,

j) User support needs (webmaster, help desk, end-user documentation, telephone line).

NOTE 1 10.2 contains further information on planning for site management and sustainment.

Website designers and developers should prepare a requirements specification for a website, including performance, availability, and information security requirements. Website developers should trace the website's functional and non-functional requirements to the website's strategic plan or charter from the Website owner.

NOTE 2 ISO/IEC/IEEE 15289:2011 provides additional information for plans, policies, specifications, and procedures, including project management plans, information management plans, documentation plans, information security plans, service availability and continuity plans, and system requirements specifications.

If a website is complex or if it implements interactive functionality, it may be useful to consider it as a software product and to apply standards for software development and maintenance. In these cases, one or more projects should be initiated to execute the responsibility to plan and manage the website throughout its entire life cycle from conception through retirement.

The design process for an informational website should include stakeholders' involvement and participation throughout the website life-cycle activities: development, operations, and maintenance. To this end, website developers should identify categories of stakeholders early in the design phase so at least a representative sample of them can participate in the website development activities. The designers should consider typical access patterns for their users. This process should facilitate concurrent validation and verification of website requirements.

7 Designing websites for systems, software, and services documentation

7.1 Information architecture

7.1.1 Information structure of a website

The website shall have a defined structure for organization of its information content and functions.

The structure (site map) should reflect the information-seeking tasks to be performed by the users, allowing them to readily grasp the site's organization and find the needed information. The structure should be visible on every page, such as through menus, tabs, or display of higher-level pages in a breadcrumb trail. When the users' task is primarily to find technical information, the site structure should reflect the logical organization of the enterprise or the products, services, systems, procedures and instructions, or concepts to be presented. The site organization should place frequently used information where it is readily accessible (one click) from the main website page (home page). Frequently used features like search, and site logon, logout, and registration (if applicable) should also be readily visible on the home page. A well organized site structure can also simplify maintenance and sustainment of the site as information is added or archived in the future. Page content should be classified as stable or dynamic and the likely frequency of changes and updates should be identified.

The structure of a Website may be hierarchical or flat. Figure 1 illustrates hierarchical information architecture for related websites.

NOTE All elements of this diagram may represent separately managed websites. Such management should reflect reference to the applicable policies of the organization hierarchy. Websites are not implicitly hierarchical.

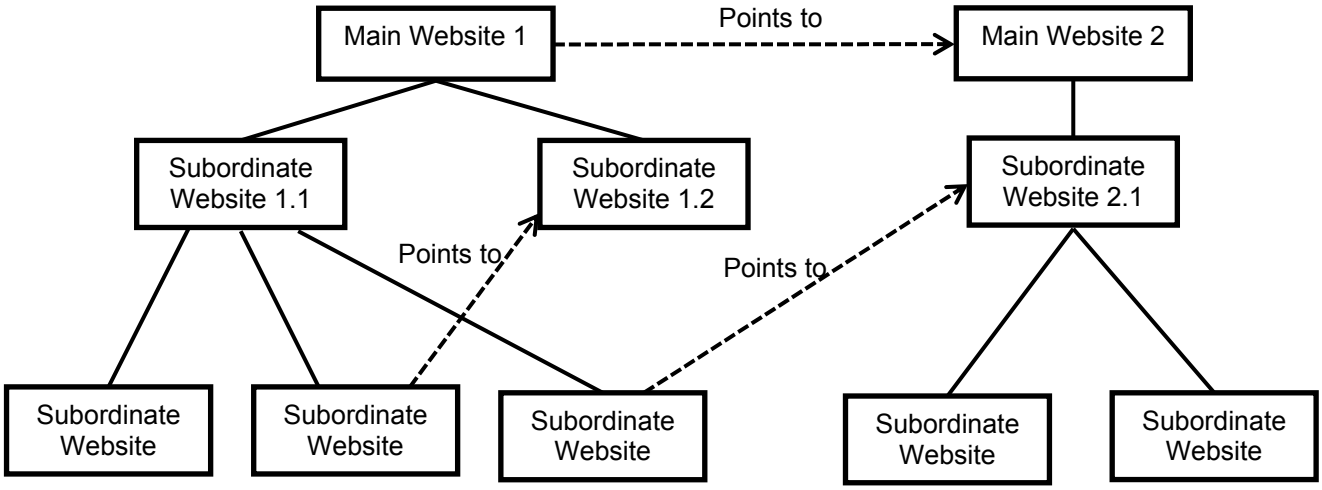

Figure 1 — Example of website information architecture

A site map document or illustration may be created for URLs and metadata for those URLs. The site map should be labeled as a site map and tested for usability with accessibility-compatible website readers.

The segmentation of content into pages for display may follow a choice of principles for ease of use. Windows and browsers can easily scroll and zoom to accommodate various amounts of content. Extended text presented on a single page is more easily comprehended when headings identify topics on the page. Very long pages, which typically require scrolling several times to view all the content, should display links to headings at the top of the page, serving as a table of contents. Important or summarized content should appear at the top of the web page, with less important or detailed content accessible through scrolling.

7.1.2 Shared resources

Default files for compliance to legal regulation or policy, copyright information, contact information, style sheets, and other site-specific data may be created for a site, or inherited from a broader organizational context.

7.1.3 Website home page

A website shall include a home page. The home page shall provide a comprehensive view and links to the types of information available on the site.

Websites that are part of a larger site construct shall contain a link to that overall site's home page. The home page shall either contain, or provide links to:

a) “top level pages” (home pages) for this site,

b) purpose of the site and intended users or tasks the website supports,

c) disclosures of the site owner and the responsible webmaster (site maintainer),

d) terms and conditions of use,

e) privacy and information-sharing policy, including cookie policy and identity-capturing policy,

f) applicable intellectual property considerations (copyright, trademark, etc) (see 6.4.1),

g) dates of last content update for this home page or policy pages indicated by this page,

h) third party plug-in download site if needed.

The home page should include a search tool to assist access to specific information. Since some users have low bandwidth connectivity, the home page for a site should load quickly (for example, within 5 seconds).

The home page may also contain:

- search services for the site,
- any ‘brands’ applicable to the site (logos or marks of certification or affiliation),
- other statements about the site owner,
- information about new content on the website,
- if the site is owned by a subdivision of a parent organization, information on the functions of the parent organization and a link to its website, if any.

Since the home page may be loaded on a variety of devices, its graphic files should be resized to minimize the time to load, and its graphics should contain height/width tags and alt tags so that a user can see quickly what the content of the page will be. Reusing graphics will have a positive impact on the overall performance. For the same purpose, multimedia and other large files such as audio and video should be designed and tagged to load after other lighter content elements of the page such as text and images have already loaded.

7.1.4 Identifying the website and its owner

The identity of the website and the website owner shall be accurately and legibly displayed on the home page or other directly linked pages ("About" page). The website shall indicate the sources of its information that is not owned by the website owner. See 7.4.1 regarding intellectual property considerations. The site shall contain a statement of policy for redress (correction) of inaccurate information found on the website and contact information whereby the website owner and webmaster of the website can be reached.

Identifying the website may include a page with descriptive information on the site owner and contact information, supplemented by banners or logos. The website should indicate whether the site is applicable for one country or internationally. Users should be able to evaluate the credibility of the information presented and identify potential sources of bias.

NOTE In some jurisdictions, contact and website ownership details are legally required.

The site should contain contact information for the site owner, the webmaster, and the website provider. The contact information should indicate whether and how quickly users can expect a reply to their attempted contact.

The site may include contact information relevant to legal rights or recourse in the event of difficulties with site-provided information (warranty).

Contact information may be internet based and should include telephone numbers or physical addresses.

7.1.5 Page title and header

Every web page shall display a distinct descriptive title. The web page title shall include useful and distinctive indication of the contents.

The web page title should be placed in a consistent location and presented in a consistent style for pages of the same type in the website. The HTML <title> should be chosen carefully considering its role in search engine indexing, query responses, window title bar, and in bookmark labels. If structured consistently, it may also improve the orientation of the user in the site.

Web pages should not contain non-essential header data (e.g. between the <head> and </head> HTML tags).

Header data should provide useful information for meeting the service objectives for the target-user community.

The value of the Content-Length entity-header indicates the size of the message body. This field should be populated with a decimal value greater than or equal to zero, whenever the size can be determined (e.g. Content-Length = 2342). For more information see W3C RFC 2616, 14.13.

7.2 Site index and search

Websites shall include an index of all pages relevant to the target audience. The site index shall be available in plain text format for accessibility. Websites with more than twenty static text pages, or with dynamic content, shall offer a keyword or full text search function.

The developers of the website should implement measures with the goal of rejecting malicious queries that result in unauthorized bulk retrievals of the database or damage the site. SQL injection is an example of such malicious inquiries. Although full protection can never be guaranteed, one can take robust actions to reject many common attacks.

NOTE See 7.12 of ISO/IEC TR 24772:2013.

The website shall display a response if no search results were identified for a query.

If the website contains search results whose top placement results are due to payments to the site owner or site provider, those paid results shall be labeled and visibly distinguished from normal results, such as by text font or background shading.

If the search results contain references from outside the website, such site references shall be clearly identified as being external to the website.

A site may have more than one such index if there are distinct target audiences.

The entry field for search should be sized to allow for display of a typical query. The search function may suggest corrected spellings for search data.

The search results should be presented in sufficient detail that the user can determine their relevance. The website should allow the user to sort search results in a useful way, such as by date, relevance, or alphabetically. Users can become frustrated while waiting for retrieval of multiple pages of search results rather than scrolling through an extended set of results retrieved all at once. Website designers should allow users to select how many results to retrieve when searching, within performance limits. Faceted search and browsing by category may be offered when a large number of results are retrieved.

Website owners should consider the implications of referencing web pages beyond the maintained responsibility of the site. Such web pages may vary in availability, size, style, consistency, accessibility, correctness, timeliness, human language, or other requirements of the managed site. A similar distinction may be applicable to any pages indexed which are not managed web pages adhering to the site's guidelines. Contractual arrangements with the site provider may be appropriate to address requirements of the managed site. Maintenance of bibliographies of offsite references may also be appropriate.

Users can expect site index/search results to access internal content and not content from outside the site. If offsite search engines are powering the results, users should be warned that external references may link to non-relevant and non-secure content.

7.2.1 Search filtering

Complex websites may offer an advanced search function that allows the user to further specify the search criteria or filter search results.

7.2.2 Keywords

Web pages shall present keywords in priority or alphabetical order and without duplication.

EXAMPLE <meta name="keywords" content="keyword1, keyword2" />).

"Full text" searches usually exclude commonly used words, such as articles and prepositions. Unless a site offers full text search of its contents, search engines should include a limited number of keywords when indexing pages.

7.2.3 Metadata for indexing

Web pages shall incorporate appropriate metadata to provide for accurate cataloguing and indexing of pages for the environment in which the web pages are accessible. Web pages shall not provide duplicate data to search engines or indexing systems, other than divergent spellings or grammatical forms.

Header tags should include data needed for web page processing (link, style, script) or page indexing (title, meta/keywords, meta/description, PICS, and Dublin Core items.) Where more than four meta-tags are included, the use of link to profiles should be used. Links to style sheets and script files should also be used to facilitate reuse as well as off-loading network overhead.

NOTE 1 The Dublin Core DTD Metadata was developed by the library sciences community, and is applicable to general purpose Web page indexing, see http://dublincore.org/specifications/.

NOTE 2 The Darwin Information Typing Architecture (DITA) specification is specific to metadata tagging of user documentation information.

NOTE 3 In some applications metadata may be recorded as part of the properties for the web page.

NOTE 4 The W3C PICS (Platform for Internet Content Selection) enables labels (metadata) to be associated with Internet content.

7.2.4 Flushing search engines

Search engines may store part or all of indexed pages. As a result, the previous content of a web page can be presented, even after a page has been updated, and incorrect or deleted material can continue to be available. The use of the “description” meta-tag provides a level of control over what is presented. The information incorporated in the “description,” early in the web page creation should take this into account. Resubmission to search engines may facilitate replacement of these references.

Web pages with time-sensitive data may utilize robots meta-tag to instruct crawlers not to cache the page.

EXAMPLE <meta name=”robots” content=”noarchive” />

7.2.5 Robot exclusion

Servers shall incorporate robot exclusion elements based upon the implications of indexing external to the site.

The use of robot technology within a website to create indexes should respect these guidelines.

NOTE Current information on the Robot Exclusion Protocol specifications may be obtained at: <http://www.robotstxt.org/robotstxt.html>.

This approach is “voluntary,” and requires respect from Web-indexing engines. Robot exclusion does not offer protection from malware and email address harvesting, nor does it hide information on a website.

Web page content, even when robot exclusion has been requested, may be indexed or stored by search engines (or users) that have access to the content. Simple removal of the pages does not eliminate the content that may be accessible to users of a search engine. Some search engines have “archival caches” of pages in case the page is no longer accessible. Most search engines include the first lines of pages in their results response (use of “description” meta attribute can provide some control over this).

Inclusion of sensitive data should be considered in this context. Efforts to eliminate data errors or expired pages may require replacement with other content at that URI and re-indexing of that content to flush out archival caches. Sensitive pages should use Cache-Control HTTP header to instruct browsers and proxies not to cache the page (e.g., Cache-Control: no-cache) associated with the content. Also, the page may include a meta-tag for cache-control (e.g., <meta http-equiv=”Cache-Control” content=”no-cache” />) associated within the content. Digital signature or fingerprinting of pages to assure content integrity can reduce risks of user modification of sensitive data; however, it is not possible to take action to assure the elimination of all copies of specific content.

7.2.5.1 Page-level exclusion

The Robots meta-tag allows HTML authors to indicate to visiting robots if a document may be indexed, or used to harvest more links. No server administrator action is required.

EXAMPLE This tag indicates that robots are not to index this document or analyze it for links:

```
<meta name="ROBOTS" content="NOINDEX, NOFOLLOW" />
```

7.2.5.2 Site-level exclusions and control

The method used to exclude robots from a site of a selected set of pages is to create a file on the server that specifies an access policy for robots. This file shall be accessible via HTTP on the local URL “/robots.txt.”

The file consists of one or more records separated by one or more blank lines (terminated by CR, CR/NL, or NL). Each record contains lines of the form

```
<field>:<optionalspace><value><optionalspace>
```

where the field name is case insensitive.

IEEE Std 1003.1-2001 gives guidance on how comments can be included in the file.

NOTE Shell conventions are as follows: the “**#**” character is used to indicate that preceding space (if any) and the remainder of the line up to the line termination, is discarded. Lines containing only a comment are discarded completely and therefore do not indicate a record boundary.

7.2.5.3 User-agent

The value of this field is the name of the robot for which the record is describing an access policy. If more than one user-agent field is present, the record describes an identical access policy for more than one robot.

At least one field needs to be present per record. The robot should be liberal in interpreting this field. A case insensitive substring match of the name without version information is recommended. If the value is “*,” the record describes the default access policy for any robot that has not matched any of the other records. It is not allowed to have multiple such records in the “/robots.txt” file.

EXAMPLE

```
User-agent: * (all robots)

User-agent: Googlebot (Googlebot robot)
```

7.2.5.4 Disallow

The value of this field specifies a partial URL that is not to be visited. This can be a full path, or a partial path; any URL that starts with this value will not be retrieved. For example, Disallow: /help disallows both “/help.html” and “/help/index.html,” whereas Disallow: /help/ would disallow “/help/index.html” but allow “/help.html.” Any empty value indicates that all URLs can be retrieved. At least one disallow field needs to be present in a record.

The presence of an empty “/robots.txt” file has no explicit associated semantics, it will be treated as if it was not present, i.e., all robots will consider themselves welcome. Only a single /robots.txt may be defined. Entries in the file cannot use wild cards or regular expressions in the disallow field, and there is no allow field defined.

7.3 Site navigation

Navigation features shall enable documentation users to go to the following locations from every page in the site:

a) Back, to return to the section/page most recently linked from;
b) Next, next logical topic/page in the sequence of topics (if any);
c) Previous, logical topic/page just prior to the one being viewed (if any);
d) Home page or top-level menu;
e) Table of contents (if any) or index (if any).

A URL pointing to a directory shall have a clearly identifiable page for further information, such as a default file (as set in a server) or a meaningful directory listing for the user community.

Navigation features guide users to information by indicating the locations to which users may move from their current location. Commonly used features for website navigation include hyperlinks displayed in tabs, menus, page headers and footers; bookmarks; cross references; navigational icons; and buttons. The website designer should include labels or explanations of unusual, flexible, or complicated navigational features. For informational websites, the user should be able to click on text or a graphic without the website unexpectedly displaying different information.

The web page should display where the topic is in the hierarchy or where the current topic fits into the total structure (a breadcrumb trail or path of navigation links from the home page). This feature is particularly useful for users who have arrived at a page through an external link or search function, without going through the site's home page. A website that has multi-level menus should allow selection from choices in two levels of the menu, aiding comprehension of the information structure.

NOTE Users can access information more readily from a larger number of specific menu choices than from a small number of non-specific high-level pages.

The main navigation links should remain visible when the user scrolls through a long page, or readily accessible (such as by a "Top of Page" link on a long page). If an embedded active object is used (i.e., Flash) then it should have a description that can be read by accessibility-compliant readers.

Except for required statements of policies and terms of use, and for logon pages, the user should be able to navigate away from any page to another page in the site without entering data.

The location and appearance of navigation aids on the various pages of an Intranet should be consistent. For example, the navigation aid to move the user to the site home page should always be located in the same page position as defined by the high level design of the website. This also applies to the relative location and appearance of other navigation elements such as “Top of Page,” “last 25 items” or “next 25 items.”

Tables of contents or site maps should be provided for large sites to aid users seeking an overview of the contents.

Speed and ease of access to information on web pages should be improved by reducing the number of clicks on the information access paths.

The name of the default page for a directory access is defined in the server configuration. The default page should be named default.htm, index.html, or home.html. The primary navigation environment should be presented when the default name within a directory is used. The Redirect header tag can be used to manage navigation.

Site navigation patterns should be re-evaluated based on user access patterns, collected over time, or navigation graphs (charts showing links between pages).

7.3.1 Links

Links between related topics shall be bidirectional, so that whichever topic the users access first, they may jump to the related information on the other topic.

Textual link anchors shall provide a clear indication of the destination of the link. Links to “under construction” or inactive pages should not be displayed to users.

EXAMPLE Rather than using Click here, use More troubleshooting tips onscreen or in a mouse-over pop-up.

Links should provide information that the user expects in one jump, rather than requiring that the user follow one or more additional links to reach the required information.

Links should be easily recognizable by users, such as by underlining and color-coding. Links should display in a different color after they have been selected.

If the destination of a link is outside the website, the users should be notified that they are leaving the website. The website should provide users with an alternate way of locating the information, in case the external link has been broken or the destination removed. Similarly, download links for large files or videos should be clearly marked as such including the file format and file size.

7.3.1.1 Absolute and relative links

Links within a website should be relative to the linking page, and not to the site root. Sites may wish to establish a reference point for relative references (e.g., top-level directory) and use <BASE HREF= … /> to establish the reference point (use of the BASE tag may complicate site relocation). Links to external websites should use persistent URIs, where available. Site pages intended for external reference should provide persistent URIs, where applicable. Digital Object Identifiers (DOI), as defined by the DOI Foundation, may be useful as persistent URIs.

The class designation “duplicate link” should be used to designate additional navigational links which duplicate one on the page. One instance should not be designated a duplicate link. This allows style sheets to hide these redundant links from users where this may be a distraction (especially for aural presentation).

7.3.1.2 Links to protected websites

Links to protected websites and pages should, indicate that the website is password protected or requires a subscription or registration. This annotation may be color-coded for maximum effect, to alert the user to the restrictive nature of the website.

7.3.2 Offsite warning

To assure that the seamless nature of the Web does not mislead the user about the source of the content, the website shall display clear notifications when the user is navigating from a site to other sites.

The notification may point out a change of security domains, or Links that lead offsite may be tagged with “<a …class="offsite">” as a method for creating a CSS controlled visual distinction. Depending on the situation, it may be useful to require browsers to use this information to implement specific policies, such as managing the history information (or cookies), blocking transfer, presenting the link with some warning icon, or presenting the user with some “leaving xxx site” warning.

As an alternative, “<… Class="onsite">” may be used to indicate links that are known to be appropriate for seamless transition. With the use of this approach, browsers should implement the “offsite” action for links that do not include this attribute.

7.3.3 Usage tracking and cookies

The project plan shall document the decision to use, or not use, cookies; and the implementation shall be consistent with this plan.

The use of cookies shall be described and the user given an option of receiving these cookies as an explicit action. Websites that use cookies, Web beacons, or other technologies which collect information on customer usage shall have a privacy statement available from their home page or general information page(s) that explains their use of such technology. Websites shall disclose if usage of prior site information is collected and if information is shared with other organizations. If cookies are required and the required cookies are not received, the site shall provide relevant feedback to the user as an error message (testing for this is not easily automated).

Additional information on security and privacy aspects of cookies is in 7.6.3.

It may be useful to use cookies to maintain state between page accesses. Tools can be used to verify that use of cookies is intended for a given site.

7.3.4 Frames

Frames shall identify the source and ownership of frame contents. Frame presentation of third party content shall indicate the source and ownership of the content.

The _blank target, or other means of creating new windows, shall not interfere with the user’s ability to return to their page history.

Various methods can be used to encapsulate graphics or other page elements on a page that are transparent to the user. If design includes the use of frames, then provision should be made for the user community to choose a no-frame implementation of the same content. This should be considered in the maintenance plan as well.

NOTE 1 This relates to requirement 22(o) of US 36 CFR 1194, commonly called Section 508.

NOTE 2 To avoid being “encapsulated” it may be appropriate to include a <base target="_top" /> HEAD entry to force linked page(s) to acquire the full, original window. Scripting may be used to detect encapsulation and reloading the current content into the _top frame.

7.4 Website content

The presentation format of a website should be independent of the information content of the website. Independence of content and format allows use of different display formats and use of different media for accessibility. Independence of content and format also simplifies site maintenance by content providers and website providers or webmasters.

NOTE 1 A variety of techniques support independence, including cascading style sheets (CSS), semantic mark-up, such as XML or DITA, and functions provided through a content management system. The choice of media is still influenced by the capabilities of the website provider and the users display device (such as small-screen mobile devices).

NOTE 2 Requirements and guidance for selection of text or graphics media for software user documentation are provided in ISO/IEC/IEEE 26514:2008.

Comprehension and navigation are key engineering design considerations. Non-textual information (e.g. video, graphics, audio) can consume significant bandwidth, but can also provide advantages in delivering information in a coherent and easily comprehended way. The use of small-screen mobile devices, low bandwidth environments of some users, the inclusion of an option for text-only delivery, adaptation for the visually impaired, and delivery in multiple languages are issues that should all be considered.

7.4.1 Intellectual property rights

Web pages may contain intellectual property that belongs to the owner of the Web page or to a third party. Web pages may also contain information considered in the public domain, which varies depending on national law and regulation. Disclosure of intellectual property rights (IPR) to website content and users' agreement to terms and conditions of use should be reviewed by a legal counsel.

7.4.1.1 Copyright information

Every web page has an implicit copyright, subject to the legal jurisdiction in which the work was created or claimed and any contractual arrangements between the developer and other interested parties. The website should include a specific copyright statement eliminating any ambiguity about the applicability of copyright. The copyright statement may be kept in metadata. Even if the intention is to make material available in the public domain, the wording to be used should be reviewed with experts familiar with the relevant jurisdiction(s) enforcement of the rights of other copyright holders.

Web pages should include a <link rights=" " /> entry.

7.4.1.2 Trademark information

Web pages and websites may use trademarks that are the property of either the site owner or another party. These trademarks may be used within the scope of the site or used within the domain name, metadata, or a dynamic database that generates the Web page. Because the international trademark system is both industry- and geographically-oriented, this inherently presents the potential for conflicts between website owners and trademark holders. Web pages should include information, including applicable Rfield designations, that helps resolve these conflicts. This could include meta-tags, explanations, and links to the appropriate information regarding the trademark owner.

7.4.2 Time-sensitive content

Website design shall include a clear way to identify the areas changed without the need for navigating the whole site.

A Web page shall include a page date as an RMfield (<pagedate>, or <... class="pagedate">). This indicates the most recent date when a change considered being of value to the target-user communities has occurred. Each Web page shall include an expiration date as an Mfield or RMfield (<expirationdate>, or <…class="expirationdate">). This date indicates the earliest date that the page information may be deleted.

All dates shall be presented with four-digit years.

If time is included, the time zone shall be specified. Because local time in this context may be ambiguous, time-zone designators are recommended (UTC or UTC-offset) when indicating the time.

Website design may segment information content by creation, expiration, or revision date and incorporate this into the overall website design. Some information has a limited useful life. Stock quotes, telephone directories, product specifications, organizational charters, and archival background information change at different rates. The nature of the information and the need of the user to have “current” or historical information affect the contents of Web pages, as well as the methods used to deliver and annotate these pages.

EXAMPLE A website may contain information on several versions of a software or hardware product, some of which are no longer actively maintained by the original manufacturer, but for which assistance is available from a wider user community. A website for a program may contain specifications which were applicable at the time of when the contract was signed.

The segmentation should be at the page level. A policy for the expiration of the changed-pages list should be described. Date and time information may be displayed by default or on request.

The page information may be changed during this period, but the type of information presented on the page should remain constant or the user redirected to the new location of the information.

The expiration date serves several functions:

- A basis for automated deletion or archiving of the page,
- An indication that can be used by pages linking to this page of its expected life span, and
- A basis for exclusion of the page from indexing or search query processes.

The value “archival” may be used to indicate that the page contents are not expected to change; some form of persistent URI should be considered for archival pages where ongoing reference is expected.

Web pages should include applicable dates from this list:

a) Date of creation, represented as an Mfield (<datecreated>, <… class="datecreated">), which is used to indicate when the content was created.

b) Date of last modification, represented as an Mfield (<datemodified>, <… class="datemodified">). Changes in this date may occur without substantive changes in the content of the page. (Mfield is suggested since this date is considered only to be of use in page management, but not for target-user communities.)

c) Content date, represented as an Mfield or RMfield (<contentdate>, <… class="contentdate">), which is used to indicate that the content was current as of this date. This may not reflect changes in content from a previous content date.

d) Date of next content review, represented as an Mfield or RMfield (<nextupdate>, <… class="nextupdate">), is used to indicate when a review is scheduled. Substantive changes might occur prior to this date, and some form of user notification may be needed in certain business situations. (See 7.8 on active links also.)

e) Date of retirement, represented as an Mfield or RMfield (<dateretired>, <… class="date retired"> may be used to indicate when a page has been archived and is no longer considered active. Organizations with requirements for archiving some or all information may want to include use of this date in their website project plan.

Content expiration and/or content review dates should reflect the expected rate of change for the content. Website maintenance tools should use these dates. These dates can be expected to be different from the cache expiration date, (see 5.2.). An automated notification should be sent to the content owner before or when content expires, so it can be updated in a timely manner.

If the purpose of the above dates is for internal maintenance rather than use by the target-user community, it may be appropriate to maintain the information independently from the page content.

Designers should use ISO 8601:2004 as a reference. This International Standard recommends the date format: YYYY-MM-DD (all digits) for dates. Where needed, dates may include time and time-zone, based upon Coordinated Universal Time (UTC). HH:MM:SS should be 24- hour format if it has to be machine-readable.

ISO 8601:2004 recommends the following time designation format:

YYYY-MM-DDThh:mm:ssTZD

where:

YYYY is year

MM is month (01–12)

DD is day (01–31)

The letter “T” is required if time is specified

hh is hour (00–23)

mm is minute (00–59)

ss is second (00–59) (decimal fractional extensions may be incorporated)

TZD is time-zone designator

value should be “Z” for UTC

or +hh:mm for positive (east) displacement from UTC

or –hh:mm for negative (west) displacement from UTC

This format should be used in any machine-readable fields where date is included in the field. For date independent (time only) machine readable fields the time subset should be used.

NOTE Although ISO 8601:2004 recommends this date format, IETF RFC 1123:1989 specifies the format exemplified by Sun, 06 Nov 1994 08:49:37 GMT, and that format is required by HTTP 1.1 in response fields.

7.5 Presentation of information on websites

7.5.1 Consistency

Navigation aids, buttons, user readable body metadata (similar content), and other items commonly appearing on multiple Web pages should be consistent across the site. The consistency should include the common look and feel as well as a common position on the Web pages.

7.5.2 Presentation of text

Text presented on web pages should be legible.

NOTE Lack of contrast between text color and background color (such as dark blue or dark red text on black background, or white text on white background) results in illegible text which is still visible to automated searches. This practice is not recommended.

The website design should support the use of common browser tools to enlarge text or shorten line lengths. The use of topical headings, short sentences (fewer than 15 words), short paragraphs, and restricted vocabulary can support reading comprehension for text on websites. For legibility, fonts with simple letterforms, large x-height and large counters have a much more discernible shape. Extended text in ALL-CAPITAL letters, text type size outside the 9-12 point range, very short lines and very long lines all make text harder to read.

7.5.3 Graphic images

Graphic elements shall contain declared height/width display size, permitting the immediate allocation of page layout for these and concurrent rendering.

The alt attribute shall be used to label a graphic and facilitate understanding of the content of graphics by persons who are not displaying graphics with their browsers. This also facilitates indexing.

Images shall not be used to present text in an alternative style. This is disruptive to text-only browsers, it limits accessibility and global applicability, and it can have a negative impact on performance.

The use of consistent style sheets can reduce page size, and provide for reuse of style for subsequent pages. Reuse of images, as opposed to use of new images, can reduce download time by taking advantage of local caching.

Alt attribute descriptions should start with unique information, for example, “home button” rather than “button for home page,” and use functional descriptions where applicable. Longdesc can be used to provide detailed information about graphical content where it is warranted.

Multiple graphic images at the server should be considered, providing for lower bandwidth connections, and/or user choice. A potential convention is to have a “thumbnail” graphic delivered, which is also a link to a higher resolution graphic as an option for the user community.

Where a server may deliver images in multiple formats, image URIs should not include a specific format name structure (e.g., xxx.gif). To allow for content negotiation with users and to minimize overhead in response, a diverse set of image formats should be provided.

Images should not be used to bypass HTML limitations or provide “style” control. Where available, CSS should be used. If email addresses are presented in images, they should be presented in a form that is accessible as text, but discourages their harvesting by robots, for example, by spelling out "at" and "dot" and including spaces.

Graphic presentation of written materials for certain languages, cultures, or disciplines may be necessary.

Sites should support image formats for JPEG, PNG, and GIF for compatibility, and seek to deliver the least overhead image acceptable to the client. For animated images, Network Motion Graphics (NMG) should be supported, and scripting or client-side executable languages may be more efficient means of providing the required functionality. Animated GIF images may not display correctly or be deprecated in newer system environments, and should be avoided.

To facilitate access by older browsers that do not support longdesc, the website designer may also provide an anchor link to that same data (longdesc takes a URI as its value).

For security purposes, firewalls and gateways can convert or block certain data types. Hence, the client may not receive the expected graphic.

7.5.4 Animations, 3D, sound, video

The user shall be able to control dynamic media objects (audio or video) by starting, pausing, restarting, and stopping them. The website shall indicate that selecting a link will launch audio or video content.

If presentation of dynamic media requires the use of specific client software, the website should provide information on the requisite media player and where it may be obtained or downloaded from a trusted source, such as one hosted and maintained by the supplier of the media player software.

Each animation, 3D, sound and video should have a description that can be read by accessibility-compliant readers (alt attribute).

Blinking or repeating animations are generally a distraction in the presentation of ICT information and should be avoided unless inherent in the information.

NOTE Animations that represent system processing or real-time event presentations may not be controllable by the user.

7.5.5 Use of color in websites

The website shall not present information solely by the use of color, unless no target users of the site may be color-impaired.

Designers of web pages should avoid color combinations that cause problems for individuals with color impairment in its various forms. Designers of website should avoid using these color pairs for background/foreground of text, or of any objects (e.g., links, borders or icons) which need to be differentiated by color: red and black and bright shades of red and green, blue and orange, green and magenta, cyan and yellow, magenta and blue, yellow and orange, and green and blue.

Backgrounds should be lighter shades than text. The use of reverse combinations (e.g., white or yellow text on black or dark blue background) is less legible and should be avoided in extended text on informational websites. Reverse combinations may be used for banners or titles.

7.5.6 Interactivity

The website should offer provisions for registered user feedback, such as ratings on the usefulness of content, comments, or questions, and may display associated guidelines for acceptable feedback. Users should receive a response from the site or through email that their feedback has been received and how it will be used. Functions for user feedback should have security provisions to protect against intrusive attacks on the website. Refer to 7.7 Privacy.

7.5.7 Collaboration and user generated content

Websites that post comments or user-generated content shall clearly indicate when displayed information is not provided by the site owner, and whether the site owner has any responsibility for the accuracy of the user-generated content.

User-generated content can be a valuable addition to a website, particularly for open-source software or IT products lacking in support from the originator. The website should state the website owner's policy regarding user-generated content that may be considered defamatory, offensive, or illegal. The website owner should review user comments and content before posting to the website to determine their relevance to the website's purpose and audience.

EXAMPLE A website includes user self-help articles reviews, comments and ratings on its user self-help articles, which may deprecate the usefulness of the information, product or service. The website owner does not post comments that disparage competitive products, offensive comments, or comments relating to matters in litigation.

7.5.8 Energy and environmental conservation

Web pages consume energy for viewing as well as printing resources. The website owner should take into account organizational or industry Green (eco-friendly) guidelines related to usage of color, fonts and background for web page viewing and printing. Energy conservation should be part of the design criteria when the Web content will be accessed from mobile devices operating on batteries. Environmental protection should be part of the design criteria when the Web content will be printed. Colors, fonts and backgrounds that can save energy and printing should be considered.

To reduce printing to paper, web pages with printable content should provide an alternate way to render and output the content to an electronic postscript file or an email message.

Web pages that need to collect information from the users through forms should implement online fillable forms instead of printed forms.

When a Web page print function is required, the website should provide a print-friendly version of the page, with streamlined content optimized for printing.

7.6 Security

A website owner or website provider shall have a security policy to safeguard business and personal data. Because some vulnerabilities allow unauthorized persons to run malicious code and thus take over any device with a MAC and IP address, website developers and providers shall take precautions to help prevent their site from becoming a host of malicious code or other attacks.

The security policy for website design, security controls, and development practices shall be made available to developers and support staff whether a new development or a modification of an existing page or site.

Website security encompasses human access as well as machine-to-machine interfaces, such as electronic devices for enterprise use, as well as electronic appliances and other consumer products with a networking

capability, including allowing remote control and monitoring. Such networkable devices have a MAC address and get an IP address on a home or enterprise network environment, and so become subject to security vulnerabilities. Additional security issues can be created through the way the live environment is configured.

NOTE Controls as defined in ISO 27001:2013 should be used as guidance or normative requirements Common vulnerabilities, include Injection, Cross Site Scripting /XSS, Broken Authentication / Session Management, Insecure Direct Object References, Cross Site Request Forgery, Security misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Insufficient Transport Layer Protection and Invalid Redirects and Forwards.

The security policy should cover the following activities:

a) Authorization,

b) Authentication – including password policy when user ID/password is used in lieu of hardware token/PIN, and session management,

c) Auditing,

d) Ensuring a proper balance of confidentiality, integrity and availability of all website data,

e) Encryption,

f) Use of cookies and other amalgamations of user data,

g) Coding best practices,

h) Privacy and the handling of Personal Identifying Information,

i) Roles and responsibilities as they apply to the website owner and developers,

j) Prevention of SQL injection where databases are used,

k) System architecture and configuration, which may include having separate web, application and database servers or involve clustering, load balancing or virtualization,

l) Sufficient and safe logging for unusual conditions, monitoring and alerting facilities to allow audit.

Security designations or characteristics should be included on the page using one of the following Resource Description Framework (RDF) standards:

1) RDF tags based on the Dublin core metadata initiative (http://www.w3schools.com/rdf/rdf_dublin.asp)

2) The W3C standard RDFa Core 1.1 (http://www.w3.org/TR/2012/REC-rdfa-core-20120607/)

The exact wording will vary in different organizations, and may have legal implications (which will vary by country). Typical security “banners” include:

- XYZ Corp. Confidential
- Internal Use Only
- Public Information

Pages without appropriate security designations may be implicitly public information (even though protected by copyright) or lacking in essential legal protections, depending on the legal jurisdictions from which they may be accessible. The security designation will not assure automated enforcement of the security designation.

Pages should avoid “welcome to” or any similar language, as that may be considered by some legal authorities as an open-ended invitation to attackers. Instead, the pages may have a narrative description about the business or the page in question.

In an Extranet environment, pages should include similar banners in a way that is consistent with the associated Extranet community. Collaboration may permit sharing of confidential information, and such pages would carry corporate-specific banners; or collaboration may generate confidential information within the collaboration, and have designations specific to that arrangement.

Declaration of security designation should not be considered sufficient to provide security control. Site design should include evaluation of passwords, encryption, and other techniques to provide additional security controls.

A qualified person associated with the website owner should assess the adequacy of the security indicators and security protection for the page and should subject each page with a security designation to a review. The person should conduct the review before the page is initially placed on the Web. The review will consider both the code for the page and the displayed page. Consideration should be given to viewing the page with all possible browsers, including mobile devices. Periodic reviews should be performed for conformance to security policies. Reviews may be at regularly scheduled intervals, as a result of a review-triggering event (e.g. page change), or when major architecture changes are to be implemented (e.g., expanding to the Internet or adding Extranet components).

7.6.1 Authentication

If a page is not designated for public access, authorized users should be required to sign in using a one-time password (OTP). OTP can be generated using a hardware token and corresponding personal identification number (PIN), a software application or an email/SMS service. When this is not feasible, or in conjunction with OTP, a user ID and password pair should be employed.

EXAMPLE The following guidelines produce stronger passwords:

- User ID should be eight (8) characters or longer
- Passwords should be at least ten (10) characters with at least two of each type of symbol:
    - Upper case symbols (A-Z)
    - Lower case symbols (a-z)
    - Numbers (0-9)
    - Special symbols (such as ?!#$%& or ~)

In case there are a defined number of consecutive unsuccessful attempts to login with wrong credentials, access by the user should be locked out for a defined number of hours. To avoid unnecessary inconvenience for a legitimate user, the lock-out period may be overwritten if a subsequent attempt is made with the correct credentials and from an IP from where the last successful login happened.

There should be additional security measures (e.g. security questions or image interpretation) for users who are logging in after a certain duration as defined in the security policy (e.g. 90 days) or using other devices than what they use normally. Website administrators should provide users advanced notice of the date by which their passwords need to be changed to avoid inactivation of their accounts.

Passwords should always be transmitted over secure transport and stored in one way hashed encrypted format. Recommended secure transport protocols are Secure Sockets Layer (SSL) and Transport Layer Security (TLS).

7.6.2 Authorization

All data input by a user shall be security checked (for example, data within expected range) prior to initial use of that data.

Authorization should consider permitted access to each page of the site and not just the home page. Role-based authorization should be used whenever certain classes of users are allowed access to certain pages or sections of the website.

Authorization determinations should also be applied to a website's metadata.

All data should be checked prior to each use of that data.

Search engines should flush old indexing information either at the end of a session or upon logoff, whichever occurs first.

The home page should clearly indicate if site access is restricted and who to contact to request access.

If authorization information is retained between visits, the user should be advised on what information is retained, in what form (for example, via the use of cookies), and for how long.

7.6.3 Cookies

The user should be allowed to opt-in to the use of cookies. The user should be informed, upon initial access to the site, what information is stored in the cookie, the consequences of opting out of using cookies, and how cookie information is used between sessions. Cookies should be set with an indicator to be deleted at the end of a session if not used for auto-login feature. Use of cookies between page accesses should only be done if the same page is accessed multiple times during a single session.

Use of third-party cookies (from analytics, scripts, and images, or if the cookie includes any external content) can lead to inadvertent insertion of malware and should be assessed for risks.

7.6.4 Digital signatures

Digital signature and other fingerprinting mechanisms may be applied for page integrity and authentication. This would be appropriate when it is necessary to assure the material presented has not been changed, as when posting price data or other data that is secured for legal or business reasons. Digitally signed PDF files can be considered for this purpose.

Information related to this may be communicated through header extensions or related files, or it may be implicit in the content body. Resigning pages may be problematic, so attention is needed to the immutability of the data (including links, etc.) within the signed area

7.6.5 Single sign-on

Website developers should consider implementing single sign-on if use cases suggest scenarios where the user will have to access multiple independent but related systems to perform a specified task or set of tasks. One of the following approaches may be used for single sign-on: NTLM, Kerberos, OpenID, Security Assertion Markup Language (SAML), Open Authorization (Oauth).

In implementing single sign-on, developers should avoid exchanging hard-coded passwords between systems, as these can be easily discovered and used as a medium of attack.

7.6.6 Data encryption

Data that is either sensitive or considered to be Personally Identifiable Information (PII) shall be encrypted both where it is stored (encryption of data at rest) and in transit between the user and the installations which store and/or make use of the data (encryption of data in transit).

All pages except those designated for public access should be transmitted over SSL or TLS. SSL certificates should be obtained from a public or enterprise-wide Certificate Authority. The Certificate Authority should be one whose certificates are trusted and supported by all relevant browsers and devices.

7.6.7 Security measures and metrics

The website provider should collect and track security measures and metrics beginning with development and continuing into production.

Security measures may include the following:

- Number of security incidents
- Costs to resolve a security incident
- Mean time to discover a security incident
- Mean time to resolve a security incident
- Number of vulnerabilities
- CVE score for each vulnerability computed using CVSS (see nvd.mitre.org)
- Mean time to address a vulnerability
- Number of security patches
- Mean time to patch
- Number of configuration items (CI) – total
- Number of CI with approved change requests
- Number of CI where approved change requests were implemented during the period
- Number of CI where approved change requests were not implemented during the period
- Number of CI where, based on automated configuration audits, the version number of the CI differed between two successive audits

7.6.8 Continuous monitoring and risk assessment

Once a website is launched or significantly modified, the owner and website provider shall regularly monitor the site's security attributes and assess security risks.

The following should be included in any risk assessment:

a) Development framework used to develop the site,

b) Any underlying databases,

c) Access vectors – is the site exposed to the Internet or is it only internally accessible,

d) Existing security protections, such as Web application firewalls or host-based security systems,

e) Analysis of the security metrics and trends.

7.7 Privacy

Information associated with identifiable individuals and personal data such as geographic location of the user, salary, birth date, and family members are subject to privacy considerations. In some cases, the geographic location, date and time of access, or IP address of the user, combined with other data, may allow individual identification of the user. The responsibility for protecting individual privacy in handling sensitive personal information applies to both the website owner and the website provider.

NOTE Requirements and restrictions on individual privacy vary among jurisdictions, cultures, and national boundaries.

Top-level pages shall include links to applicable privacy policy statements. The links should be placed in similar locations on the pages, such as in the web page header or footer.

End-user data shall not be gathered without explicit user consent. In some countries, this is related to legal issues.

Users of online systems often avoid submitting feedback because they fear their contact information or their comments will be disclosed or shared with unauthorized third parties. User confidentiality, anonymity and personal contact information shall be protected, and the user should be notified by the web page about the organization privacy policies that pertain to how the information submitted is protected. In the case the user information is subject to disclosure due to policies or applicable laws (i.e.: public records laws, QA policies, etc.), the user shall be warned before the information is submitted.

All information collected from a user that would individually identify the user shall be discarded when the user terminates the session prior to the delivery of the prescribed item.

It is acceptable to retain the data collected if the user accepts the retention of data (such as for return for later completion of the action) at the time the session is terminated. The user shall be informed of the length of time for which the information will be retained. The user shall be informed about the use of data for commercial and promotional activities and the website shall obtain the user's consent prior to its use.

Anonymity shall be allowed upon user choice, with the potential of not providing the service or the information requested.

Indexing of websites by conforming Web page generation tools shall adhere to the information technology industry Robot Exclusion Standard (Robot Exclusion Protocol).

The site owner and site provider shall establish a privacy policy, covering

a) the nature of the information gathered or tracked,

b) how the information will be used,

c) with whom the information will be shared.

The site owner shall declare on the site its conformance to the following privacy requirements concerning notice, choice, onward transfer, access security, data integrity, and enforcement.

The user may be asked to allow retention of data, when the data to be collected from the user requires a significant input from the user. Informative messages should be provided to explain the needs of the service and to exhibit some contact points for further clarification.

Indexing can provide a back door to restricted information. This may require restricting access to the index or excluding restricted information from the index.

7.7.1 Notice

The site owner shall notify individuals about the purposes for which they collect and use information about them. The site owner shall provide information about how individuals can contact the organization with any inquiries or complaints, the types of third parties to which it discloses the information and the choices and means the organization offers for limiting its use and disclosure. The non-disclosure agreement shall be between the site owner and the user and be bounded by a specified time frame, after which the information will be destroyed.

The site owner may obtain the user’s personal information prior to allowing the user critical data access. Further, the site owner may obtain a non-disclosure agreement with the user to prevent unauthorized data sharing.

7.7.2 Choice

Organizations shall give individuals the opportunity to choose (opt out) whether their personal information will be disclosed to a third party or used for a purpose incompatible with the purpose for which it was originally collected or subsequently authorized by the individual. For sensitive information, affirmative or explicit (opt in) choice shall be given if the information is to be disclosed to a third party or used for a purpose other than its original purpose or the purpose authorized subsequently by the individual.

7.7.3 Onward transfer (transfers to third parties)

To disclose information to a third party, organizations shall apply the notice and choice requirements from 7.7.1 and 7.7.2.

Where an organization wishes to transfer information to a third party that is acting as an agent it may do so if it makes sure that the third party subscribes to the privacy principles or is subject to the same regulations for control of data. As an alternative, the organization can enter into a written agreement with such third party requiring that the third party provide at least the same level of privacy protection as is required by the relevant principles.

7.7.4 Access

Individuals shall have access to personal information about them that an organization holds and shall be able to correct, amend, or delete that information where it is inaccurate

7.7.5 Security

Organizations shall take reasonable precautions to protect personal information from loss, misuse, and unauthorized access, disclosure, alteration, and destruction. Data encryption shall be used when sensitive user's information is being retained.

7.7.6 Data integrity

An organization should take reasonable steps to determine that data is reliable for its intended use, accurate, complete, and current.

7.7.7 Enforcement

To ensure conformance with the website privacy policies, the website owner and website provider shall declare:

a) Readily available and affordable independent recourse mechanisms so that each individual's complaints and disputes can be investigated and resolved and damages awarded where the applicable law or private sector initiatives so provide;

b) Procedures for verifying that the commitments organizations make to adhere to the privacy policy have been implemented. That information provided by the user may be retained or used for legal purposes in the case of privacy, access and acceptance policy violations.

7.7.8 Reporting

During a detected violation or non-compliance with privacy policy by a site user, the website owner and website provider may collect information for forensic purposes

7.8 Accessibility

The target-user community evaluation shall take into account the likely existence (or future existence) of individuals who will need to access the information or services of the site and who have limited sight, color blindness, mobility impairments, audio impairments, or require other special considerations, as well as ergonomic requirements for general ease-of-access and ease-of-use for users.

Non-text media, such as graphical images or video, shall have alternative text descriptions.

The design process shall include consideration of conformance to Level Triple-A of the W3C Web Accessibility Initiative (WAI), published in ISO/IEC 40500:2012. Web pages should conform to the Web Content Accessibility Guidelines (WCAG) Level A or Level Double-A.

Web page text to background luminance-contrast shall exceed 33% (better than 67% recommended).

Web pages shall not include flashing or blinking objects which have a blinking frequency or flicker rate greater than 2 Hz without consideration for photosensitive epilepsy impact. Frequency greater than 55 Hz is acceptable under 36 CFR 1194.22(j).

Where timeout is applied, a mechanism shall be provided to allow a user to indicate more time is required.

Forms shall use label and tab index designations to allow persons using assistive technology to access the fields and functionality required to complete and submit the forms.

Web pages shall use the TABINDEX attribute in conjunction with the A, BUTTON, INPUT, TEXTAREA, and OBJECT element and any input control where this provides a logical sequencing to access these elements.

Where a set of pages contain common initial links, and/or duplicate links, TABINDEX shall be used to present unique links for this page first. To allow the user to avoid duplicate links, TABINDEX shall be used to present duplicates after all links have been sequenced once, and a ‘refresh’ link provided to reset the series without traversing the duplicates. For forms that have more than one logical section, for example, personal information, billing information, ship-to information, FIELDSET and LEGEND elements shall be used to identify these sections.

Form fields should have associated LABEL elements (affects TEXTAREA, SELECT, and INPUT fields of type TEXT, PASSWORD, CHECKBOX, email, number, date, RADIO, and FILE) or use WAI ARIA techniques

Repetitive navigation links should be assigned a TABINDEX value of zero (which should result in these being presented at the end of the tabbing sequence).

Web pages where the primary page content does not start immediately in the BODY element should define a DIV element with the attribute ID="content" to enclose the primary content in HTML4, or should use the <article> tag in HTML5. This will facilitate access for users of restricted or special browsers, such as those used by the visually impaired.

The user should have the alternative of selecting a text-only page, without style sheets or frames.

The website should be accessible from different devices, such as mobile phones, tablets, or personal computers, at resolutions depending on target-user needs. Websites should have techniques to identify different platforms and, browsers and may have compatible versions for site access.

The World Wide Web Consortium's At a Glance (http://www.w3.org/WAI/WCAG20/glance/) summarizes key concepts of website accessibility considerations as follows:

Perceivable
- Provide text alternatives for non-text content.
- Provide captions and other alternatives for multimedia.
- Create content that can be presented in different ways, including by assistive technologies, without losing meaning.
- Make it easier for users to see and hear content.

Operable
- Make all functionality available from a keyboard.
- Give users enough time to read and use content.
- Do not use content that causes seizures.
- Help users navigate and find content.

Understandable
- Make text readable and understandable.
- Make content appear and operate in predictable ways.
- Help users avoid and correct mistakes.

Robust
- Maximize compatibility with current and future user tools.

Web authors should apply parsers and validators to validate that standards are set for content, CSS, and accessibility related details. Archived content should be periodically reviewed for usability with current standard tools and platforms.

Legal requirements for access vary by jurisdiction. Practical considerations may change as web-based information becomes either "mission critical" within an organization or displaces other forms of communication with target-user community individuals. Information about current guidelines and related initiatives from the W3C can be found at http://www.w3.org/WAI.

Use of the 216 "Web safe" colors is recommended. These colors are selected, in hexadecimal format, with RGB values that consist of any valid combination of 00, 33, 66, 99, CC or FF only. Thus the luminance for any specific RGB color can be computed as: luminance = 0.3 °— Red + 0.59 °— Green + 0.11 °— Blue.24.

Timeouts or refresh should be used with care to assure users can understand and interact with pages correctly.

Specification of all possible TABINDEX elements may be necessary to assure proper browser sequencing. Sequencing should be verified with target browsers.

Web pages should use the ACCESSKEY attribute with the BUTTON, INPUT, and TEXTAREA tags to initiate the related functions. ACCESSKEY should be considered for initiating link operations with the A and AREA tags as well. When specified, ACCESSKEY designators should be made visible to users and given a distinguishing style (which should be done with CSS class/style designations) to facilitate user awareness. ACCESSKEY designations should avoid overlap with browser and operating system defined shortcuts.

NOTE Browsers and assistive technologies do not have a common set of shortcut key (accesskey) assignments.

Pages should use a common look and feel, including the location of a common set of navigation buttons. The first link on a page should be a link to the unique content of this page and be identified with alt text such as 'skip navigation' or 'skip to content. This initial link may need to be a 1x1 pixel image that is not visible to users operating on a visual basis, but will be presented to individuals using audio or Braille output where avoiding the repeated information is important

7.9 Translation and localization

Web access quite often spans multi-cultural domains and/or international boundaries. Websites shall take into account international and cultural requirements of the target-user community as part of the design process.

If a specific culture is a significant target-user community for page content, review should be performed by experts in that culture.

NOTE Refer to W3C Internationalization (I18) Activity translation and localization for design and implementation assistance> http://www.w3.org/International/.

It is appropriate to establish site conventions for data types such as PNG, JPEG, GIF, HTML, file or directory naming (e.g., ".fr" for French version, ".en" for English, etc), where using a dash symbol "-" in file/directory naming to space different words is preferred for better indexing. Some client environments may not be able to handle data types if the file extensions vary from common usage.

Sites should include a meta-tag containing a meta statement declaring the jurisdictions in which the site is intended for use: "<meta name="intended for use" content="list of ISO 3166-1:2013 country codes" />".

7.9.1 Browser language selection

Translations shall include error messages displayed to users.

To facilitate accurate indexing and ease of access for users, Web pages shall include the LANG meta-tag declaring the primary language environment(s) for each page.

An example of use in the <HTML> tag is <html lang="en-US" />, although the lang attribute can be inherited (including use in the span and div tags) for page segments with language changes. The declaration of the language of presentation shall be the native language of the Web page.

Websites should evaluate the client's human language environment selection and initialize or deliver pages responsive to this within the overall context of the target-user community. The user should be able to select the language of preference from the browser environment using the ISO 639 language code or name of the language, and this should be provided to the server via the HTTP "Content-Language" header. If the preferred language is not available, then the user should be given a selection of languages, if these are available. When a user has elected to see a page in a specific language, this should override the user's preset preference; and this may require use of information about the link that leads to the target page (see 7.5.5.)

NOTE Graphics of flags are not recommended for selection of languages. Flags represent countries, not languages.

Website designers should consider that some languages and browsers take more or less space than the source language to present translated text. The impact of languages read vertically, left to right, or right to left on the placement of information and graphics on the page should also be considered.

Legal considerations also need to be incorporated into design of multilingual websites; some countries require delivery of certain information in specific languages. When using a single language in a multi-cultural environment, the style and simplicity (including use of idioms and specialized terms) of the language should reflect the target-user community.

Automated translation tools may provide capabilities that meet the need for multilingual delivery. These may be more effective if Web contents are developed with automated translation as an objective. The Web design should consider the possible implications of user initiated automatic translation. Where translation is required the results should be verified. If automatic translation links are provided using external translation engines, the user should be advised of the automatic nature of the translation, and the potential for unintended changes in content and clarity in the translated text.

The two-letter codes identified in ISO 639-1 should be used to indicate common languages, which may be followed by a hyphen and a two-letter country code to denote variants The <dir> (directory) tag may also be needed to denote information for proper sequencing of presentation.

The lang attribute should be used by tools for both creation (e.g. spelling checkers, etc.) and presentation (e.g., speech synthesizers) where applicable. For multiple language versions of a document, the link element with alternate, lang, and an appropriate URI may be used to indicate the URI for alternate-language versions. Also, the server may deliver alternate language versions based on site-specific conventions.

7.9.2 Icon use

Icons can be international symbols or may be culturally dependent. Icons should be accompanied by text or alt attribute to provide for navigation by individuals who are not familiar with the icons used, individuals traversing the Web by text, and persons with visual/motion impairments. Icons may be selected from those defined in the ISO/IEC 11581 series for international use. Icons may have trademark or legal implications as well.

7.9.3 Holidays and time zones

Holidays vary between cultures and may even be specific to a particular locale. The Web page should provide dates in universal formats (See ISO 8601) as well as any culturally-specific terms. The website should not be designed on the premise that all users accessing the page will use the same time model as the page designers. Time-zone variations as well as “work day” variations should be considered in this context.

7.9.4 Place of origin

The country or place of origin shall use the two-letter country code identifier from ISO 3166-1:2013 for an RMfield or an Mfield.

To facilitate interaction with the target-user community, or for legal protection, it may be useful for the well engineered Web page or website to indicate the country or place of origin. If country of origin is to be included, it should be an RMfield, or an Rfield and an Mfield (<origin>, <... class="origin">). Web pages may include location designations (or exclusions) where these relate to specific legal jurisdictions.

7.9.5 Hemisphericals

Some references are hemispherically oriented. Winter means something different in the northern hemisphere than it does in the southern hemisphere. Equating seasons to months should be avoided. References such as “west” or “east” may be culture- or hemisphere-specific (testing for this is not easily automated).

7.9.6 Units: metric, monetary

Web pages shall use measurement unit(s) applicable to their target-user communities. Outside the United States, units of the modern metric system (SI Units) are the standard for measurement, and in most of the world they are a requirement for commerce.

The monetary units defined in ISO 4217 shall be used (testing for this is not easily automated).

Monetary units are nation-specific. Web pages should state monetary units in terms and currency symbols applicable to the context (both use of reference and intended user community). Some currency symbols are overloaded (such as “$”) and require additional qualification based on the user community.

7.9.7 Regulations

Business practices vary between legal jurisdictions in addition to those ways indicated above. Comparative advertising, price quotations, intellectual property, or other forms of information may be regulated or prohibited in specific environments. Website owners should review the commercial limitations of the page contents with experts in these areas, as applicable. If advertising is accepted on a site, it may be evaluated for consistency with the ethical expectations of the targeted user community and with legal restrictions.

To facilitate cross-border exchange of data, websites should prominently identify if there are geographic restrictions or conditions that affect potential users from other countries that may want to obtain technical information from the site. This information should be easily accessible from the home page and available if users are required to provide contact data to obtain information.

7.9.8 Contact Information

When presenting or collecting physical address information, the website should include country and postal code information. It may be useful to collect country or postal code information before other information to minimize the user entry required.

NOTE Postal codes vary in format, and validation code should take this into consideration.

8 Website platform engineering

8.1 Selecting technical formats and standards to use for the website

The website designer shall accommodate website access by devices and software prevalent in the target user community.

The website designer should consider the legacy and anticipated evolution of the users' target environment, as well as likely changes in technology, to minimize the need to re-engineer websites to accommodate technical changes.

NOTE The rate of adoption of new technology at the consumer level often exceeds that of industry and the public sector.

EXAMPLE Devices that should be considered include the following:

— Wireless and mobile devices,

— Video enhanced telephones,

— DVD or TV devices with Web interfaces,

— Braille display units,

— Access-specific and/or text-only devices,

— Vehicular display units,

— Display units for controls and appliances.

Designers should consider what will be implemented as programmable hardware logic instead of writing software applications to make use of the new protocol, as with each new protocol or protocol subset, the software application may be redundant or inhibit performance. Considerations should include screen display area (which can be quite small on some of these devices); latency of communications (e.g. satellite links, wireless channel bandwidth, etc); and, limited (or non-existent) local cache/storage. Caching is a powerful tool to improve performance, but cache state management requires attention. Software tools like AJAX can improve performance and response time of web applications in low bandwidth networks by improving on client and server side processing. These tools in conjunction with caching can yield significant performance improvements. Similar considerations related to communications bandwidth and costs are required. Limited bandwidth and “per minute” tariffs are common on an international basis and in the emerging mobile and radio communications environments.

Protocols or protocol subsets to support this next generation of mobile devices may require additional consideration in selection of target protocols. Consideration should be given to use of the Wireless Applications Protocol (WAP), and XHTML base protocol.

Websites should monitor client browsers and capabilities as a basis for ongoing environmental documentation updates. Website designers should also remain aware of the need for the website to be compatible with browsers not currently in use by clients, especially because people who are disabled and people with different browsers may join the client group at any time.

The technology and standards related to the development of websites changes rapidly over time with the development of new versions, and changes in the technology in the browsers and other software capable of viewing them. Designers should consider portability of legacy code as well as the core metadata having the capability to make use of cloud web services and apps. Support for older formats is eventually deprecated within browsers, so websites that are developed using older technologies need to be updated or risk becoming unusable or inaccessible for their audience. Therefore designers should investigate and select formats and technologies that are currently well supported and likely to retain that support in the future. Portability to different standards should also be an important consideration. This is especially true for multimedia formats.

Standards for HTML, XML, and other data formats can be found from W3 consortium, and the guidance in these standards for supported use should be adhered to by the designers and developers of the website.

It is a recommended practice that the content and the presentation of information on websites are separate from each other. This has the advantage that the content can be transformed into different formats and displayed in different ways for users. In this way it may be useful to create the content in a self-defining and flexible format such as XML, and then later transform it into more browser friendly mark-up such as HTML that is likely to evolve over time.

8.1.1 HTML versions

The version of HTML, and the features within that version of HTML, should be selected based on the client environment of the target-user community. For example, frames are incompatible not only with old browsers, but also with some types of output devices like voice synthesizers or (line) tactile displays. Such features should be given critical evaluation in the design phase. Removal of an architectural feature like “frames” can require significant redesign. Web page developers should be familiar with XML and evaluate how, if, and when to incorporate XML into a website.

As a default, new Web pages should use HTML5 or XHTML in its HTML compatible form. Some of the XHTML compatible guidelines should be included in the website project plan, even where older browser compatibility is required (for example, lowercase tags.)

NOTE See the html-xhtml authoring guide at www.w3c.org for essential elements of XHTML compatibility.

8.1.2 Cascading style sheets

Web pages shall separate the presentation from the content, to the extent that it is feasible.

The trade-off between accommodating a greater range of target-client browsers using page-specific characteristics and the maintenance advantage of page-independent presentation offered by style sheets shall be included in website design.

Web page generation tools should support CSS as an external style sheet, only using site-developer specified/selected ‘class’ (or ‘id’) attributes and avoiding the ‘important(!)’ designation so end-users can apply their own style sheets to match their preferences/requirements.

The decision to use cascading style sheets (CSS) should include evaluation of the capability of target user environments.

A simple example is using color in Web pages. Explicit incorporation of color is one option; style sheet incorporation of color is another. The same color scheme can be applied to a diverse set of pages in a consistent way using a style sheet, reducing coding and maintenance effort. A change to the common style sheet, rather than changes to the many pages using that plan, can accomplish a change in the color scheme. Moreover, specific user communities may want or need to override the color selection put forward by the design (visual impairments for example), which is only viable with a mechanism such as cascading style sheets.

Similarly, if hard-copy printing of a page is desirable, the CSS printer presentation style should be included.

8.1.3 Bandwidth efficiencies

The first bytes (including <head> bytes) have the most impact on network overhead. Transport Control Protocol (TCP) operates with a “slow start,” awaiting an acknowledgment of initial packets sent before initiating a full sequence of transmissions. This avoids congestion of the net that may be directed to a nonresponsive site. This makes the data transferred first from the server, and initial elements of the page (e.g., <head>, etc) more critical in response time and network loading. Data in the <head> sequence should be focused to minimize overhead, and provide essential data to the client. Since the HTML format calls for all metadata to be in the <head> section, the developer should test changes in code in order to maximize bandwidth efficiencies.

Tags expected in the head section of a Web page including minimal overhead would include: 'title', 'link' (to style sheets), 'meta' (as designated in Dublin Core plus 'keyword', 'description', or "http-equiv"), 'base', 'script', 'object'. Where extended sets of metadata, style or scripts are included, the 'link' element should be used to reduce 'in page' overhead. Relevant information about the metadata should be indicated with the 'profile' attribute of the 'head' tag.

To facilitate indexing presentation of a collection of related pages, indicate the “initial” page in all of the pages with the “link” element.

EXAMPLE <link rel="start" type="text/html" href="first_page.htm" title ="whatever the title of this set should be" />

8.1.4 Document type declaration

Static web pages have initial lines with <Content-Type>, which may also be applied to dynamically generated Web pages. <!DOCTYPE.> indicates the DTD applicable for this page. XHTML pages should have the initial <?xml version=”1.0” ?> declaration, and for HTML consistency may need to include both HTML and XHTML head elements.

NOTE Head data gets preferential treatment in network transfers, and it is assumed that it will all be transferred for the client to be able to establish the environment for page processing. The incorporation of extraneous data at this point is poor Web page engineering.

8.1.5 Description meta-tag

The Description meta-tag may be used to provide guidance to search engines on what to present users in the search response (e.g. <meta name="description" content="response" />). W3C guidance defines and recommends usage for Description meta-tags. Search engines often display the first few lines of a Web page to help searchers to identify the sites they want. Some engines display the Meta-tag Description attribute instead. This display can persist long after the actual Web page has been deleted. Therefore, for specific information to be visible, early page placement can help. If information is to be visible, then early page placement should be avoided (for various reasons search engines may be displaying pages that the designer did not intend to have publicly available). Finally, to assure old information is not presented by search engines, it may be necessary to replace the page with a “no longer available” message page for an extended period of time to provide for search engine replacement of the earlier data (resubmission may also be useful.)

8.1.6 XML considerations

XML provides mechanisms for delineating document structure in ways that are responsive to business objectives. A well-formed HTML document is one instance of an XML document. XML provides for new tags that can be content specific, and facilitate automated processing of content. Within the HTML environment, XML-type structures should be designated with the id and class attributes, and potentially the and elements.

Within an HTML 4.0 document, id is defined as being unique, and can be used as an anchor for fragment links, whereas class can be duplicated many times within a document. Both id and class can be used to distinguish a page segment for style sheet presentation control (developers should verify that usage of 'class' and 'id' for style specification work for the targeted range of browsers). Websites may plan for the accommodation of a range of browsers identified in the target user community client environment during the design planning

process. This can be accomplished by identification of browser types and delivery of different sets of pages based on this, or by ensuring that the critical information content for a page can be effectively presented by the full range of browsers. Browser and version-specific dependencies should be avoided.

8.1.7 Image formats and compression

During content negotiation with the server, the server may identify that the client can accept compressed content. Compression of static pages will reduce site and network overhead. Delivery of compressed dynamic pages may be a useful trade-off to deliver content to the client with the least connection overhead.

If data is also to be encrypted, it should be compressed first.

Similar formatting of images into efficient formats, such as the Joint Photographic Experts Group (JPEG), Portable Network Graphics (PNG), or graphical interchange format (GIF), can also provide timely response to clients that can accept these more efficient formats. The smallest acceptable image should be transferred to the client. Client selection of data formats may be critical to client-side applications, and should be respected when possible. Thumbnails, which are miniature pictures of an original that is scaled down, should also be provided for large size images.

8.2 Server technology independence

Depending on the target audience and the desired sophistication of the pages, a Web page may make use of server side capabilities such as server side include (SSI), active server page (ASP), or other capabilities. It is desirable, whenever possible, to produce pages that do not depend on server settings or capabilities. Two recommendations in this area include the following:

a) Avoid links to a directory in a relative reference. Instead point to the file within the directory. For example <a href="detail/"> should be <a href="detail/index.htm">. The “default file” may vary from server to server, pages that reference directories may not be portable from one server to another.

b) Whenever important elements such as navigation elements are provided through server support, these navigation controls should also be provided directly, perhaps through a text menu at the bottom of the page.

Because more server code is treated as comments by browsers, these pages will be usable across a wide range of servers even though their appearance may change.

The ultimate goal is to allow pages, whenever possible, to be moved from server to server, and even be moved onto CD-ROM for distribution without suffering from broken links.

8.3 Scripting and executable considerations

Client side execution such as scripting may be refused by clients. Part of the design process shall include documenting when, if ever, such facilities will be used.

If a site requires scripts for some features, then the server shall notify the user that downloading of scripts is required. Selection of specific tools or versions of implementations shall be considered in both the context of the target-client environments and the life cycle management of the website.

Because client environments may disable client execution or scripting for security reasons, servers should be able to deliver information without scripting. Where possible, standards-based environments that are processor-, operating system-, and browser-independent should be targeted.

8.3.1 Scripting languages

Scripting languages are widely used, and supported by most recent browsers. Scripts can operate on the server side using, for example, the common gateway interface (CGI) or on the client side through scripts embedded in the page or applets. However, not all browsers support client-side scripts and users may turn off

both Java and client side scripting. This may be a matter of corporate security policy, or to reduce the distraction of intrusive dynamic elements. The W3C stipulates that any Web page using client-side scripts is required to provide the same functionality on the page without the scripts in order to be considered accessible.

NOTE 1 See Techniques and Failures for Web Content Accessibility Guidelines 2.0 at www.w3.org.

Dynamic page creation should be focused on server side scripting/programming. This facilitates end-user accessibility, the range of target devices, and security.

NOTE 2 Persons accessing pages using non-visual means have trouble identifying dynamic page changes, and become frustrated with scanning duplicate content to identify changes.

8.3.2 JavaScript

When a web page uses JavaScript or ECMAScript, the environment will provide the ability to execute the script through HTML <script> elements.

NOTE ISO/IEC 16262:2011 includes a specification for ECMAScript.

EXAMPLE JavaScript is <script>document.write(" Sample text for a web page ");</script>.

JavaScript is commonly used to write functions which are embedded or included in the HTML code of a web page. These functions interact with the DOM of the web page. Some advantages JavaScript has over HTML are that it can detect user actions while HTML cannot, can run locally in a user's browser which enables the application to be more responsive, and supported by the several browsers.

If a link requires an outside agent for further processing or to obtain a file, like a.pdf, then it would be considered an access limiting practice.

8.3.3 Java

The Java web programming language is used on the Internet and Intranets and provides considerable application functionality through the use of Java applets for client-side or through servlets for server-side. Offline and standalone capabilities are possible using Java Web Start (JWS) or Java Network Launching Protocol (JNLP). For enterprise web applications, dynamic web pages can be generated with servlets implemented in a web framework or using Java Server Pages (JSPs) compiled in a servlet in runtime. Java is capable of yielding excellent performance and security relative to CGI scripts. Java Foundation Classes (JFC) with the Swing libraries offer, among other functionalities, user interface flexibility following the pattern Model View Controller (MVC). Because browser support for Java is inconsistent, websites that utilize Java-only web pages should provide supplemental web pages for users requiring enhanced accessibility, who cannot use Java functionality on web pages.

8.4 Database management system considerations

Databases used in web environments enable the data persistence or dynamic update and integrity of the site. Databases may be used in the presentation of website content, in collecting tracking information and in the management of the website. Most website management tools use database environments to organize and manage resources. The website designer and provider should consider the responsibilities and tools to define the architecture for centralized, local, and distributed databases.

Database management systems should be selected so data can be used, exchanged or distributed to different platforms without significant changes in configuration and web programming, and in consideration of anticipated traffic and website growth with the scalability of the database and host environment.

Database engineers should consider data access and security needs for encryption of data.

9 Evaluation and testing of websites

9.1 Evaluating site usability

The website developer shall develop criteria for evaluating website usability by analyzing the target-user community and information to be retrieved. The website developer shall prepare test cases to evaluate the user interaction with the website.

The website tester shall test performance capabilities of the website, simulating the anticipated peak load to be supported when the site is in operation. The evaluation shall include the anticipated client environments of these target-user communities. Diversity of browsers in use, complementary capabilities (e.g. script, byte code, graphics), and the bandwidth of connectivity shall be included in this environmental evaluation.

Website assessments shall be done on the object(s) (text, graphics, layout, navigation, multimedia, etc.) as delivered to typical client device(s), and not assuming that generation tools will convert the source accurately.

The website tester shall check for errors in text and links on static as well as dynamically generated pages.

Web page designs should be subjected to design reviews in keeping with good engineering practices. Depending on the value and expected impact of specific website, additional reviews may be warranted. The design review subject matter may include evaluations of the graphical design, legal implications, cultural impacts, linguistic review, market research, accessibility and usability. The design review should span the entire range of functional objectives, technical capabilities and constraints throughout the system. The review should also address the capabilities and limitations of the target user community. The insertion of new technology into the system requires the widest range of reviewer experience. In addition, the content should be subjected to review by applicable experts and other users.

The website in development should be tested and evaluated for effective human-computer interaction.

NOTE 1 Taking into consideration the different perspectives of different users, ISO/IEC 25010 provides guidance and a framework for discerning quality requirements within the context of different user perspectives. The International Standard contains a quality in use system model with a number of characteristics that covers the human-computer interaction systems in use. For measuring and evaluating system quality, it provides consistent terminology for referenced during system testing. For reporting usability test results, see ISO/IEC TR 25060:2010.

Common user interface characteristics can be tested by heuristic evaluation methods, such as visibility of system status, and other heuristic methods used in the interface development cycle.

Simplistic “hit rate” measures may not be sufficient unless Web pages for low-bandwidth or text-only users are being compared to equivalent Web pages. A representative measure may be the time or the number of keystrokes required of the user community to arrive at the desired end page.

NOTE 2 Refer to ISO/IEC 25060:2010 for Design Standards for Usability.

Quality assurance should be part of site planning and development. The project plan should indicate specific tools and processes to be used during implementation to assure the quality objectives are met.

Web pages should be subjected to proofreading and quality assurance. Proofreading should involve the use of the full range of browsers, screen resolutions, and browser window sizes and shapes.

The quality assurance process should validate that the presentation meets all the objectives and requirements of this recommended practice and other applicable standards. It should also validate the user requirements.

During evaluation of the system to be developed, the quality attributes should be based against a common standard.

NOTE 3 ISO/IEC 25020:2007 provides the criteria for selecting software quality measures and quality measure elements along with the issues affecting the reliability and/or validity of measures. It provides a guideline and a framework for measuring quality requirements and evaluation of software products.

9.2 Testing websites before release

The website owner and primary webmaster shall establish the methods, processes, and procedures to test the site prior to release. The website owner and primary webmaster shall establish procedures to

a) report discovered errors or defects;

b) track errors and defects;

c) correct errors and defects;

d) report the correction of errors and defects.

Development testing shall be conducted as part of the implementation process. Development testing of websites shall address requirements in various areas, such as:

- Web pages shall exhibit accessibility features.
- Websites shall provide security controls such as passwords if access is restricted, to reduce the threat of unauthorized control of resources.
- Websites shall be tested for content protection, especially protection of sensitive information, from malicious changes.
- Viewing web pages shall be tested on a variety of displays and with different resolutions and color settings to verify that web page content remains readable and legible.
- Cross-browser / cross- platform support: because different browsers have different rendering engines to parse and display HTML/CSS, etc., web pages shall be tested across multiple browsers to verify that web pages function in different browsers.
- Hyperlinks shall point to an existing, loadable web page (no dead links) that is relevant to the title of the link.

NOTE Web links that do not use the exact wording found on the target page may need human intervention to validate the link.

Validation testing should be pursued in at least two distinct phases: development testing and operational testing.

9.3 Validation of markup language and accessibility conformance

Submission of Web pages to validation tools shall be done in a way that is consistent with the proprietary nature of the information content.

Web pages should be submitted for either internal or external validation of HTML or XML for DTD conformance and WCAG2.0 compliance using tools such as the W3C Markup Validation Service http://validator.w3.org Operational validation

Even though no changes have been made to a website, its operations may change due to changes elsewhere in the network. Therefore, links identified within the website and external resources used within the website (such as data feeds, pictures, videos, and frames) should be validated and updated on a regular basis. The validation process is in addition to live broken link error handling that should be included inside the HTML code, scripts, and other website elements. Using web analytics tools supports statistical measurement and evaluation of website performance and success of conversion rates. Analysis of daily unique hits, monthly page views, and browser statistics can support the validation of the following:

a) Correction of invalid links, either changed to a currently valid link or removed from the site.

b) Identification of orphan pages and a decision to remove the page, link to the home page, or to leave the page (possibly due to external traffic to the page from a different user profile).

c) Affirmation that resources such as images, videos, and other site content are still valid and a decision to replace or remove references to unavailable resources.

d) Verification that links have not been “hijacked” and link to the intended information.

e) Verification that different protocols such as HTTP, HTTPS, FTP, and others are working properly and have updated certificates, authentication controls or other validation methods.

9.3.1 Active links

External links shall be tested before and after each system release.

The website owner or provider shall periodically test external links to verify that all links are still active. Automatic review of links should help to quickly identify targets that are not valid anymore, but human review of links may be needed to validate that the correct content is linked. Use of persistent URIs may help to avoid some of the problems created by these references.

Links that go to pages with critical information should provide indication of the last verification date as an Mfield (<linkverified>, <… class="linkverified">).

9.3.2 Dead links

Care should be taken that all web links are up-to-date. Dead, inactive, or missing links severely detract from the utility of a website. The website owner should periodically verify that all links are still active. Many times, links become out-of-date, and merely serve as placeholders for the actual web link. Websites demand periodic maintenance to insure that links are current. Automated tools exist that check the existence, if not veracity, of web links. Site designers should avoid over-specifying websites in order to avoid web link obsolescence. In general, the greater the specificity, the more likely the link will become outdated. On the other hand, a more generalized website address can force the user to burrow down several layers in order to get to the precise website needed. The site designer should exercise judgment between over-specifying the website link or forcing the user to do extensive searching once connected to the site in question.

10 Site management and sustainment

10.1 Website life-cycle management

Web pages, websites, and Web projects have a lifetime—a life cycle. The website owner and developer shall estimate the duration of the life cycle, and plan for website management and sustainment during its active life cycle and support the execution of the plan.

The website management planning should take into consideration the potential technical changes, changes in standards, regulatory changes, policy changes, security, business continuity, financial issues, and organizational aspects that may require changes in information content, protection, designation, or access.

10.2 Planning for site management and sustainment

The website management plan shall include requirements, processes, responsibilities, and budgets for the website sustainment and maintenance, website performance, stakeholder involvement, and website retirement. Websites shall have a problem management process.

Website maintenance planning should identify the source and responsibilities for the following, depending on the complexity, size and user base of the website:

a) Maintenance and support organization,

b) Processes and responsibilities for handling website scheduled maintenance,

c) Website performance standards and measurements to assess its effectiveness,

d) Processes and responsibilities for handling website event-triggered maintenance,

e) Processes for user support, if offered,

f) Process for approval of changes to content and to support software, including monitoring for changes in client or server environments that may require or warrant website reengineering,

g) Website enhancements or reengineering,

h) Verification and validation of the enhanced or reengineered website,

i) Configuration and release management,

j) Security and business continuity, including risk management,

k) Periodically validating site content, such as eliminating or clearly labeling obsolete information content or discontinued services; updating the status of information or services; validating and updating links to related information.

NOTE ISO/IEC/IEEE 12207 provides more information on software support processes. ISO/IEC/IEEE 20000-1 addresses the supporting processes for a service management system. Both include requirements for configuration management and problem management, from different perspectives. IEEE Std 828-2012™ specifies requirements for configuration management.

10.3 Providing user support

The website shall provide a point of contact for the site: the webmaster. The point of contact e-mail address shall exist and be actively monitored for messages in keeping with the criticality of the site(s).

This may be necessary to notify a site of problems that preclude successful access to the site or its proper content. Presentation of the email address may be formatted to avoid automatic harvesting.

Websites should make answers to frequent questions simple to find and simple to understand with minimal human intervention. Some websites provide self-service technical information with provisions for additional tiered user support through a help desk. Technical support websites should have a mechanism for users to submit questions, such as an online form, online chat or an e-mail which is routed to technical support.

This is a required e-mail address, even if it is not part of the page content. This is not an alternative for having information concerning the content owner, the person responsible for the information content presented.

The person(s) actively monitoring for messages should direct the message to the person(s) assigned the responsibility for responding to the message. A website may have multiple webmasters responsible for independent subsets of the website. In this case, the person(s) monitoring for messages should direct the message to the appropriate internal Webmaster.

10.4 Maintenance procedures and methods

Website maintenance should be planned, executed, monitored and controlled to keep a website functional, accurate, current and accessible. The website provider should plan for maintenance to include procedures for scheduled (preventive) and unscheduled (corrective, event-triggered) maintenance.

10.4.1 Backups

Website information and configuration settings shall be backed up and stored on a regular basis so that they can be restored.

Backup procedures shall include tasks and responsibilities before the backup, during the backup, after the backup and during restorations.

Security of the backups shall meet or exceed that of the backed up website.

The website provider shall periodically verify that websites can be successfully restored from backup, or that dynamic content can be regenerated. The checks can be automated or performed manually by simulating restoration to verify its integrity. The website provider shall inform the website user of the length of time required to reactivate the website from a complete loss of service.

Backup content should include code, data and databases, multimedia resources, and other files that contain the website and make the website functional.

NOTE Backups may be accomplished by the use of continually mirrored sites rather than by periodic backups.

Backup procedures should be specified using automatic backup mechanisms when feasible. Identification of the backup should include website identification, date and time information, responsible party identification, and other relevant information that may be needed to restore the website on another machine. Backup procedures should specify the service responsible for storage of the backup copies. Storage should be off site from the website in case of disaster. Multiple off site locations, each with its own backup copy may be considered.

Security of backups may include encryption of the backup.

Restoration of the information methods, processes and procedures should consider the backup media retrieval and the backup media usage. These methods, processes and procedures may be different for different situations. For example, retrieval may be different for a partial verses a complete retrieval. The reason for the retrieval may also cause use of a different set of methods, processes, and procedures. For example, retrieval due to unintended site destruction, security breach, or a natural disaster each may require a different set of methods, processes and procedures.

10.4.2 Content changes

Effective websites are designed to minimize the sustainment effort needed to change the website content. A change in content can be due to changes in organizational strategy and policy, technology, standards, or errors and defects. Changes in policies (e.g. organizational, regulatory, and legislative) and stakeholder needs can lead to changes in information content, protection, designation, or access.

The website owner, webmaster, and website provider shall establish the methods, processes, and procedures to control changes and keep the site content current. Individuals shall be designated with responsibility to develop updated content, approve updates, and release updated content into operation.

The website owner and primary webmaster shall establish the requirements and procedures to handle out-dated (no longer current) content. The requirements and procedures shall include:

a) how to identify when content is no longer current, for example the product being discussed on the web page is no longer manufactured, is no longer sold or has been substantially changed;
b) how to notify users that the content is no longer current, this may include on page notification, e-mail, or other means;
c) who to actively notify that the content is no longer current, this may include notification to webmasters of inbound links that the content is out-dated and, if applicable, a link to the current content;
d) how to handle out-dated content, this may include permanent archival, time based archival with eventual removal or removal. See 10.5 Archiving.

NOTE The procedures may be to assign responsibility to individuals to update page or site content as needed, allow a select set of people to make comments or maintain an online conversation such as in a blog environment, or schedule updates with version controls (see versioning below).

10.4.3 Site or page relocation

Changes in client or server environments may require or warrant site modification or re-engineering (e.g. the shift from desktop to mobile devices, the shift from central data to cloud computing, the discontinuation of a hosting service or program). It is likely that a site and/or pages within a site will need to be relocated over the life of that site.

Techniques to accommodate this include a site-specific Cname or Domain Name Service (DNS) entry, for example “http://mysite.domain.com.” This allows “mysite” to be changed to a different set of systems in a transparent way. This can also provide for redundancy, fail over, and similar capabilities. Where possible, accesses to the old location should resolve or be redirected to the new location.

Site-specific names should not include a specific machine name, location name, or other element that is likely to change with time.

Physical Internet Protocol (IP) addresses should not be used, except in maintenance applications where a specific physical target is essential. Be aware that the application of dynamic addresses on the client side may not provide the desired physical target even with specific IP addresses.

Documents of enduring relevance that are accessed via a website should be provided with URLs that are similarly enduring. For example, the path coded in a URL should not mirror the transitory organization of the website. The organization of the website may change; the URL to access enduring documents should not.

If, when HTTP Error 404 (page not found) is encountered, an informative page with links to key parts of the site (and a means of searching the site) is provided, the site will be much more usable following relocations of material.

Relative URLs and host relative URL servers can use the “redirect” capability of either HTTP or server scripting to return the right page to the user. This can be used to accommodate changes in page location. Relative URLs allow for:

- Migration of pages within a site.
- Maintenance of a replica or development version.
- Consistent digital signature/integrity validation.

10.4.4 Redirection

Redirection or refresh of a page shall not inhibit a user’s ability to navigate to prior pages. Users shall be allowed to return to the page from which they initiated a hyperlink.

Redirection may be initiated by a server to provide better response to user request. Reasons for applying redirection include:

a) Page location changes (see 4.2.8).

b) Catch directory changes and direct request to the correct URI.

c) To accept and resolve mistyped URIs.

d) Eliminating case dependencies in URIs.

e) Adjusting for differences in object name extensions (e.g., htm/html, jpg/jpeg, etc).

f) Common spelling errors that may be site-specific.

g) Provide default for attempts to access directories.

h) Delivering selected Web pages to client from a selection list.

i) To accommodate language preference (see 6.3.7).

j) To accommodate text-only preference.

Redirection has the advantage of providing back the corrected URI so that bookmarking occurs with this version. The designer should consider the value of having directions for users to implement the redirection manually, when appropriate.

Servers should respond to attempts to access invalid links within an existing site by redirecting such requests to a defined working page with an explanation of the error and some navigational hints.

10.4.5 Versioning

In some cases, a website can approach the complexity of a software project, particularly if the site implements interactive functionality or involves multiple developers and/or departments. In such a case, a software maintenance process of versions and version release should be adopted to provide a disciplined basis for the maintenance activity. The webmaster should consider the following:

a) The website should maintain developer accountability for all changes made to the scripting/framework/structure/"code".

b) A source code control system may be used to coordinate code changes, especially when multiple developers are involved.

c) Separate modification timestamps should be provided for content updates and for scripting/framework/structure/"code" changes. The timestamps will aid in identifying pages where testing or debugging should be focused.

d) New site versions should be fully tested before being released to the site audience.

If style sheets are not available, the website design should use an alternate method for indicating page classifications. Style sheets may be used to indicate obsolete pages or other classifications (e.g. "draft," "confidential") as "background." An alternate method for accessibility to users with physical disabilities should be included.

10.5 Archiving

At the end of a site's life, some informational Web pages may need to be removed from the website (internet). Other Web pages may be "permanent archival" material remaining on the Internet, with little maintenance of content, and with an unbounded life span.

When a site is permanently removed from access or deleted, it should also be removed from search engines and directories.

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g) Techniques and Failures for Web Content Accessibility Guidelines 2.0 <http://www.w3.org/TR/WCAG20-TECHS>

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Abstract: This standard defines system engineering and management requirements for the life cycle of websites, including strategy, design, engineering, testing and validation, and management and sustainment for Intranet and Extranet environments. The goal of this standard is to improve the usability of informational websites and ease of maintenance of managed Web operations in terms of locating relevant and timely information, applying information security management, facilitating ease of use, and providing for consistent and efficient development and maintenance practices. .It applies to those using web technology to present information and communications technology (ICT) information, such as user documentation for systems and software, life-cycle documentation for systems and software engineering projects, and documentation of policies, plans, and procedures for IT service management. This standard provides requirements for website owners and website providers, managers responsible for establishing guidelines for website development and operations, for software developers and operations and maintenance staff who may be external or internal to the website owner's organization. It applies to websites for public access and for limited access, such as for users, customers, and subscribers seeking information on IT products and services. It includes increased emphasis on the human factors concerns for making information easily retrievable and usable for the intended audience. It focuses on vendor- and product-independent considerations.

Keywords: 23026, website management, website engineering, webmaster

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