Ministry of Communications and Information Technology

National Information Center

General Department of Information Technology

Information Systems Department

Section Policies and Standards

Web Site Standards

Commission on software standards

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Table of Contents:

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

1

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

2

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

3

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

4

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

5

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

6

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

7

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

8

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

9

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

10

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

11

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

12

1. <u>Introduction</u>

The **Sudan** joined early the communications and information revolution in the region, but it wasn't the same case for the development and application of standards and specifications to information technology and communication (ICT) is long overdue, and more recently started to think seriously about this recognition of the importance and ensure the success of e-government projects, which rely mainly on scientific standards and specifications and the Court.

Outcome of the standards in the National Information Centre on the establishment of a specialized unit in the area of standards in 2007 and made valuable efforts in the formation of three committees to develop standards and specifications in the field of information technology and the **committees** are:

- Committee on Standards in hardware and networks.
- Committee on Standards in operating systems, confidentiality, insurance.
- Commission on software standards.

    In addition to committee for standards of training centres, maintenance and services.

The importance of standards:

The importance of standards in that it managed to create an environment characterized by quality, advanced technology, where it:

- An effective way to create a strong infrastructure.
- A way to lay the foundations of assessment and measurement of quality as well as reduce cost and risk and simplify the actions.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

13

- Facilitate the measurement of the benefits of information technology and growing acceptance, satisfaction, and thus it expands the scope of the spread of information technology.

- Improved communication between the relevant actors and encourage the consolidation of joint action.

- Increase the competitiveness and sustainability at the local and global products and services.

This document is one of Software Standards Committee products where the Web site standards important to assist those involved in the creation of Web sites to base their decisions on the most current and best available evidence. The standard is particularly relevant to the government design of information-oriented sites, but can be applied across the wide spectrum of Web sites

The Sudan portal known as the web portal , also known as a links page, presents information from diverse sources in a unified way. Apart from the standard search engine feature, web portals offer other services such as e-mail, news, stock prices, information, databases and entertainment. Portals provide a way for enterprises to provide a consistent look and feel with access control and procedures for multiple applications and databases, which otherwise would have been different entities altogether. This standards will help the Government in building a web portal Sudan.

All Sudan Government Web sites must comply with the Criteria and indicators for assessing the government's Web sites.

1.1 Life of this Standard

National Information Center (NIC) reviews standards every 5 years. At that time, standards are reaffirmed, rescinded, or revised according to the submitted updates. Updates to be included in the next revision should be sent to the committee chair or to National Information Center (NIC).

1.2 Purpose

National Information Center (NIC) created this set of guidelines for several reasons:

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

14

1. To create better and more usable government Web sites and web portal.

2. To provide quantified, peer-reviewed Web site design guidelines.

By addressing these issues, the *standard* will help enable organizations to make more effective design decisions.

2. Scope

The audiences for the *Guidelines* are Web site managers, designers, and others involved in the creation or maintenance of Web sites or web portal.

2.1 Normative references

1. Research-Based Web Design & Usability Guidelines **, Michael O. Leavitt**(Secretary of Health and Human Services) and **Ben Shneiderman (**Professor of Computer Science, University of Maryland).

2. **Web Content Accessibility Guidelines (WCAG) 2.0,** W3C Recommendation 11 December 2008.

3.Definition Of Terms

3.1 Above the fold

The region of a Web page that is visible without scrolling. The area above the fold will vary according to a user's monitor size and their resolution settings. The region above the fold is called a screenful.

3.2 Active voice

Active voice makes subjects do something (to something). For example, in 'Jill selected the link,' the verb 'selected' is in the active voice.

3.3 Anchor links

Anchor links can be used on content pages that contain several (usually three or more) screenfuls of information. Anchor links allow users to skip through textual information, resulting in a more efficient information-finding

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

15

process. Anchor links are best arranged as a table of contents for the page. See also **'Within-page links.'**

3.4 Applet

A mini-software program that a Java- or Active X-enabled browser downloads and uses automatically.

3.5 Assistive technologies

Technologies (software or hardware) that increase, maintain, or improve the functional capabilities of individuals with disabilities when interacting with computers or computer-based systems.

3.6 Auto-tabbing

A Web site feature whereby the data entry cursor automatically moves from one entry field to the next as a user enters a pre-determined number of characters. For instance, when entering phone number data in three separate entry fields of three digits, three digits, four digits, the data entry cursor would auto-tab from the first field to the second field once the user has entered three digits, and again from the second field to the third field once the user has entered another three digits.

3.7 Banner

Banners are graphic images that commonly function as Web-based billboards. Banner ads generally appear toward the top-center of the screen, and are used as attention-grabbing links to other sites.

3.8 Breadcrumbs

Breadcrumbs are a navigation element that allows users to orient themselves within a Web site, or efficiently move to one of the intermediate pages. Breadcrumbs are usually placed near the top of the page (generally immediately beneath the browser's address bar). For example, if users are reading about the features and benefits of 'widget x,' breadcrumbs might show the following information:

Home > Products > Widget x >   Features/Benefits

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
      Standards

16

Breadcrumbs allow users to find their way to the homepage and ensure that they won't easily become lost. Breadcrumbs should be designed so that users can click on any of the words in the breadcrumb string to jump to that section of the Web site.

3.9 Card sorting

A method used to identify categories that are inherent in a set of items. The goal of card sorting is to understand how a typical user views a given set of items. Card sorting can be done manually by writing items on individual paper cards, and then asking users to group together similar cards. This also can be done using many different software systems. The grouping information from all card sorters is then combined and analyzed using cluster analysis software.

3.10 Cascading menu

A menu structure where submenus open when the user selects a choice from a menu. Cascading menus are particularly useful in hierarchically-complex Web sites.

3.11 Check box

A control element that a user can click to turn an option on or off. When the option is on, an '**X**' or '3' appears in the box. Check boxes are conventionally used when users may select one or more items from a list of items.

3.12 Clickability cues

A visual indication that a given word or item on a Web page is clickable. Cues that can be used to indicate the clickability of an item include color, underlining, bullets, and arrows.

3.13 Client-side

Occurring on the client side of a client-server system. JavaScript scripts are client-side because they are executed by the user's browser (the client). In contrast, CGI scripts are server-side because they run on the Web server.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

17

3.14 Cognitive walkthrough

An inspection method for evaluating the design of a user interface, with special attention to how well the interface supports 'exploratory learning,' i.e., first-time use without formal training. The evaluation is done by having a group of evaluators go step-by-step through commonly used tasks. It can be performed by evaluators in the early stages of design, before performance testing is possible.

3.15 Connection speed

The maximum rate at which Web pages are downloaded to a user's computer. Connection speed is often quoted in bps (bits per second). Common connection speeds include dial-up (modem) at 56,000 bps, DSL/cable at 500,000 bps or higher, and T1 at 1,500,000 bps or higher.

3.16 Content page

A Web page designed to convey specific information to a user. Content pages

are often found two or three clicks deep within a Web site. The defining characteristic of a content page is a reliance on text, graphics, and pictures that are designed to convey information on a given subject to users.

3.17 Continuous text

In a Web context, continuous text comprises sentences and paragraphs. See also **'Prose Text.'**

3.18 Data entry field

A visually well-defined location on a page where users may type data.

3.19 Density, page

A measure of the percentage of the screen that is filled with text and graphics. .

3.20 Destination page

The location in a Web site where a given user goes after clicking on a link.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

18

See also **'Target page.'**

3.21 Download time

The amount of time required for a requested page to fully appear on a user's screen.

3.22 Drop-down list

Screen-based controls in which one list item shows, and the remaining list items are hidden until users click on a downward-facing arrow. Drop-down lists allow designers to preserve screen real estate while maintaining the ability to present a full suite of options to users.

3.23 Embedded link

A link that is found in the middle of prose or continuous text. Embedded links are often used to provide users with the definitions of terms or to lead them to supporting or related information.

3.24 Entry field

The entry field, which is also known as a data or text entry field, is employed when users are required to make text or data entries, including keywords, commands, quantities, etc.

3.25 Expert evaluation or Expert review
See '**Heuristic evaluation.'**

3.26 Fold

The fold is defined as the lowest point where a Web page is no longer visible on a computer monitor or screen. Where on a Web page the fold falls is a function of the monitor size, the screen resolution, and the font size selection. The information that is visible when a Web page first loads is considered to be 'above the fold.' Those regions of the same Web page that are visible only by scrolling are considered to be 'below the fold.'

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                        Standards

19

3.27 Frame

A feature supported by most browsers that enables the designer to divide the display area into two or more sections (frames). The contents of each frame behave like different Web pages.

3.28 Gloss

An automated action that provides summary information on where a link will take a user prior to the user clicking on the link. Often, glosses appear as a small 'pop-up' text box adjacent to a link. The gloss appears as the user moves the mouse over the link that is programmed with the gloss.

3.29 Heading

The title, subtitle, or topic that stands at the top or beginning of a paragraph or section of text.

3.30 Heuristic evaluation

An inspection method for finding certain types of usability problems in a user interface design. Heuristic evaluation involves having one or more usability specialists individually examine the interface and judge its compliance with recognized usability principles. These usability principles are the 'heuristics' from which the method takes its name.

3.31 Image map

A graphic designed to assist users' navigation of a Web site. Regions of the graphic are designed to be clickable.

3.32 Index link

Index links function as a table of contents—they provide users a quick glance at the Web site organization, allows users to quickly ascertain where they want to go, and to navigate there directly from the homepage.

3.33 Keyword

A word that is used as a reference point for finding other words or information using a search capability in a Web site.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

20

3.34 Masthead

The (usually) graphical banner at the top of a Web page that identifies the organization or group that hosts the Web site. The masthead typically contains the name of the organization and site (if different) and an organizational logo.

3.35 Minesweeping

An action designed to identify where on a page links are located. Minesweeping involves the user rapidly moving the cursor or pointer over a page, watching to see where the cursor or pointer changes to indicate the presence of a link. See also **'Mouseover.'**

3.36 Mouseover

A Web interaction wherein some visually-apparent change occurs to an item when the user's cursor/pointer is placed over the item. Examples of visually-apparent change includes links highlighting (words, images, etc.), cursors/pointers changing shape, or menus opening. See also **'Minesweeping.'**

3.37 Navigation page

A Web page that contains no content
and that is designed solely to direct or redirect users. Navigation pages may be designed as homepages, site maps, site overviews, etc.

3.38 Open list

An open list is a screen-based control where either all of the list items are immediately visible on the screen, or where several list items are immediately visible to the user, and the remaining list items can be viewed by scrolling the list.

3.39 Page title

Page titles refer to the text located in the browser title bar (this is the bar found at the very top of the screen of common browsers).

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                    Standards

21

3.40 Paging

A Web site design methodology that requires users to follow a series of 'Next page' links to read an entire article. Moving from page-to-page is an alternative to scrolling through long pages.

3.41 Panels

Visually and thematically-defined sections of a Web page. Panels are frequently placed in the left and right margins of pages. Panels often contain navigation aids, including related links. Content is not usually placed in left or right panels.

3.42 Passive voice

Voice is a grammatical feature of English verbs. Passive voice permits subjects to have something done to them (by someone or something).
For example, 'The link was clicked by John.' Some argue that passive voice is more indirect and wordier than active voice.

3.43 Path

The route taken by a user as they move through a Web site. The path can be shown by breadcrumbs.

3.44 Performance objectives

The goals set for user behaviors on an individual Web page or a series of Web pages. These objectives usually are stated in terms of the time to correctly select a link, the overall accuracy of selecting links, the average time to select a target page, etc.

3.45 Performance test

A usability test that is characterized by having typical users perform a series of tasks where their speed, accuracy and success are closely monitored and measured.

3.46 Physical consistency

Physical consistency refers to the 'look and feel' of a Web site. Physically

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

22

consistent Web pages will have logos, headers, and navigation elements all located in the same place. The pages also will use the same fonts and graphic elements across all pages in the site.

3.47 Plug-in

A software module that adds a specific feature or service to a larger system. For example, there is a number of plug-ins for common browsers that enable them to display different types of audio and video.

3.48 Point-and-click

A term used to describe conventional Web surfing behavior. When a user visually identifies a link they wish to follow, they place their mouse pointer over the link (point) and depress the appropriate button on the mouse (click). See also **'Mouseover.'**

3.49 Pop-under/Pop-up

A pop-under or pop-up is a window that is automatically invoked when a user loads a Web page. Pop-under appears 'below' the active browser window, whereas pop-ups appear 'above' the active window and can obscure screen contents.

3.50 Preference objectives

The goals set for user attitudes toward individual Web pages or an entire Web site. The objectives are usually set and measured using questionnaires. These objectives include information concerning user acceptance and user satisfaction.

3.51 Prose text

Ordinary writing, in a Web context, prose text comprises sentences and paragraphs. See also **'Continuous Text.'**

3.52 Pushbutton

Pushbuttons are screen-based controls that contain a text label or an image (or both). Pushbuttons are used to provide quick and convenient access to

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

23

frequently-used actions. The pushbutton control is always activated with a single click of a mouse button. Clicking on pushbuttons should cause the indicated action to take place, i.e., 'search.' Do not use pushbuttons to move from one location to another in a Web site.

3.53 Radio button

A screen-based control used to select one item from a list of mutually-exclusive items (i.e., use radio buttons when only one item in a list of several items can be selected).

3.54 Reveals

Information that automatically appears on the screen during a Web-based slideshow presentation, or while viewing a multimedia Web page.

3.55 Scanning

An information-retrieval method whereby users look quickly through a Web page looking for target information (headers, keywords, etc.). Scanning can be a quick and efficient information-retrieval method if Web pages are designed to accommodate scanning.

3.56 Screen reader

A software program used to allow reading of content and navigation of the screen using speech or Braille output. Used primarily by people who have difficulty seeing.

3.57 Screenful

A screenful is defined as that portion of a Web page that is visible on any given user's monitor or screen at any given point in time. The size of the screenful is determined by the user's monitor size, screen resolution settings, and the user's selected font size.

3.58 Scroll bar

The scroll bar is visible along the right edge of common browsers. It is defined by a movable box that runs on a vertical or horizontal axis.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

24

3.59 Scroll stopper

A graphic or other page element that may visually impede a user from scrolling to the true top or bottom of a page. Misplaced headers, horizontal lines, or sections of text in very small fonts may act as scroll stoppers.

3.60 Scrolling

A method of traversing a Web page wherein users either roll the scroll wheel on their mouse, or manually move the scroll bar located on the right side of their browser's screen.

3.61 Section 508

Section 508 of the Rehabilitation Act was enacted to eliminate barriers in information technology, to make available new opportunities for people with disabilities, and to encourage development of technologies that will help achieve these goals. The law applies to all Federal agencies when they develop, procure, maintain, or use electronic and information technology. Under Section 508 (29 U.S.C. § 794d), agencies must give disabled employees and members of the public access to information that is comparable to the access available to others.

3.62 Semantics

Semantics is a term used to distinguish the meaning of an instruction from its format. A semantic error occurs when you enter a legal command that does not make sense in the current context. To reduce error, provide semantic hints. Example of a semantic hint: 'Use AND to retrieve a smaller set of records in which both of the search terms are present. Use OR to retrieve a larger number of records; OR is commonly used to search for synonymous terms or concepts.'

3.63 Server-side (image map)

Occurring on the server side of a client-server system. For example, on the Web, CGI scripts are server-side applications because they run on the Web server. In contrast, JavaScript scripts are client-side because they are executed by the browser (the client). Java applets can be either server-side or client-side depending on which computer (the server or the client) executes

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

25

them.

3.64 Simultaneous menus

Menus that simultaneously display choices from multiple levels in the menu hierarchy, providing users with the ability to make menu choices in any order.

3.65 Site map

A clickable, graphic- or text-based display of a Web site's hierarchy.

3.66 Style sheet

A set of statements that specify presentation of a document. Style sheets may have three different origins: they may be written by content providers, created by users, or built into browsers or plug-ins.

3.67 Syntax

The formatting rules that address the spelling of language components and the rules controlling how components should be combined. A syntax error occurs if you misspell a command, use inappropriate grammar, capitalization, etc. To reduce error, provide syntactic hints. Example of a syntactic hint: 'Enter search terms separated by AND, OR, NOT, and/or enclose terms in double quotes to specify your search.' 'All operators must be capitalized.'

3.68 Tab

A graphical navigation element that is most often placed at the top of a Web page. Effective tabs should be designed so that they resemble real-world file folder tabs.

3.69 Tagline

A phrase or short sentence placed directly below a Web page's masthead. The tagline functions to quickly identify the purpose of the Web site. It may be a subtitle, an organizational motto, or a vision or purpose statement.

3.70 Target page

The location in a site where a user will find the information they are seeking. See also **'Destination page.'**

3.71 Task analysis

A method used to identify and understand the activities to be performed by users when interacting with a Web site.

3.72 Thumbnail image

A small copy of a larger image.

3.73 Time out

When entering data that may be sensitive (e.g., credit card or social security numbers), many Web sites will disconnect ('time out') if a user has not interacted with the browser in a set amount of time.

3.74 URL

URL is an abbreviation for Uniform Resource Locator. Every Web page has a URL that is used to identify the page and the server on which the page resides.

3.75 Usability testing

Usability testing includes a range of test and evaluation methods that include automated evaluations, inspection evaluations, operational evaluations and human performance testing. In a typical performance test, users perform a variety of tasks with a prototype (or an operational system) while observers note what each user does and says while performance data are recorded. One of the main purposes of usability testing is to identify issues that keep users from meeting the usability goals of a Web site.

3.76 Widget

Screen-based controls that are used to interact with a Web site and other systems. Widgets include pushbuttons, selection lists, radio buttons, sliders, etc.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
Standards

27

3.77 Within-page links

Within-page links are used on content pages that contain several (e.g., three or more) screenfuls of information. Within-page links are best arranged as a table of contents for the page. Within-page links allow users to skip through textual information, resulting in a more efficient information-finding process. See also **'Anchor links.'**

3.78 web portal

also known as a links page, presents information from diverse sources in a unified way. Apart from the standard search engine feature, web portals offer other services such as e-mail, news, stock prices, information, databases and entertainment. Portals provide a way for enterprises to provide a consistent look and feel with access control and procedures for multiple applications and databases, which otherwise would have been different entities altogether.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

28

4. Design Process and Evaluation

There are several usability-related issues, methods, and procedures that require careful consideration when designing and developing Web sites. The most important of these are presented in this chapter, including 'up-front' issues such as setting clear and concise goals for a Web site, determining a correct and exhaustive set of user requirements, ensuring that the Web site meets user's expectations, setting usability goals, and providing useful content.

To ensure the best possible outcome, designers should consider a full range of user-interface issues, and work to create a Web site that enables the best possible human performance. The current research suggests that the best way to begin the construction of a Web site is to have many different people propose design solutions (i.e., parallel design), and then to follow up using an iterative design approach. This requires conducting the appropriate usability tests and using the findings to make changes to the Web site.

4.1 Provide Useful Content

Guideline: Provide content that is engaging, relevant, and appropriate to the audience(*All Sudan Government Web sites must comply with the Criteria and indicators for assessing the government's Web site*).

Comments: Content is the information provided on a Web site. Do not waste resources providing easy access and good usability to the wrong content. One study found that content is the most critical element of a Web site. Other studies have reported that content is more important than navigation, visual design, functionality, and interactivity.

4.2 Establish User Requirements

Guideline: Use all available resources to better understand users' requirements.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

29

Comments: The greater the number of exchanges of information with potential users, the better the developers' understanding of the users' requirements. The more information that can be exchanged between developers and users, the higher the probability of having a successful Web site. These could include customer support lines, customer surveys and interviews, bulletin boards, sales people, user groups, trade show experiences, focus groups, etc. Successful projects require at least four (and average five) different sources of information. Do not rely too heavily on user intermediaries.

The information gathered from exchanges with users can be used to build 'use cases.' Use cases describe the things that users want and need the Web site to be able to do. In one study, when compared with traditional function-oriented analyses, use cases provided a specification that produced better user performance and higher user preferences.

4.3 Understand and Meet User's Expectations

Guideline: Ensure that the Web site format meets user expectations, especially related to navigation, content, and organization.

Comments: One study found that users define 'usability' as their perception of how consistent, efficient, productive, organized, easy to use, intuitive, and straightforward it is to accomplish tasks within a system.

It is important for designers to develop an understanding of their users' expectations through task analyses and other research. Users can have expectations based on their prior knowledge and past experience. One study found that users acted on their own expectations even when there were indications on the screen to counter those expectations.

The use of familiar formatting and navigation schemes makes it easier for users to learn and remember the layout of a site. It's best to assume that a certain percentage of users will not use a Web site frequently enough to learn to use it efficiently. Therefore, using familiar conventions works best.

4.4 Involve Users in Establishing User Requirements

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
Standards

30

Guideline: Involve users to improve the completeness and accuracy of user requirements.

Comments: One of the basic principles of user-centered design is the early and continual focus on users. For this reason, user involvement has become a widely accepted principle in the development of usable systems. Involving users has the most value when trying to improve the completeness and accuracy of user requirements. It is also useful in helping to avoid unused or little-used system features. User involvement may improve the level of user acceptance, although the research is not yet clear that it does in all cases. There is little or no research suggesting that user involvement leads to more effective and efficient use of the system. Finally, the research suggests that users are not good at helping make design decisions. To summarize, users are most valuable in helping designers know what a system should do, but not in helping designers determine how best to have the system do it.

4.5 Set and State Goals

Guideline: Identify and clearly articulate the primary goals of the Web site before beginning the design process.

Comments: Before starting design work, identify the primary goals of the Web site (educate, inform, entertain, sell, etc.). Goals determine the audience, content, function, and the site's unique look and feel. It is also a good idea to communicate the goals to, and develop consensus for the site goals from, management and those working on the Web site.

4.6 Focus on Performance Before Preference

Guideline: If user performance is important, make decisions about content, format, interaction, and navigation before deciding on colors and decorative graphics.

Comments: Focus on achieving a high rate of user performance before dealing with aesthetics. Graphics issues tend to have little impact, if any, on users' success rates or speed of performance.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
Standards

31

4.7 Consider Many User Interface Issues

Guideline: Consider as many user interface issues as possible during the design process.

Comments: Consider numerous usability-related issues during the creation of a Web site. These can include: the context within which users will be visiting a Web site; the experience levels of the users; the types of tasks users will perform on the site; the types of computer and connection speeds used when visiting the site; evaluation of prototypes; and the results of usability tests.

4.8 Be Easily Found in the Top 30

Guideline: In order to have a high probability of being accessed, ensure that a Web site is in the 'top 30' references presented from a major search engine.

Comments: One study showed that users usually do not look at Web sites that are not in the 'top 30.' Some of the features required to be in the 'top 30' include appropriate meta-content and page titles, the number of links to the Web site, as well as updated registration with the major search engines.

4.9 Set Usability Goals

Guideline: Set performance goals that include success rates and the time it takes users to find specific information, or preference goals that address satisfaction and acceptance by users.

Comments: Setting user performance and/or preference goals helps developers build better Web sites. It can also help make usability testing more effective. For example, some intranet Web sites have set the goal that information will be found eighty percent of the time and in less than one minute.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
Standards

32

4.10 Use Parallel Design

Guideline: Have several developers independently propose designs and use the best elements from each design.

Comments: Do not have individuals make design decisions by themselves or rely on the ideas of a single designer. Most designers tend to adopt a strategy that focuses on initial, satisfactory, but less than optimal, solutions. Group discussions of design issues (brainstorming) do not lead to the best solutions.
The best approach is parallel design, where designers independently evaluate the design issues and propose solutions. Attempt to 'saturate the design space' before selecting the ideal solution. The more varied and independent the ideas that are considered, the better the final product will be.

4.11 Use Personas

Guideline: Use personas to keep the design team focused on the same types of users.

Comments: Personas are hypothetical 'stand-ins' for actual users that drive the decision making for interfaces. They are not real people, but they represent real people. They are not 'made up,' but are discovered as a by-product of an investigative process with rigor and precision. Interfaces should be constructed to satisfy the needs and goals of personas.
Some usability specialists feel that designers will have far more success designing an interface that meets the goals of one specific person, instead of trying to design for the various needs of many. The design team should develop a believable persona so that everybody will accept the person. It is usually best to detail two or three technical skills to give an idea of computer competency, and to include one or two fictional details about the persona's life. Even though a few observational studies have been reported, there are no research studies that clearly demonstrate improved Web site success when personas are used.

Keep the number of personas for each Web site relatively small – use three to five. For each persona include at least a first name, age, photo, relevant personal information, and work and computer proficiency.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
              Standards

33

5. Optimizing the User Experience

Web sites should be designed to facilitate and encourage efficient and effective human-computer interactions. Designers should make every attempt to reduce the user's workload by taking advantage of the computer's capabilities. Users will make the best use of Web sites when information is displayed in a directly usable format and content organization is highly intuitive. Users also benefit from task sequences that are consistent with how they typically do their work, that do not require them to remember information for more than a few seconds, that have terminology that is readily understandable, and that do not overload them with information.

Users should not be required to wait for more than a few seconds for a page to load, and while waiting, users should be supplied with appropriate feedback. Users should be easily able to print information. Designers should never 'push' unsolicited windows or graphics to users.

5.1 Do Not Display Unsolicited Windows or Graphics

Guideline: Do not have unsolicited windows or graphics 'pop-up' to users.

Comments: Users have commented that unsolicited windows or graphics that 'pop up' are annoying and distracting when they are focusing on completing their original activity.

5.2 Increase Web Site Credibility

Guideline: Optimize the credibility of information-oriented Web sites.

Comments: Based on the results of two large surveys, the most important Web site-related actions that organizations can do to help ensure high Web site credibility are to:
- Provide a useful set of frequently asked questions (FAQ) and answers.
- Ensure the Web site is arranged in a logical way.
- Provide articles containing citations and references.
- Show author's credentials.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                    Standards

35

- Ensure the site looks professionally designed.
- Provide an archive of past content (where appropriate).
- Ensure the site is as up-to-date as possible.
- Provide links to outside sources and materials.
- Ensure the site is frequently linked to by other credible sites.

5.3 Standardize Task Sequences

Guideline: Allow users to perform tasks in the same sequence and manner across similar conditions.

Comments: Users learn certain sequences of behaviors and perform best when they can be reliably repeated. For example, users become accustomed to looking in either the left or right panels for additional information. Also, users become familiar with the steps in a search or checkout process.

5.4 Reduce the User's Workload

Guideline: Allocate functions to take advantage of the inherent respective strengths of computers and users.

Comments: Let the computer perform as many tasks as possible, so that users can concentrate on performing tasks that actually require human processing and input. Ensure that the activities performed by the human and the computer take full advantage of the strengths of each. For example, calculating body mass indexes, remembering user IDs, and mortgage payments are best performed by computers.

5.5 Design for Working Memory Limitations

Guideline: Do not require users to remember information from place to place on a Web site.

Comments: Users can remember relatively few items of information for a relatively short period of time. This 'working memory' capacity tends to lessen even more as people become older. One study compared the working

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

36

memory performance of age groups 23-44 years and 61-68 years. The younger group performed reliably better than the older group.

When users must remember information on one Web page for use on another page or another location on the same page, they can only remember about three or four items for a few seconds. If users must make comparisons, it is best to have the items being compared side-by-side so that users do not have to remember information—even for a short period of time.

5.6 Minimize Page Download Time

Guideline: Minimize the time required to download a Web site's pages.

Comments: The best way to facilitate fast page loading is to minimize the number of bytes per page.

5.7 Warn of 'Time Outs'

Guideline: Let users know if a page is programmed to 'time out,' and warn users before time expires so they can request additional time.

Comments: Some pages are designed to 'time out' automatically (usually because of security reasons). Pages that require users to use them within a fixed amount of time can present particular challenges to users who read or make entries slowly.

5.8 Display Information in a Directly Usable Format

Guideline: Display data and information in a format that does not require conversion by the user.

Comments: Present information to users in the most useful and usable format possible. Do not require users to convert or summarize information in order for it to be immediately useful. It is best to display data in a manner that is consistent with the standards and conventions most familiar to users.

To accommodate a multinational Web audience, information should be provided in multiple formats (e.g., centigrade and Fahrenheit for temperatures) or the user should be allowed to select their preferred formats

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
Standards

37

(e.g., the 12-hour clock for American audiences and the 24-hour clock for European audiences).

Do not require users to convert, transpose, compute, interpolate, or translate displayed data into other units, or refer to documentation to determine the meaning of displayed data.

5.9 Format Information for Reading and Printing

Guideline: Prepare information with the expectation that it will either be read online or printed.

Comments: Documents should be prepared that are consistent with whether users can be expected to read the document online or printed. One study found that the major reason participants gave for deciding to read a document from print or to read it online was the size of the document. Long documents (over five pages) were printed, and short documents were read online. In addition, users preferred to print information that was related to research, presentations, or supporting a point. They favored reading it online if for entertainment.

Users generally favored reading documents online because they could do it from anywhere at anytime with 24/7 access. Users were inclined to print (a) if the online document required too much scrolling, (b) if they needed to refer to the document at a later time, or (c) the complexity of the document required them to highlight and write comments.

5.10 Provide Feedback when Users Must Wait

Guideline: Provide users with appropriate feedback while they are waiting.

Comments: If processing will take less than 10 seconds, use an hourglass to indicate status. If processing will take up to sixty seconds or longer, use a process indicator that shows progress toward completion. If computer processing will take over one minute, indicate this to the user and provide an auditory signal when the processing is complete.

Users frequently become involved in other activities when they know they must wait for long periods of time for the computer to process information. Under these circumstances, completion of processing should be indicated by a non-disruptive sound (beep).

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

38

5.11 Inform Users of Long Download Times

Guideline: Indicate to users the time required to download an image or document at a given connection speed.

Comments: Providing the size and download time of large images or documents gives users sufficient information to choose whether or not they are willing to wait for the file to download. One study concluded that supplying users with download times relative to various connection speeds improves their Web site navigation performance.

5.12 Develop Pages that Will Print Properly

Guideline: If users are likely to print one or more pages, develop pages with widths that print properly.

Comments: It is possible to display pages that are too wide to print completely on standard 8.5 x 11 inch paper in portrait orientation. Ensure that margin to margin printing is possible.

5.13 Do Not Require Users to Multitask While Reading

Guideline: If reading speed is important, do not require users to perform other tasks while reading from the monitor.

Comments: Generally, users can read from a monitor as fast as they can from paper, unless they are required to perform other tasks that require human 'working memory' resources while reading. For example, do not require users to look at the information on one page and remember it while reading the information on a second page. This can reliably slow their reading performance.

5.14 Use Users' Terminology in Help Documentation

Guideline: When giving guidance about using a Web site, use the users' terminology to describe elements and features.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                Standards

39

Comments: There is varied understanding among users as to what many Web site features are called, and in some cases, how they are used. These features include 'breadcrumbs,' changing link colors after they've been clicked, the left and right panels on the homepage, the tabs at the top of many homepages, and the search capability. For example, if the term 'breadcrumb' is used in the help section, give enough context so that a user unfamiliar with that term can understand your guidance. If you refer to the 'navigation bar,' explain to what you are referring. Even if users know how to use an element, the terms they use to describe it may not be the same terms that a designer would use.

5.15 Provide Printing Options

Guideline: Provide a link to a complete printable or downloadable document if there are Web pages, documents, resources, or files that users will want to print or save in one operation.

Comments: Many users prefer to read text from a paper copy of a document. They find this to be more convenient, and it allows them to make notes on the paper. Users sometimes print pages because they do not trust the Web site to have pages for them at a later date, or they think they will not be able to find them again.

5.16 Provide Assistance to Users

Guideline: Provide assistance for users who need additional help with the Web site.

Comments: Users sometimes require special assistance. This is particularly important if the site was designed for inexperienced users or has many first time users. For example, in one Web site that was designed for repeat users, more than one-third of users (thirty-six percent) were first time visitors. A special link was prepared that allowed new users to access more information about the content of the site and described the best way to navigate the site.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

40

6. Accessibility

Web sites should be designed to ensure that everyone, including users who have difficulty seeing, hearing, and making precise movements, can use them. Generally, this means ensuring that Web sites facilitate the use of common assistive technologies.

This is chapter defines how to make Web content more accessible to people with disabilities. Accessibility involves a wide range of disabilities, including visual, auditory, physical, speech, cognitive, language, learning, and neurological disabilities. Although these guidelines cover a wide range of issues, they are not able to address the needs of people with all types, degrees, and combinations of disability. These guidelines also make Web content more usable by older individuals with changing abilities due to aging and often improve usability for users in general.

6.1 Text Alternatives

Guideline: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, peech, symbols or simpler language.

Comments: exceptions:
- *Controls, Input*: If non-text content is a control or accepts user input, then it has a name that describes its purpose.
- *Time-Based Media*: If non-text content is time-based media, then text alternatives at least provide descriptive identification of the non-text content.
- *Test*: If non-text content is a test or exercise that would be invalid if presented in text, then text alternatives at least provide descriptive identification of the non-text content.
- *Sensory*: If non-text content is primarily intended to create a specific sensory experience, then text alternatives at least provide descriptive identification of the non-text content.
- *CAPTCHA*: If the purpose of non-text content is to confirm that content is being accessed by a person rather than a computer, then text alternatives that identify and describe the purpose of the non-text

content are provided, and alternative forms of CAPTCHA using output modes for different types of sensory perception are provided to accommodate different disabilities.

- *Decoration*, Formatting, Invisible: If non-text content is pure decoration, is used only for visual formatting, or is not presented to users, then it is implemented in a way that it can be ignored by assistive technology.

6.2 Time-based Media

Guideline: Provide alternatives for time-based media.

Comments:
1- Audio-only and Video-only (Prerecorded): For prerecorded audio-only and prerecorded video-only media, the following are true, except when the audio or video is a media alternative for text and is clearly labeled as such:

- Prerecorded Audio-only: An alternative for time-based media is provided that presents equivalent information for prerecorded audio-only content.
- Prerecorded Video-only: Either an alternative for time-based media or an audio track is provided that presents equivalent information for prerecorded video-only content.

2- Captions (Prerecorded): Captions are provided for all prerecorded audio content in synchronized media, except when the media is a media alternative for text and is clearly labeled as such.

3- Audio Description or Media Alternative (Prerecorded): An alternative for time-based media or audio description of the prerecorded video content is provided for synchronized media, except when the media is a media alternative for text and is clearly labeled as such.

4- Captions (Live): Captions are provided for all live audio content in synchronized media.

National Information Center- General Department of Information Technology Standards   Information Systems Department - Section Policies and Standards

43

5- Audio Description (Prerecorded): Audio description is provided for all prerecorded video content in synchronized media.

6- Sign Language (Prerecorded): Sign language interpretation is provided for all prerecorded audio content in synchronized media.

7- Extended Audio Description (Prerecorded): Where pauses in foreground audio are insufficient to allow audio descriptions to convey the sense of the video, extended audio description is provided for all prerecorded video content in synchronized media.

8- Media Alternative (Prerecorded): An alternative for time-based media is provided for all prerecorded synchronized media and for all prerecorded video-only media.

9- Audio-only (Live): An alternative for time-based media that presents equivalent information for live audio-only content is provided.

6.3 Adaptable

Guideline: Create content that can be presented in different ways (for example simpler layout) without losing information or structure.

Comments:
1- Info and Relationships: Information, structure, and relationships conveyed through presentation can be programmatically determined or are available in text.

2- Meaningful Sequence: When the sequence in which content is presented affects its meaning, a correct reading sequence can be programmatically determined.

3- Sensory Characteristics: Instructions provided for understanding and operating content do not rely solely on sensory characteristics of components such as shape, size, visual location, orientation, or sound.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

44

6.4 Distinguishable

Guideline: Make it easier for users to see and hear content including separating foreground from background.
Comments:

1- Use of Color: Color is not used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

2- Audio Control: If any audio on a Web page plays automatically for more than 3 seconds, either a mechanism is available to pause or stop the audio, or a mechanism is available to control audio volume independently from the overall system volume level.

3- Contrast (Minimum): The visual presentation of text and images of text has a contrast ratio of at least 4.5:1, except for the following:
   - Large Text: Large-scale text and images of large-scale text have a contrast ratio of at least 3:1;
   - Incidental: Text or images of text that are part of an inactive user interface component, that are pure decoration, that are not visible to anyone, or that are part of a picture that contains significant other visual content, have no contrast requirement.
   - Logotypes: Text that is part of a logo or brand name has no minimum contrast requirement.

4- Resize text: Except for captions and images of text, text can be resized without assistive technology up to 200 percent without loss of content or functionality.

5- Images of Text: If the technologies being used can achieve the visual presentation, text is used to convey information rather than images of text except for the following:
   - Customizable: The image of text can be visually customized to the user's requirements;

National Information Center- General Department of Information Technology Standards   Information Systems Department - Section Policies and

45

- Essential: A particular presentation of text is essential to the information being conveyed.

6- Contrast (Enhanced): The visual presentation of text and images of text has a contrast ratio of at least 7:1, except for the following: (Level AAA)
   - Large Text: Large-scale text and images of large-scale text have a contrast ratio of at least 4.5:1;
   - Incidental: Text or images of text that are part of an inactive user interface component, that are pure decoration, that are not visible to anyone, or that are part of a picture that contains significant other visual content, have no contrast requirement.
   - Logotypes: Text that is part of a logo or brand name has no minimum contrast requirement.

7- Low or No Background Audio: For prerecorded audio-only content that (1) contains primarily speech in the foreground, (2) is not an audio CAPTCHA or audio logo, and (3) is not vocalization intended to be primarily musical expression such as singing or rapping, at least one of the following is true:
   - No Background: The audio does not contain background sounds.
   - Turn Off: The background sounds can be turned off.
   - 20 dB: The background sounds are at least 20 decibels lower than the foreground speech content, with the exception of occasional sounds that last for only one or two seconds. (*Note*: *Per the definition of "decibel," background sound that meets this requirement will be approximately four times quieter than the foreground speech content.*)

8- Visual Presentation: For the visual presentation of blocks of text, a mechanism is available to achieve the following:
   - Foreground and background colors can be selected by the user.
   - Width is no more than 80 characters or glyphs (40 if CJK).
   - Text is not satisfied (aligned to both the left and the right margins).

- Line spacing (leading) is at least space-and-a-half within paragraphs, and paragraph spacing is at least 1.5 times larger than the line spacing.
- Text can be resized without assistive technology up to 200 percent in a way that does not require the user to scroll horizontally to read a line of text on a full-screen window.

9- Images of Text (No Exception): Images of text are only used for pure decoration or where a particular presentation of text is essential to the information being conveyed. *Note: Logotypes (text that is part of a logo or brand name) are considered essential.*

6.5 Keyboard Accessible

Guideline: Make all functionality available from a keyboard.

Comments:
1- Keyboard: All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes, except where the underlying function requires input that depends on the path of the user's movement and not just the endpoints. *Note 1: This exception relates to the underlying function, not the input technique. For example, if using handwriting to enter text, the input technique (handwriting) requires path-dependent input but the underlying function (text input) does not.*
Note 2: This does not forbid and should not discourage providing mouse input or other input methods in addition to keyboard operation.
2- No Keyboard Trap: If keyboard focus can be moved to a component of the page using a keyboard interface, then focus can be moved away from that component using only a keyboard interface, and, if it requires more than unmodified arrow or tab keys or other standard exit methods, the user is advised of the method for moving focus away.
Note: Since any content that does not meet this success criterion can interfere with a user's ability to use the whole page, all content on the Web page (whether it is used to meet other success criteria or not) must meet this success criterion.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                    Standards

47

3- Keyboard (No Exception): All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes.

6.6 Enough Time

Guideline : Provide users enough time to read and use content.

Comments:
1- Timing Adjustable: For each time limit that is set by the content, at least one of the following is true:
- Turn off: The user is allowed to turn off the time limit before encountering it; or
- Adjust: The user is allowed to adjust the time limit before encountering it over a wide range that is at least ten times the length of the default setting; or
- Extend: The user is warned before time expires and given at least 20 seconds to extend the time limit with a simple action (for example, "press the space bar"), and the user is allowed to extend the time limit at least ten times; or
- Real-time Exception: The time limit is a required part of a real-time event (for example, an auction), and no alternative to the time limit is possible; or
- Essential Exception: The time limit is essential and extending it would invalidate the activity; or
- 20 Hour Exception: The time limit is longer than 20 hours.

2- Pause, Stop, Hide: For moving, blinking, scrolling, or auto-updating information, all of the following are true:
- Moving, blinking, scrolling: For any moving, blinking or scrolling information that (1) starts automatically, (2) lasts more than five seconds, and (3) is presented in parallel with other content, there is a mechanism for the user to pause, stop, or hide it unless the movement, blinking, or scrolling is part of an activity where it is essential; and Auto-updating: For any auto-updating information that (1) starts automatically and (2) is presented in parallel with other

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
            Standards

48

content, there is a mechanism for the user to pause, stop, or hide it or to control the frequency of the update unless the auto-updating is part of an activity where it is essential.

3- No Timing: Timing is not an essential part of the event or activity presented by the content, except for non-interactive synchronized media and real-time events.

4- Interruptions: Interruptions can be postponed or suppressed by the user, except interruptions involving an emergency.

5- Re-authenticating: When an authenticated session expires, the user can continue the activity without loss of data after re-authenticating.

6.7 Seizures

Guideline : Do not design content in a way that is known to cause seizures.

Comments:

1- Three Flashes or Below Threshold: Web pages do not contain anything that flashes more than three times in any one second period, or the flash is below the general flash and red flash thresholds.

2- Three Flashes: Web pages do not contain anything that flashes more than three times in any one second period. (Level AAA)

6.8 Navigable

Guideline: Provide ways to help users navigate, find content, and determine where they are.

Comments:

1- Bypass Blocks: A mechanism is available to bypass blocks of content that are repeated on multiple Web pages.

2- Page Titled: Web pages have titles that describe topic or purpose.

3- Focus Order: If a Web page can be navigated sequentially and the navigation sequences affect meaning or operation, focusable components receive focus in an order that preserves meaning and operability.

4- Link Purpose (In Context): The purpose of each link can be determined from the link text alone or from the link text together with its programmatically determined link context, except where the purpose of the link would be ambiguous to users in general.

5- Multiple Ways: More than one way is available to locate aWeb page within a set of Web pages except where the Web Page is the result of, or a step in, a process.

6- Headings and Labels: Headings and labels describe topic or purpose.

7- Focus Visible: Any keyboard operable user interface has a mode of operation where the keyboard focus indicator is visible.

8- Location: Information about the user's location within a set of Web pages is available.

9- Link Purpose (Link Only): mechanism is available to allow the purpose of each link to be identified from link text alone, except where the purpose of the link would be ambiguous to users in general.

10- Section Headings: Section headings are used to organize the content.

6.9 Readable

Guideline : Make text content readable and understandable.

Comments:
1- Language of Page: The default human language of eachWeb page can be programmatically determined.

2- Language of Parts: The human language of each passage or phrase in the content can be programmatically determined except for proper names, technical terms, words of indeterminate language, and words or phrases that have become part of the vernacular of the immediately surrounding text.

3- Unusual Words: A mechanism is available for identifying specific definitions of words or phrases used in an unusual or restricted way, including idioms and jargon.

4- Abbreviations: A mechanism for identifying the expanded form or meaning of abbreviations is available.

5- Reading Level: When text requires reading ability more advanced than the lower secondary education level after removal of proper names and titles, supplemental content, or a version that does not

National Information Center- General Department of Information Technology Information Systems Department - Section Policies and Standards

50

require reading ability more advanced than the lower secondary education level, is available.

6- Pronunciation: A mechanism is available for identifying specific pronunciation of words where meaning of the words, in context, is ambiguous without knowing the pronunciation.

6.10 Predictable

Guideline: Make Web pages appear and operate in predictable ways.

Comments:
1- On Focus: When any component receives focus, it does not initiate a change of context.
2- On Input: Changing the setting of any user interface component does not automatically cause a change of context unless the user has been advised of the behavior before using the component.
3- Consistent Navigation: Navigational mechanisms that are repeated on multiple Web pages within a set of Web pages occur in the same relative order each time they are repeated, unless a change is initiated by the user.
4- Consistent Identification: Components that have the same functionality within a set of Web pages are identified consistently.
5- Change on Request: Changes of context are initiated only by user request or a mechanism is available to turn off such changes.

6.11 Input Assistance

Guideline: Help users avoid and correct mistakes.

Comments:
1- Error Identification: If an input error is automatically detected, the item that is in error is identified and the error is described to the user in text.
2- Labels or Instructions: Labels or instructions are provided when content requires user input.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                              Standards

51

3- Error Suggestion: If an input error is automatically detected and suggestions for correction are known, then the suggestions are provided to the user, unless it would jeopardize the security or purpose of the content.

4- Error Prevention (Legal, Financial, Data): For Web pages that cause legal commitments or financial transactions for the user to occur, that modify or delete user-controllable data in data storage systems, or that submit user test responses, at least one of the following is true:

    1. Reversible: Submissions are reversible.

    2. Checked: Data entered by the user is checked for input errors and the user is provided an opportunity to correct them.

    3. Confirmed: A mechanism is available for reviewing, confirming, and correcting information before finalizing the submission.

5- Help: Context-sensitive help is available.

6- Error Prevention (All): For Web pages that require the user to submit information, at least one of the following is true:

- Reversible: Submissions are reversible. 1.
- Checked: Data entered by the user is checked for input errors and the user is provided an opportunity to correct them.
- Confirmed: mechanism is available for reviewing, confirming, and correcting information before finalizing the submission.

6.12 Compatible

Guideline: Maximize compatibility with current and future user agents, including assistive technologies.

Comments:
1- Parsing: In content implemented using markup languages, elements have complete start and end tags, elements are nested according to their specifications, elements do not contain duplicate attributes, and any IDs are unique, except where the specifications allow these features.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

52

Note: Start and end tags that are missing a critical character in their formation, such as a closing angle bracket or a mismatched attribute value quotation mark are not complete.

2- Name, Role, Value: For all user interface components (including but not limited to: form elements, links and components generated by scripts), the name and role can be programmatically determined; states, properties, and values that can be set by the user can be programmatically set; and notification of changes to these items is available to user agents, including assistive technologies.

Note: This success criterion is primarily for Web authors who develop or script their own user interface components. For example, standard HTML controls already meet this success criterion when used according to specification.

7. Hardware and Software

Designers are rarely free to do whatever comes to mind. Just as designers consider their users' needs for specific information, they must also consider any constraints imposed on them by their users' hardware, software, and speed of connection to the Internet. Today, a single operating system (Microsoft's XP) dominates personal computer market. Similarly, only two Web site browsers are favored by the vast majority of users. More than ninety percent of users have their monitors set to 1024x768, 800x600 or 1280x1024 pixel resolution. And while most users at work have high-speed Internet access, many home users still connect using dial-up.

Within the constraints of available time, money, and resources, it is usually impossible to design for all users. Therefore, identify the hardware and software used by your primary and secondary audiences and design to maximize the effectiveness of your Web site.

7.1 Design for Common Browsers

Guideline: Design, develop and test for the most common browsers.

Comments: Designers should attempt to accommodate ninety-five percent of all users. Ensure that all testing of a Web site is done using the most popular browsers.

7.2 Account for Browser Differences

Guideline: Do not assume that all users will have the same browser features, and will have set the same defaults.

Comments: Users with visual impairments tend to select larger fonts, and some users may turn off backgrounds, use fewer colors, or overrides font. The designer should find out what settings most users are using, and specify on the Web site exactly what assumptions were made about the browser settings.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

54

7.3 Design for Popular Operating Systems

Guideline: Design the Web site so it will work well with the most popular operating systems.

Comments: Designers should attempt to accommodate ninety-five percent of all users. Ensure that all testing of a Web site is done using the most common operating systems.

Currently, the most popular operating system is Microsoft's Windows XP which has over 80 of the market share. The second is Windows 2000 (eight percent), then Windows 98 (five percent), and the Macintosh (three percent). Designers should consult one of the several sources that maintain current figures to help ensure that they are designing to accommodate as many users as possible.

7.4 Design for User's Typical Connection Speed

Guideline: Design for the connection speed of most users.

Comments: At work in the United States, at least eighty-nine percent of users have high speed access, while less than eleven percent are using fifty-six K (or slower) modems. At home, more than two-thirds of users have high speed access. These figures are continually changing. Designers should consult one of the several sources that maintain current figures.

7.5 Design for Commonly Used Screen Resolutions

Guideline: Design for monitors with the screen resolution set at 1024x768 pixels.

Comments: Designers should attempt to accommodate ninety-five percent of all users.
As of June 2006, 56% of users have their screen resolution set at 1024x768. By designing for 1024x768, designers will accommodate this most common

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
Standards

55

resolution, as well as those at any higher resolution. Ensure that all testing of Web sites is done using the most common screen resolutions.

8. The Homepage

The homepage is different from all other Web site pages. A well-constructed homepage will project a good first impression to all who visit the site.

It is important to ensure that the homepage has all of the features expected of a homepage and looks like a homepage to users. A homepage should clearly communicate the site's purpose, and show all major options available on the Web site. Generally, the majority of the homepage should be visible 'above the fold,' and should contain a limited amount of prose text. Designers should provide easy access to the homepage from every page in the site.

8.1 Enable Access to the Homepage

Guideline: Enable users to access the homepage from any other page on the Web site.

Comments: Many users return to the homepage to begin a new task or to start a task over again. Create an easy and obvious way for users to quickly return to the homepage of the Web site from any point in the site.

Many sites place the organization's logo on the top of every page and link it to the homepage. While many users expect that a logo will be clickable, many other users will not realize that it is a link to the homepage. Therefore, include a link labeled 'Home' near the top of the page to help those users.

8.2 Show All Major Options on the Homepage

Guideline: Present all major options on the homepage.

Comments: Users should not be required to click down to the second or third level to discover the full breadth of options on a Web site. Be selective about what is placed on the homepage, and make sure the options and links presented there are the most important ones on the site.

8.3 Create a Positive First Impression of Your Site

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

57

Guideline: Treat your homepage as the key to conveying the quality of your site.

Comments: In terms of conveying quality, the homepage is probably the most important page on a Web site. One study found that when asked to find high quality Web sites, about half of the time participants looked only at the homepage. You will not get a second chance to make a good first impression on a user.

8.4 Communicate the Web Site's Value and Purpose

Guideline: Clearly and prominently communicate the purpose and value of the Web site on the homepage.

Comments: Most people browsing or searching the Web will spend very little time on each site. Emphasize what the site offers that is of value to users, and how the site differs from key competitors. Many users waste time because they misunderstand the purpose of a Web site. In one study, most users expected that a site would show the results of research projects, not merely descriptions of project methodology.

In some cases the purpose of a Web site is easily inferred. In other cases, it may need to be explicitly stated through the use of brief text or a tagline. Do not expect users to read a lot of text or to click into the Site to determine a Site's purpose. Indicating what the Site offers that is of value to users, and how the Site differs from key competitors is important because most people will spend little time on each Site.

8.5 Limit Prose Text on the Homepage

Guideline: Limit the amount of prose text on the homepage.

Comments: The first action of most users is to scan the homepage for link titles and major headings. Requiring users to read large amounts of prose text can slow them considerably, or they may avoid reading it altogether.

8.6 Ensure the Homepage Looks like a Homepage

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                    Standards

58

Guideline: Ensure that the homepage has the necessary characteristics to be easily perceived as a homepage.

Comments: It is important that pages 'lower' in a site are not confused with the homepage. Users have come to expect that certain actions are possible from the homepage. These actions include, among others, finding important links, accessing a site map or index, and conducting a search.

8.7 Limit Homepage Length

Guideline: Limit the homepage to one screenful of information, if at all possible.

Comments: Any element on the homepage that must immediately attract the attention of users should be placed 'above the fold.' Information that cannot be seen in the first screenful may be missed altogether—this can negatively impact the effectiveness of the Web site. If users conclude that what they see on the visible portion of the page is not of interest, they may not bother scrolling to see the rest of the page.

Some users take a long time to scroll down 'below the fold,' indicating a reluctance to move from the first screenful to subsequent information. Older users and novices are more likely to miss information that is placed below the fold.

8.8 Announce Changes to a Web Site

Guideline: Announce major changes to a Web site on the homepage—do not surprise users.

Comments: Introducing users to a redesigned Web site can require some preparation of expectations. Users may not know what to do when they are suddenly confronted with a new look or navigation structure. Therefore, you should communicate any planned changes to users ahead of time. Following completion of changes, tell users exactly what has changed and when the changes were made. Assure users that all previously available information will continue to be on the site.

It may also be helpful to users if you inform them of site changes at other

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

59

relevant places on the Web site. For example, if shipping policies have changed, a notification of such on the order page should be provided.

8.9 Attend to Homepage Panel Width

Guideline: Ensure that homepage panels are of a width that will cause them to be recognized as panels.

Comments: The width of panels seems to be critical for helping users understand the overall layout of a Web site. In one study, users rarely selected the information in the left panel because they did not understand that it was intended to be a left panel. In a subsequent study, the panel was made narrower, which was more consistent with other left panels experienced by users. The newly designed left panel was used more.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

60

9. Page Layout

All Web pages should be structured for ease of comprehension. This includes putting items on the page in an order that reflects their relative importance. Designers should place important items consistently, usually toward the top and center of the page. All items should be appropriately aligned on the pages. It is usually a good idea to ensure that the pages show a moderate amount of white space—too much can require considerable scrolling, while too little may provide a display that looks too 'busy.' It is also important to ensure that page layout does not falsely convey the top or bottom of the page, such that users stop scrolling prematurely.

When a Web page contains prose text, choose appropriate line lengths. Longer line lengths usually will elicit faster reading speed, but users tend to prefer shorter line lengths. There are also important decisions that need to be made regarding page length. Pages should be long enough to adequately convey the information, but not so long that excessive scrolling becomes a problem. If page content or length dictates scrolling, but the page's table of contents needs to be accessible, then it is usually a good idea to use frames to keep the table of contents readily accessible and visible in the left panel.

9.1 Avoid Cluttered Displays

Guideline: Create pages that are not considered cluttered by users.

Comments: Clutter is when excess items on a page lead to a degradation of performance when trying to find certain information. On an uncluttered display, all important search targets are highly salient, i.e., clearly available. One study found that test participants tended to agree on which displays were least cluttered and those that were most cluttered.

9.2 Place Important Items Consistently

Guideline: Put important, clickable items in the same locations, and closer to the top of the page, where their location can be better estimated.

Comments: Users will try to anticipate where items will appear on their

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                              Standards

61

screen. They will start 'searching' a page before the layout appears on their screen. When screen items remain constant, users learn their location on a page, and use this knowledge to improve task performance. Experienced users will begin moving their mouse to the area of the target before the eye detects the item. Users can anticipate the location of items near the top much better than those farther down the page.

9.3 Place Important Items at Top Center

Guideline: Put the most important items at the top center of the Web page to facilitate users' finding the information.

Comments: Users generally look at the top center of a page first, then look left, then right, and finally begin systematically moving down the total Web page. All critical content and navigation options should be toward the top of the page. Particularly on navigation pages, most major choices should be visible with no, or a minimum of, scrolling.

9.4 Structure for Easy Comparison

Guideline: Structure pages so that items can be easily compared when users must analyze those items to discern similarities, differences, trends, and relationships.

Comments: Users should be able to compare two or more items without having to remember one while going to another page or another place on the same page to view a different item.

9.5 Establish Level of Importance

Guideline: Establish a high-to-low level of importance for information and infuse this approach throughout each page on the Web site.

Comments: The page layout should help users find and use the most important information. Important information should appear higher on the page so users can locate it quickly. The least used information should appear toward the bottom of the page. Information should be presented in the order that is most useful to users.

People prefer hierarchies, and tend to focus their attention on one level of the hierarchy at a time. This enables them to adopt a more systematic strategy when scanning a page, which results in fewer revisits.

9.6 Optimize Display Density

Guideline: To facilitate finding target information on a page, create pages that are not too crowded with items of information.

Comments: Density can be defined as the number of items per degree of visual angle within a visually distinct group. This density either can be crowded with many items, or sparse with few items. One study found that locating a target in a crowded area took longer than when the target was in a sparse area. Also, participants searched and found items in the sparse areas faster than those in the crowded areas. Participants used fewer fixations per word in the crowded areas, but their fixations were much longer when viewing items in the crowded areas. Finally, participants tended to visit sparse areas before dense groups. To summarize, targets in sparse areas of the display (versus crowded areas) tended to be searched earlier and found faster.

9.7 Align Items on a Page

Guideline: Visually align page elements, either vertically or horizontally.

Comments: Users prefer consistent alignments for items such as text blocks, rows, columns, checkboxes, radio buttons, data entry fields, etc. Use consistent alignments across all Web pages.

9.8 Use Fluid Layouts

Guideline: Use a fluid layout that automatically adjusts the page size to monitor resolution settings that are 1024x768 pixels or higher.

Comments: When web page layouts are fixed either to the left or centered, much of the available screen space is not used. It is best to take advantage of as much of the screen space as possible because this will help move more

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

63

information above the fold. There has been no degradation in user performance when using the non-fluid layouts. However, most users prefer the fluid layout. One 2003 study reported a compliance rate for this guideline of twenty-eight percent, and a 2001 study found that only twenty-three percent of top Web sites used a fluid layout. Keep in mind that large monitors and higher pixel resolutions allow viewing of more than one window at a time.

9.9 Avoid Scroll Stoppers

Guideline: Ensure that the location of headings and other page elements does not create the illusion that users have reached the top or bottom of a page when they have not.

Comments: In one study, three headings were positioned in the center of a page below a section of introductory text—the headings were located about one inch below the navigation tabs. When users scrolled up the page from the bottom and encountered these headings, they tended to stop, thinking the headings indicated the top of the page.

Similarly, users have been found to not scroll to the true bottom of a page to find a link because they encountered a block of text in a very small font size. This small type led users to believe that they were at the true bottom of the page. Other elements that may stop users' scrolling include horizontal lines, inappropriate placement of 'widgets,' and cessation of background color.

9.10 Set Appropriate Page Lengths

Guideline: Make page-length decisions that support the primary use of the Web page.

Comments: In general, use shorter pages for homepages and navigation pages, and pages that need to be quickly browsed and/or read online. Use longer pages to (1) facilitate uninterrupted reading, especially on content pages;
(2) match the structure of a paper counterpart; (3) simplify page maintenance (fewer Web page files to maintain); and, (4) make pages more convenient to download and print.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

64

9.11 Use Moderate White Space

Guideline: Limit the amount of white space (areas without text, graphics, etc.) on pages that are used for scanning and searching.

Comments: 'Density' is the percentage of the screen filled with text and graphics. One study found that higher density is related to faster scanning, and has no impact on user accuracy or preference. Another study found that users prefer moderate amounts of white space, but the amount of white space has no impact on their searching performance. On content (i.e., text) pages, use some white space to separate paragraphs. Too much separation of items on Web pages may require users to scroll unnecessarily.

9.12 Choose Appropriate Line Lengths

Guideline: If reading speed is most important, use longer line lengths (75-100 characters per line). If acceptance of the Web site is most important, use shorter line lengths (fifty characters per line).

Comments: When designing, first determine if performance or preference is most important. Users read faster when line lengths are long. However, they tend to prefer shorter line lengths, even though reading shorter lines generally slows overall reading speed. One study found that line lengths of about twenty characters reliably slowed reading speed.

When space for text display is limited, display a few longer lines of text rather than many shorter lines of text. Always display continuous text in columns containing at least fifty characters per line.

Research done using a paper-based document found that medium line length was read fastest.

9.13 Use Frames when Functions Must Remain Accessible

Guideline: Use frames when certain functions must remain visible on the screen as the user accesses other information on the site.

Comments: It works well to have the functional items in one frame and the

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                 Standards

65

items that are being acted upon in another frame. This is sometimes referred to as a 'simultaneous menu' because making changes in one frame causes the information to change in another frame. Side-by-side frames seem to work best, with the functions on the left and the information viewing area on the right.

Keep in mind that frames can be confusing to some users. More than three frames on a page can be especially confusing to infrequent and occasional users. Frames also pose problems when users attempt to print, and when they search pages.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

66

10. Navigation

Navigation refers to the method used to find information within a Web site. A navigation page is used primarily to help users locate and link to destination pages. A Web site's navigation scheme and features should allow users to find and access information effectively and efficiently. When possible, this means designers should keep navigation-only pages short. Designers should include site maps, and provide effective feedback on the user's location within the site.

To facilitate navigation, designers should differentiate and group navigation elements and use appropriate menu types. It is also important to use descriptive tab labels, provide a clickable list of page contents on long pages, and add 'glosses' where they will help users select the correct link. In well-designed sites, users do not get trapped in dead-end pages.

10.1 Provide Navigational Options

Guideline: Do not create or direct users into pages that have no navigational options.

Comments: Many Web pages contain links that open new browser windows. When these browser windows open, the Back button is disabled (in essence, the new browser window knows nothing of the user's past navigation, and thus is disabled). If the new window opens full-screen, users may not realize that they have been redirected to another window, and may become frustrated because they cannot press Back to return to the previous page. If such links are incorporated into a Web site, the newly-opened window should contain a prominent action control that will close the window and return the user to the original browser window.

In addition, designers should not create Web pages that disable the browser's Back button. Disabling the Back button can result in confusion and frustration for users, and drastically inhibits their navigation.

10.2 Differentiate and Group Navigation Elements

Guideline: Clearly differentiate navigation elements from one another, but group and place them in a consistent and easy to find place on each page.

Comments: Create a common, Web site-wide navigational scheme to help users learn and understand the structure of your Web site. Use the same navigation scheme on all pages by consistently locating tabs, headings, lists, search, site map, etc. Locate critical navigation elements in places that will suggest clickability (e.g., lists of words in the left or right panels are generally assumed to be links).

Make navigational elements different enough from one another so that users will be able to understand the difference in their meaning and destination. Grouping reduces the amount of time that users need to locate and identify navigation elements.

Do not make users infer the label by studying a few items in the group. Finally, make it easy for users to move from label to label (link to link) with a single eye movement. This best can be done by positioning relevant options close together and to using vertical lists.

10.3 Use a Clickable 'List of Contents' on Long Pages

Guideline: On long pages, provide a 'list of contents' with links that take users to the corresponding content farther down the page.

Comments: For long pages with several distinct sections that are not visible from the first screenful, add a short, clickable list of the sections (sometimes called 'anchor' or 'within-page' links) at the top of the page. 'Anchor links' can serve two purposes: they provide an outline of the page so users can quickly determine if it contains the desired information, and they allow users to quickly navigate to specific information.

Since 'anchor links' enable a direct link to content below the first screenful, they are also useful for getting users to specific information quickly when they arrive from a completely different page.

10.4 Provide Feedback on Users' Location

Guideline: Provide feedback to let users know where they are in the Web

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
       Standards

68

site.

Comments: Feedback provides users with the information they need to understand where they are within the Web site, and for proceeding to the next activity. Examples of feedback include providing path and hierarchy information (i.e., 'breadcrumbs'), matching link text to the destination page's heading, and creating URLs that relate to the user's location on the site. Other forms of feedback include changing the color of a link that has been clicked (suggesting that destination has been visited), and using other visual cues to indicate the active portion of the screen.

10.5 Place Primary Navigation Menus in the Left Panel

Guideline: Place the primary navigation menus in the left panel, and the secondary and tertiary menus together.

Comments: One study found that navigation times were faster when the primary menu was located in the left panel. Also, navigation performance was best when the secondary and tertiary menus were placed together. Placing a navigation menu in the right panel was supported as a viable design option by both performance and preference measures. Users preferred having the primary menu in the left panel, and grouping secondary and tertiary menus together, or grouping all three menu levels together. The best performance and preference was achieved when all three menus were placed in the left panel (placing them all in the right panel achieved close to the same performance level).

10.6 Use Descriptive Tab Labels

Guideline: Ensure that tab labels are clearly descriptive of their function or destination.

Comments: Users like tabs when they have labels that are descriptive enough to allow error-free selections. When tab labels cannot be made clear because of the lack of space, do not use tabs.

10.7 Present Tabs Effectively

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

69

Guideline: Ensure that navigation tabs are located at the top of the page, and look like clickable versions of real-world tabs.

Comments: Users can be confused about the use of tabs when they do not look like real-world tabs. Real-world tabs are those that resemble the ones found in a file drawer. One study showed that users are more likely to find and click appropriately on tabs that look like real-world tabs.

10.8 Keep Navigation-Only Pages Short

Guideline: Do not require users to scroll purely navigational pages.

Comments: Ideally, navigation-only pages should contain no more than one screenful of information. Users should not need to scroll the page, even a small distance. One study showed that users considered the bottom of one screenful as the end of a page, and they did not scroll further to find additional navigational options.

10.9 Use Appropriate Menu Types

Guideline: Use 'sequential' menus for simple forward-moving tasks, and use 'simultaneous' menus for tasks that would otherwise require numerous uses of the Back button.

Comments: Most Web sites use familiar 'sequential' menus that require items to be selected from a series of menus in some predetermined order. After each selection is made, another menu opens. The final choice is constrained by the sum total of all previous choices.

Simultaneous menus display choices from multiple levels in the menu hierarchy, providing users with the ability to make choices from the menu in any order. Simultaneous menus are often presented in frames, and are best employed in situations where users would have to make extensive use of the Back button if presented with a sequential menu.

10.10 Use Site Maps

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

70

Guideline: Use site maps for Web sites that have many pages.

Comments: Site maps provide an overview of the Web site. They may display the hierarchy of the Web site, may be designed to resemble a traditional table of contents, or may be a simple index.

Some studies suggest that site maps do not necessarily improve users' mental representations of a Web site. Also, one study reported that if a site map does not reflect users' (or the domain's) conceptual structure, then the utility of the map is lessened.

10.11 Use 'Glosses' to Assist Navigation

Guideline: Provide 'glosses' to help users select correct links.

Comments: 'Glosses' are short phrases of information that popup when a user places his or her mouse pointer close to a link. It provides a preview to information behind a link. Users prefer the preview information to be located close to the link, but not placed such that it disturbs the primary text. However, designers should not rely on the 'gloss' to compensate for poorly labeled links.

10.12 Breadcrumb Navigation

Guideline: Do not expect users to use breadcrumbs effectively.

Comments: One study reported no difference in task completion times and total pages visited between groups that had breadcrumbs and those that did not. Participants could have used breadcrumbs thirty-two percent of the time, but only did so six percent of the time. It is probably not worth the effort to include breadcrumbs unless you can show that your Web site's users use them frequently, either to navigate the site, or to understand the site's hierarchy.

One study found that test participants who received instruction on the use of breadcrumbs completed tasks much faster than those who did not. This time savings could result in increased productivity for users that search Web sites

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

71

on a daily basis.

11. Scrolling and Paging

Designers must decide, early in the design process,
whether to create long pages that require extensive scrolling or shorter pages
that will require users to move frequently from page to page (an activity
referred to as paging). This decision will be based on considerations of the
primary users and the type of tasks being performed. For example, older
users tend to scroll more slowly than younger users; therefore, long scrolling
pages may slow them down considerably. As another example, some tasks
that require users to remember where information is located on a page may
benefit from paging, while many reading tasks benefit from scrolling.

Generally, designers should ensure that users can move from page to page as
efficiently as possible. If designers are unable to decide between paging and
scrolling, it is usually better to provide several shorter pages rather than one
or two longer pages. The findings of usability testing should help confirm or
negate that decision.

When scrolling is used, a Web site should be designed to allow the fastest
possible scrolling. Users only should have to scroll through a few screenfuls,
and not lengthy pages. Designers should never require users to scroll
horizontally.

11.1 Eliminate Horizontal Scrolling

Guideline: Use an appropriate page layout to eliminate the need for users to
scroll horizontally.

Comments: Horizontal scrolling is a slow and tedious way to view an entire
screen. Common page layouts including fluid and left-justified may require
some users to scroll horizontally if their monitor resolution or size is smaller
than that used by designers.

11.2 Facilitate Rapid Scrolling While Reading

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

73

Guideline: Facilitate fast scrolling by highlighting major items.

Comments: Web pages will move quickly or slowly depending on how users elect to scroll. Some users click on the arrows at the ends of the scroll bar, which can be slow but does allow most information to be read during the scrolling process. Other users drag the scroll box, which tends to be much faster. When the scroll box is dragged, the information may move too fast on the screen for users to read prose text, but they can read major headings that are well-designed and clearly placed. Keep in mind that older users (70 and over) will scroll much more slowly than younger users (39 and younger).

11.3 Use Scrolling Pages For Reading Comprehension

Guideline: Use longer, scrolling pages when users are reading for comprehension.

Comments: Make the trade-off between paging and scrolling by taking into consideration that retrieving new linked pages introduces a delay that can interrupt users' thought processes. Scrolling allows readers to advance in the text without losing the context of the message as may occur when they are required to follow links.

However, with pages that have fast loading times, there is no reliable difference between scrolling and paging when people are reading for comprehension. For example, one study showed that paging participants construct better mental representations of the text as a whole, and are better at remembering the main ideas and later locating relevant information on a page. In one study, paging was preferred by inexperienced users.

11.4 Use Paging Rather Than Scrolling

Guideline: If users' system response times are reasonably fast, use paging rather than scrolling.

Comments: Users should be able to move from page to page by selecting links and without having to scroll to find important information.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
             Standards

74

11.5 Scroll Fewer Screenfuls

Guideline: If users are looking for specific information, break up the information into
smaller portions (shorter pages).

Comments: For many Web sites, users deal best with smaller, well-organized pages of information rather than lengthy pages because scrolling can take a lot of time. Older users tend to scroll much more slowly than younger users. One study found that Internet users spend about thirteen percent of their time scrolling within pages. Even though each event takes little time, cumulative scrolling adds significant time.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
     Standards

75

12. Headings, Titles, and Labels

Most users spend a considerable amount of time scanning rather than reading information on Web sites. Well-designed headings help to facilitate both scanning and reading written material. Designers should strive to use unique and descriptive headings, and to use as many headings as necessary to enable users to find what they are looking for—it is usually better to use more rather than fewer headings. Headings should be used in their appropriate HTML order, and it is generally a good idea not to skip heading levels.

Designers should ensure that each page has a unique and descriptive page title. When tables are used, designers should make sure that descriptive row and column headings are included that enable users to clearly understand the information in the table. It is occasionally important to highlight certain critical information.

12.1 Use Clear Category Labels

Guideline: Ensure that category labels, including links, clearly reflect the information and items contained within the category.

Comments: Category titles must be understood by typical users. Users will likely have difficulty understanding vague, generalized link labels, but will find specific, detailed links, and descriptors easier to use.

12.2 Provide Descriptive Page Titles

Guideline: Put a descriptive, unique, concise, and meaningfully different title on each Web page.

Comments: Title refers to the text that is in the browser title bar (this is the bar found at the very top of the browser screen). Titles are used by search engines to identify pages. If two or more pages have the same title, they cannot be differentiated by users or the Favorites capability of the browser.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                Standards

77

If users bookmark a page, they should not have to edit the title to meet the characteristics mentioned above.

Remember that some search engines only list the titles in their search results page. Using concise and meaningful titles on all pages can help orient users as they browse a page or scan hot lists and history lists for particular URLs. They can also help others as they compile links to your pages.

To avoid confusing users, make the title that appears in the heading of the browser consistent with the title in the content area of the pages.

12.3 Use Descriptive Headings Liberally

Guideline: Use descriptive headings liberally throughout a Web site.

Comments: Well-written headings are an important tool for helping users scan quickly. Headings should conceptually relate to the information or functions that follow them.

Headings should provide strong cues that orient users and inform them about page organization and structure. Headings also help classify information on a page. Each heading should be helpful in finding the desired target.

The ability to scan quickly is particularly important for older adults because they tend to stop scanning and start reading more frequently. If headings are not descriptive or plentiful enough, the user may start reading in places that do not offer the information they are seeking, thereby slowing them down unnecessarily.

12.4 Use Unique and Descriptive Headings

Guideline: Use headings that are unique from one another and conceptually related to the content they describe.

Comments: Using poor headings (mismatches between what users were expecting and what they find) is a common problem with Web sites. Ensure that headings are descriptive and relate to the content they introduce.
If headings are too similar to one another, users may have to hesitate and re-read to decipher the difference. Identifying the best headings may require

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

78

extensive usability testing and other methods.

12.5 Highlight Critical Data

Guideline: Visually distinguish (i.e., highlight) important page items that require user attention, particularly when those items are displayed infrequently.

Comments: Items to highlight might include recently changed data, data exceeding acceptable limits, or data failing to meet some other defined criteria. Highlight is used here in its general sense, meaning to emphasize or make prominent. Highlighting is most effective when used sparingly, i.e., highlighting just a few items on a page that is otherwise relatively uniform in appearance.

12.6 Use Descriptive Row and Column Headings

Guideline: Ensure that data tables have clear, concise, and accurate row and column headings.

Comments: Use row and column headings to indicate unique cell contents. Users require clear and concise table headings in order to make efficient and effective use of table information. Row and column headings will indicate to screen readers how data points should be labeled or identified, so the user can understand the significance of the cell in the overall scheme of the table.

12.7 Use Headings in the Appropriate HTML Order

Guideline: Use headings in the appropriate HTML order.

Comments: Using the appropriate HTML heading order helps users get a sense of the hierarchy of information on the page. The appropriate use of H1-H3 heading tags also allows users of assistive technologies to understand the hierarchy of information.

12.8 Provide Users with Good Ways to Reduce Options

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

79

Guideline: Provide users with good ways to reduce their available options as efficiently as possible.

Comments: Users seem willing to reduce their
options quickly. Provide all options clearly so that users can focus first on selecting what they consider to be the most important option.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

80

13. Links

Linking means that users will select and click on a hypertext link on a starting page (usually the homepage), which then causes a new page to load. Users continue toward their goal by finding and clicking on subsequent links.

To ensure that links are effectively used, designers should use meaningful link labels (making sure that link names are consistent with their targets), provide consistent click ability cues (avoiding misleading cues), and designate when links have been clicked.

Whenever possible, designers should use text for links rather than graphics. Text links usually provide much better information about the target than do graphics.

13.1 Use Meaningful Link Labels

Guideline: Use link labels and concepts that are meaningful, understandable, and easily differentiated by users rather than designers.

Comments: To avoid user confusion, use link labels that clearly differentiate one link from another. Users should be able to look at each link and learn something about the link's destination. Using terms like 'Click Here' can be counterproductive.

Clear labeling is especially important as users navigate down through the available links. The more decisions that users are required to make concerning links, the more opportunities they have to make a wrong decision.

13.2 Link to Related Content

Guideline: Provide links to other pages in the Web site with related content.

Comments: Users expect designers to know their Web sites well enough to provide a full list of options to related content.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                Standards

81

13.3 Match Link Names with Their Destination Pages

Guideline: Make the link text consistent with the title or headings on the destination (i.e., target) page.

Comments: Closely matched links and destination targets help provide the necessary feedback to users that they have reached the intended page.

If users will have to click more than once to get to a specific target destination, avoid repeating the exact same link wording over and over because users can be confused if the links at each level are identical or even very similar. In one study, after users clicked on a link entitled 'First Aid,' the next page had three options. One of them was again titled 'First Aid.' The two 'First Aid' links went to different places. Users tended to click on another option on the second page because they thought that they had already reached 'First Aid.'

13.4 Avoid Misleading Cues to Click

Guideline: Ensure that items that are not clickable do not have characteristics that suggest that they are clickable.

Comments: Symbols usually must be combined with at least one other cue that suggests clickability. In one study, users were observed to click on a major heading with some link characteristics, but the heading was not actually a link.

However, to some users bullets and arrows may suggest clickability, even when they contain no other clickability cues (underlining, blue coloration, etc.). This slows users as they debate whether the items are links.

13.5 Repeat Important Links

Guideline: Ensure that important content can be accessed from more than one link.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

82

Comments: Establishing more than one way to access the same information can help some users find what they need. When certain information is critical to the success of the Web site, provide more than one link to the information. Different users may try different ways to find information, depending on their own interpretations of a problem and the layout of a page. Some users find important links easily when they have a certain label, while others may recognize the link best with an alternative name.

13.6 Use Text for Links

Guideline: Use text links rather than image links.

Comments: In general, text links are more easily recognized as clickable. Text links usually download faster, are preferred by users, and should change colors after being selected. It is usually easier to convey a link's destination in text, rather than with the use of an image.

In one study, users showed considerable confusion regarding whether or not certain images were clickable. This was true even for images that contained words. Users could not tell if the images were clickable without placing their cursor over them ('minesweeping'). Requiring users to 'minesweep' to determine what is clickable slows them down.

Another benefit to using text links is that users with text-only and deactivated graphical browsers can see the navigation options.

13.7 Designate Used Links

Guideline: Use color changes to indicate to users when a link has been visited.

Comments: Generally, it is best to use the default text link colors (blue as an unvisited location/link and purple as a visited location/link). Link colors help users understand which parts of a Web site they have visited. In one study, providing this type of feedback was the only variable found to improve the user's speed of finding information. If a user selects one link, and there are other links to the same target, make sure all links to that target

change color.

One 2003 study indicated a compliance rate of only thirty-three percent for this guideline; a 2002 study showed a compliance rate of thirty-five percent.

13.8 Provide Consistent Clickability Cues

Guideline: Provide sufficient cues to clearly indicate to users that an item is clickable.

Comments: Users should not be expected to move the cursor around a Web site ('minesweeping') to determine what is clickable. Using the eyes to quickly survey the options is much faster than 'minesweeping.' Similarly, relying on mouseovers to designate links can confuse newer users, and slow all users as they are uncertain about which items are links.

Be consistent in your use of underlining, bullets, arrows, and other symbols such that they always indicate clickability or never suggest clickability. For example, using images as both links and as decoration slows users as it forces them to study the image to discern its clickability.

Items that are in the top center of the page, or left and right panels have a high probability of being considered links. This is particularly true if the linked element looks like a real-world tab or push button.

13.9 Ensure that Embedded Links are Descriptive

Guideline: When using embedded links, the link text should accurately describe the link's destination.

Comments: Users tend to ignore the text that surrounds each embedded link; therefore, do not create embedded links that use the surrounding text to add clues about the link's destination.

13.10 Use 'Pointing-and-Clicking'

Guideline: 'Pointing-and-clicking,' rather than mousing over, is preferred when selecting menu items from a cascading menu structure.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
            Standards

84

Comments: One study found that when compared with the mouseover method, the 'point-and-click' method takes eighteen percent less time, elicits fewer errors, and is preferred by users.

13.11 Use Appropriate Text Link Lengths

Guideline: Make text links long enough to be understood, but short enough to minimize wrapping.

Comments: A single word text link may not give enough information about the link's destination. A link that is several words may be difficult to read quickly, particularly if it wraps to another line. Generally, it is best if text links do not extend more than one line. However, one study found that when users scan prose text, links of nine to ten words elicit better performance than shorter or longer links. Keep in mind that it is not always possible to control how links will look to all users because browser settings and screen resolutions can vary.

13.12 Indicate Internal vs. External Links

Guideline: Indicate to users when a link will move them to a different location on the same page or to a new page on a different Web site.

Comments: One study showed that users tend to assume that links will take them to another page within the same Web site. When this assumption is not true, users can become confused. Designers should try to notify users when they are simply moving down a page, or leaving the site altogether.

13.13 Clarify Clickable Regions of Images

Guideline: If any part of an image is clickable, ensure that the entire image is clickable or that the clickable sections are obvious.

National Information Center- General Department of Information Technology Standards   Information Systems Department - Section Policies and

85

Comments: Users should not be required to use the mouse pointer to discover clickable areas of images. For example, in a map of the United States, if individual states are clickable, sufficient cues should be given to indicate the clickable states.

13.14 Link to Supportive Information

Guideline: Provide links to supportive information.

Comments: Use links to provide definitions and descriptions to clarify technical concepts or jargon, so that less knowledgeable users can successfully use the Web site. For example, provide links to a dictionary, glossary definitions, and sections dedicated to providing more information.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

86

14. <u>Text Appearance</u>

There are several issues related to text characteristics that can help ensure a Web site communicates effectively with users:
• Use familiar fonts that are at least 12-points;
• Use black text on plain, high-contrast backgrounds; and
• Use background colors to help users understand the grouping of related information.

Even though it is important to ensure visual consistency, steps should be taken to emphasize important text. Commonly used headings should be formatted consistently, and attention-attracting features, such as animation, should only be used when appropriate.

14.1 Use Black Text on Plain, High-Contrast Backgrounds

Guideline: When users are expected to rapidly read and understand prose text, use black text on a plain, high-contrast, non-patterned background.

Comments: Black text on a plain background elicited reliably faster reading performance than on a medium-textured background. When compared to reading light text on a dark background, people read black text on a white background up to thirty-two percent faster. In general, the greater the contrast between the text and background, the easier the text is to read.

14.2 Format Common Items Consistently

Guideline: Ensure that the format of common items is consistent from one page to another.

Comments: The formatting convention chosen should be familiar to users. For example, telephone numbers should be consistently punctuated (800-555-1212), and time records might be consistently punctuated with colons (HH:MM:SS).

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                Standards

87

14.3 Use Mixed-Case for Prose Text

Guideline: When users must read a lot of information, use lower-case fonts and appropriate capitalization to ensure the fastest possible reading speed.

Comments: Using 'mixed-case' fonts for reading prose text means that most letters will be lowercase, with all letters that should be capitalized being in uppercase. Most users have had considerable experience reading lowercase letters and are therefore very proficient at it.

14.4 Ensure Visual Consistency

Guideline: Ensure visual consistency of Web site elements within and between Web pages.

Comments: Two studies found that the number of errors made using visually inconsistent displays is reliably higher than when using visually consistent displays. Visual consistency includes the size and spacing of characters; the colors used for labels, fonts and backgrounds; and the locations of labels, text and pictures. Earlier studies found that tasks performed on more consistent interfaces resulted in (1) a reduction in task completion times; (2) a reduction in errors; (3) an increase in user satisfaction; and (4) a reduction in learning time.

However, users tend to rapidly overcome some types of inconsistencies. For example, one study found that the use of different-sized widgets (such as pushbuttons, entry fields, or list boxes) does not negatively impact users' performance or preferences.

14.5 Use Bold Text Sparingly

Guideline: Use bold text only when it is important to draw the user's attention to a specific piece of information.

Comments: In the following example with the Field Identifiers bolded on

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

88

the left, users spent about four times as long looking at the bold Field Identifiers than the non-bold Field Values. In the example on the right, participants spent more time looking at the bolded Field Values. In addition, the non-bold Field Values elicited better search accuracy rates than did the bold Field Values. In situations like this example, it is probably best to not use bold for either field identifiers or field values. In general, bold text should be used sparingly.

14.6 Use Attention-Attracting Features when Appropriate

Guideline: Use attention-attracting features with caution and only when they are highly relevant.

Comments: Draw attention to specific parts of a Web page with the appropriate (but limited) use of moving or animated objects, size differential between items, images, brightly-colored items, and varying font characteristics.

Not all features of a Web site will attract a user's attention equally. The following features are presented in order of the impact they have on users:

• _Movement (e.g., animation or 'reveals') is the most effective attention-getting item. Research suggests that people cannot stop themselves from initially looking at moving items on a page. However, if the movement is not relevant or useful, it may annoy the user. If movement continues after attracting attention, it may distract from the information on the Web site.

• Larger objects, particularly images, will draw users' attention before smaller ones. Users fixate on larger items first, and for longer periods of time. However, users will tend to skip certain kinds of images that they believe to be ads or decoration.

• Users look at images for one or two seconds, and then look at the associated text caption. In many situations, reading a text caption to understand the meaning of an image is a last resort. Parts of images or text that have brighter colors seem to gain focus first.

Having some text and graphic items in brighter colors, and others in darker colors, helps users determine the relative importance of elements. Important attention-attracting font characteristics can include all
uppercase, bolding, italics, underlining, and increased font size.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

89

14.7 Use Familiar Fonts

Guideline: Use a familiar font to achieve the best possible reading speed.

Comments: Research shows no reliable differences in reading speed or user preferences for twelve point Times New Roman or Georgia (serif fonts), or Arial, Helvetica, or Verdana (sans serif fonts).

14.8 Use at Least 12-Point Font

Guideline: Use at least a 12-point font (e.g., typeface) on all Web pages.

Comments: Research has shown that fonts smaller than 12 points elicit slower reading performance from users. For users over age 65, it may be better to use at least fourteen-point fonts. Never use less than nine-point font on a Web site.

Traditional paper-based font sizes do not translate well to Web site design. For instance, Windows Web browsers display type two to three points larger than the same font displayed on a Macintosh. User-defined browser settings may enlarge or shrink designer-defined font sizes. Defining text size using pixels will result in differently-sized characters depending upon the physical size of the monitor's pixels and its set resolution, and presents accessibility issues to those individuals who must specify large font settings.

14.9 Color-Coding and Instructions

Guideline: When using color-coding on your Web site, be sure that the coding scheme can be quickly and easily understood.

Comments: One study found that participants were able to answer questions significantly faster when the interface was color-coded, but only when information about the color-coding was provided. When both color-coding and information about how to interpret the colors were provided, user performance improved by forty percent. Be sure that the information provided does not require the user to read and comprehend a lot of text to understand it.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                    Standards

90

14.10 Emphasize Importance

Guideline: Change the font characteristics to emphasize the importance of a word or short phrase.

Comments: Font characteristics that are different from the surrounding text will dominate those that are routine. Important font characteristics include bolding, italics, font style (serif vs. sans serif), font size (larger is better to gain attention), and case (upper vs. lower). When used well, text style can draw attention to important words.

The use of differing font characteristics has negative consequences as well–reading speed can decrease by almost twenty percent, and thus should be used sparingly in large blocks of prose. Do not use differing font characteristics to show emphasis for more than one or two words or a short phrase. Do not use underlining for emphasis because underlined words on the Web are generally considered to be links.

14.11 Highlighting Information

Guideline: Do not use two (or more) different ways to highlight the same information on one page.

Comments: One study found that participants were able to complete tasks faster when the interface contained either color-coding or a form of ranking, but not both. The presence of both seemed to present too much information, and reduced the performance advantage by about half.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
Standards

91

15. Lists

Lists are commonly found on Web sites.

These may be lists of, for example, people, drugs, theaters, or restaurants. Each list should be clearly introduced and have a descriptive title. A list should be formatted so that it can be easily scanned. The order of items in the list should be done to maximize user performance, which usually means that the most important items are placed toward the top of the list. If a numbered list is used, start the numbering at 'one,' not 'zero.' Generally only the first letter of the first word is capitalized, unless a word that is usually capitalized is shown in the list.

15.1 Order Elements to Maximize User Performance

Guideline: Arrange lists and tasks in an order that best facilitates efficient and successful user performance.

Comments: Designers should determine if there is an order for items that will facilitate use of the Web site. If there is, ensure that the site is formatted to support that order, and that all pages follow the same order. For example, ensure that lists of items, sets of links, and a series of tabs are in a meaningful order.

Where no obvious order applies, organize lists alphabetically or numerically. Keep in mind that it is the user's logic that should prevail rather than the designer's logic.

15.2 Place Important Items at Top of the List

Guideline: Place a list's most important items at the top.

Comments: Experienced users usually look first at the top item in a menu or list, and almost always look at one of the top three items before looking at those farther down the list. Research indicates that users tend to stop scanning a list as soon as they see something relevant, thus illustrating the

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

92

reason to place important items at the beginning of lists.

15.3 Format Lists to Ease Scanning

Guideline: Make lists easy to scan and understand.

Comments: The use of meaningful labels, effective background colors, borders, and white space allow users to identify a set of items as a discrete list.

15.4 Display Related Items in Lists

Guideline: Display a series of related items in a vertical list rather than as continuous text.

Comments: A well-organized list format tends to facilitate rapid and accurate scanning. One study indicated that users scan vertical lists more rapidly than horizontal lists. Scanning a horizontal list takes users twenty percent longer than scanning a vertical list.

15.5 Introduce Each List

Guideline: Provide an introductory heading (i.e., word or phrase) at the top of each list.

Comments: Providing a descriptive heading allows users to readily understand the reason for having a list of items, and how the items relate to each other. The heading helps to inform users how items are categorized, or any prevailing principle or theme. Users are able to use lists better when they include headings.

15.6 Use Static Menus

Guideline: Use static menus to elicit the fastest possible speed when accessing menu items.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
Standards

93

Comments: To elicit the fastest possible human performance, designers should put the most frequently used menus times in the first few positions of a menu. Designers should determine the location of items within a menu based on the frequency of use of each item. Adaptable menus, where users are allowed to change the order of menu items, elicits reasonably fast performance as well. The slowest performance is achieved when an adaptive menu, where the computer automatically changes the position of menu items, is used. One study found that users prefer having static menus, rather than adaptive menus.

15.7 Start Numbered Items at One

Guideline: When items are numbered, start the numbering sequence at 'one' rather than 'zero.'

Comments: Do not start the numbering with a 'zero.' When counting, people start with 'one,' not 'zero.'

15.8 Use Appropriate List Style

Guideline: Use bullet lists to present items of equal status or value, and numbered lists if a particular order to the items is warranted.

Comments: Bullet lists work best when the items do not contain an inherent sequence, order, or rank. Numbered lists assign each item in the list an ascending number, making the numerical order readily apparent. Numbered lists are especially important when giving instructions.

15.9 Capitalize First Letter of First Word in Lists

Guideline: Capitalize the first letter of only the first word of a list item, a list box item, check box labels, and radio button labels.

Comments: Only the first letter of the first word should be capitalized

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

94

unless the item contains another word that would normally be capitalized.

National Information Center- General Department of Information Technology Standards   Information Systems Department - Section Policies and

95

16. <u>Screen-Based Controls (Widgets)</u>

In order to interact with a Web site, users
usually require the use of screen-based controls (sometimes known
as 'widgets'). Besides the pervasive link, commonly used screen-based
controls include pushbuttons, radio buttons, check boxes, drop-down lists
and entry fields. Designers should ensure that they use familiar widgets in a
conventional or commonly-used manner.

When pushbuttons are used, ensure that they look like pushbuttons and that
they are clearly labeled. In some cases, the pushbuttons will need to be
prioritized to facilitate their proper use.

Radio buttons are used to select from among two or more mutually-
exclusive selections. Check boxes should be used to make binary choices,
e.g., 'yes' or 'no.' Drop-down lists are generally used to select one item
from among many. To speed user performance, show default values when
appropriate, and do not limit the number of viewable list box options.

Entry fields are used when completing forms and entering text into search
boxes. Designers should try to minimize the amount of information entered
by users. Each entry field should be clearly and consistently labeled, with
the labels placed close to the entry fields. Designers should also clearly
distinguish between 'required' and 'optional' data entry fields, and attempt
to minimize the use of the
Shift key.

To facilitate fast entry of information, designers should automatically place
the cursor in the first data entry field, provide labels for each field (e.g.,
pounds, miles, etc.), and provide auto-tabbing functionality. In order to
increase accuracy of data entry, partition long data items into smaller units,
enable the software to automatically detect errors, and do not require case-
sensitive data entries. Showing users their data entries can increase accuracy.
For experienced users, the fastest possible entry of information will come
from allowing users to use entry fields instead of selecting from list boxes.

16.1 Distinguish Required and Optional Data Entry Fields

Guideline: Distinguish clearly and consistently between required and

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
         Standards

96

optional data entry fields.

Comments: Users should be able to easily determine which data entry fields are required and which are optional. Many Web sites are currently using an asterisk in front of the label for required fields. Other sites are adding the word 'required' near the label. One study found that bolded text is preferred when compared to the use of chevrons (>>>), checkmarks, or color to indicate required fields.

16.2 Label Pushbuttons Clearly

Guideline: Ensure that a pushbutton's label clearly indicates its action.

Comments: The label of a pushbutton should clearly indicate the action that will be applied when the pushbutton is clicked. Common pushbutton labels include 'Update,' 'Go,' 'Submit,' 'Cancel,' 'Enter,' 'Home,' 'Next,' and 'Previous.'

16.3 Label Data Entry Fields Consistently

Guideline: Ensure that data entry labels are worded consistently, so that the same data item is given the same label if it appears on different pages.

Comments: If possible, employ consistent labeling conventions. For example, do not use single
words or phrases for some labels and short sentences for others, or use verbs for some and nouns for others.

16.4 Do Not Make User-Entered Codes Case Sensitive

Guideline: Treat upper- and lowercase letters as equivalent when users are entering codes.

Comments: Do not make user-entered codes case sensitive unless there is a valid reason for doing so (such as increased security of passwords). If required, clearly inform users if they must enter codes in a case specific manner. When retaining data entered by users, show the data as it was

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
Standards

97

entered by the user.

16.5 Label Data Entry Fields Clearly

Guideline: Display an associated label for each data entry field to help users understand what entries are desired.

Comments: Employ descriptive labels that clearly, concisely, and unambiguously define the required entry. Make labels distinct enough so that readers do not confuse them with the data entries themselves. This can be done by bolding the labels or providing other visual cues, such as an asterisk.

Do not create new jargon when labeling data entry fields. Use common terms (e.g., male, female) rather than arbitrary labels (e.g., Group 1, Group 2). If the meaning of a proposed label is in doubt, conduct usability testing with an appropriate sample of qualified users.

16.6 Minimize User Data Entry

Guideline: Do not require users to enter the same information more than once.

Comments: Requiring re-entry of data imposes an additional task on users, and increases the possibility of entry errors. When entries made by users on one page are required on another page, the computer should retrieve the original entries, rather than requiring re-entry of the same information. In general, require users to make as few entries as possible.

16.7 Put Labels Close to Data Entry Fields

Guideline: Ensure that labels are close enough to their associated data entry fields so that users will recognize the label as describing the data entry field.

Comments: All labels and related information should be close to the data entry field to enable users to easily relate the label and entries required.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
Standards

98

16.8 Allow Users to See Their Entered Data

Guideline: Create data entry fields that are large enough to show all of the entered data without scrolling.

Comments: Users should be able to see their entire entry at one time. There always will be some users who will enter more data than can be seen without scrolling; however, try to minimize the need to scroll or move the cursor to see all the data for that field. If there is a character limit for a particular field, state that near the entry field.

Designers should be particularly aware of the length of data entry fields used for entering search terms. One study found that this entry field should be at least 35-40 characters long to accommodate ninety-five percent of search terms being used.

16.9 Use Radio Buttons for Mutually Exclusive Selections

Guideline: Provide radio buttons when users need to choose one response from a list of mutually exclusive options.

Comments: Radio buttons should be used when there is a need to select from among mutually exclusive items. Users should be able to click on the button or its text label to make their selection. Assign one of the radio button choices as the default when appropriate. One study reported that for making mutually exclusive selections, radio buttons elicit reliably better performance than drop-down lists. Radio buttons are also preferred over both open lists and drop-down lists.

16.10 Use Familiar Widgets

Guideline: Use widgets that are familiar to your users, and employ them in their commonly used manner.

Comments: Do not assume that all users are familiar with all available widgets. Unfamiliar widgets will slow some users, and cause others not to use the widget because they do not know how to make it work properly. For instance, one study showed that some users, particularly older users, do not

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

99

know how to use a drop-down list.

In choosing widgets, designers typically consider such issues as the amount of available screen 'real estate,' reducing the number of user clicks, and whether the user will be choosing one from among many items, or several items at once. Usability test the performance and acceptability of widgets to ensure they do not confuse or slow users.

16.11 Anticipate Typical User Errors

Guideline: Use the computer to detect errors made by users.

Comments: Do not expect that users always will make correct entries. Anticipate possible user errors, and when possible, allocate responsibility to the computer to identify these mistakes and suggest corrections. For example, if a date is entered as 'February 31,' the computer should generate an error message asking for a revised entry.

Design the site's search engine (and other places where users enter data) to accommodate common misspellings and certain other errors.

16.12 Partition Long Data Items

Guideline: Partition long data items into shorter sections for both data entry and data display.

Comments: Partitioning long data items can aid users in detecting entry errors, and can reduce erroneous entries. For example, it is easier to enter and verify a ten digit telephone number when entered as three groups, NNN-NNN-NNNN. Similarly, ZIP+4 codes and Social Security numbers are best partitioned.

16.13 Use a Single Data Entry Method

Guideline: Design data entry transactions so that users can stay with one entry method as long as possible.

Comments: Do not have users shift back and forth between data entry

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
               Standards

100

methods. Requiring users to make numerous shifts from keyboard to mouse to keyboard can substantially slow their entry speed.

16.14 Prioritize Pushbuttons

Guideline: Use location and highlighting to prioritize pushbuttons.

Comments: If one pushbutton in a group of pushbuttons is used more frequently than the others, put that button in the first position. Also make the most frequently used button the default action, i.e., that which is activated when users press the Enter key.

One study reported that designers should place the button most likely to be clicked on the left side of a two-button set of buttons. This button arrangement allows the user to read the first button label, and since it is the most likely selection, click on that button immediately. Some users look at the left and then right button before making a selection, preferring to be fully informed before submitting a response.

16.15 Use Check Boxes to Enable Multiple Selections

Guideline: Use a check box control to allow users to select one or more items from a list of possible choices.

Comments: Each check box should be able to be selected independently of all other check boxes.
One study showed that for making multiple selections from a list of non-mutually exclusive items, check boxes elicit the fastest performance and are preferred over all other widgets. Users should be able to click on either the box or the text label.

16.16 Label Units of Measurement

Guideline: When using data entry fields, specify the desired measurement units with the field labels rather than requiring users to enter them.

Comments: Designers should include units such as minutes, ounces, or centimeters, etc. as part of the data entry field label. This will reduce the

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

101

number of keystrokes required of users (speeding the data entry process), and reduce the chance of errors.

16.17 Do Not Limit Viewable List Box Options

Guideline: When using open lists, show as many options as possible.

Comments: Scrolling to find an item in a list box can take extra time. In one study, an open list that showed only three (of five) options was used. To see the hidden two items, users had to scroll. The need to scroll was not obvious to users who were not familiar with list boxes, and slowed down those that did know to scroll.

16.18 Display Default Values

Guideline: Display default values whenever a likely default choice can be defined.

Comments: When likely default values can be defined, offer those values to speed data entry. The initial or default item could be the most frequently selected item or the last item selected by that user. In general, do not use the default position to display a heading or label for that widget.

16.19 Place Cursor in First Data Entry Field

Guideline: Place (automatically) a blinking cursor at the beginning of the first data entry field when a data entry form is displayed on a page.

Comments: Users should not be required to move the mouse pointer to the first data entry field and click on the mouse button to activate the field. Designers should consider, however, that programming this automatic cursor placement might negatively impact the performance of screen reader software.

16.20 Ensure that Double-Clicking Will Not Cause Problems

Guideline: Ensure that double-clicking on a link will not cause undesirable

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
Standards

102

or confusing results.

Comments: Many users double-click on a link when only one click is needed. Developers cannot stop users from double-clicking, but they should try to reduce the negative consequences of this behavior. Usability testing has indicated that if users start with quick double-clicks, they tend to continue to do this for most of the test. Sometimes, when both clicks are detected by the computer, the first click selects one link and the second click selects a second link, causing unexpected (i.e., puzzling) results.

16.21 Use Open Lists to Select One from Many

Guideline: Use open lists rather than drop-down lists to select one from many.

Comments: Generally, the more items users can see in a list (without scrolling), the faster their responses will be, and the fewer omission errors they will make. Ideally, users should be able to see all available items without scrolling.

When compared with drop-down lists, open lists tend to elicit faster performance primarily because drop-down lists require an extra click to open. However, if a list is extremely long, a drop-down list may be better. The available research does not indicate the upper number limit of items that should be displayed in a list.

16.22 Use Data Entry Fields to Speed Performance

Guideline: Require users to enter information using data entry fields (instead of selecting from list boxes) if you are designing to speed human performance.

Comments: At least two studies have compared the effectiveness of text entry versus selection (list boxes) for entering dates and making airline reservations. Both studies found text entry methods were faster and preferred over all other methods. However, use of text entry fields tends to elicit more errors.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

103

16.23 Use a Minimum of Two Radio Buttons

Guideline: Never use one radio button alone.

Comments: Use at least two radio buttons together. If users can choose not to activate any of the radio button choices, provide a choice labeled 'None.'

16.24 Provide Auto-Tabbing Functionality

Guideline: Provide auto-tabbing functionality for frequent users with advanced Web interaction skills.

Comments: Auto-tabbing can significantly reduce data entry times for frequent users by not requiring them to manually tab from field to field.

16.25 Minimize Use of the Shift Key

Guideline: Design data entry transactions to minimize use of the Shift key.

Comments: If possible, designers should not require users to enter characters that require the use the Shift key. Using the Shift key imposes a demand for extra user attention and time. For example, the designer can include symbols such as the dollar or percent sign near data entry fields rather than requiring users to enter those characters. Designers also can treat upper- and lowercases as equivalent when entered by users.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
    Standards

104

17. <u>Graphics, Images, and Multimedia</u>

Graphics are used on many, if not most, Web pages. When used appropriately, graphics can facilitate learning. An important image to show on most pages of a site is the organization's logo. When used appropriately, images, animation, video, and audio can add tremendous value to a Web site. When animation is used appropriately, it is a good idea to introduce the animation before it begins.

Many images require a large number of bytes that can take a long time to download, especially at slower connection speeds. When images must be used, designers should ensure that the graphics do not substantially slow page download times. Thumbnail versions of larger images allow users to preview images without having to download them.

Sometimes it is necessary to label images to help users understand them. Usability testing should be used to help ensure that Web site images convey the intended message. In many cases, the actual data should be included with charts and graphs to facilitate fast and accurate understanding.

It is usually not a good idea to use images as the entire background of a page. Complex background images tend to slow down page loading, and can interfere with reading the foreground text.

Experienced users tend to ignore graphics that they consider to be advertising. Designers should ensure that they do not create images that look like banner ads. Also, they should be careful about placing images in locations that are generally used for advertisements.

17.1 Use Simple Background Images

Guideline: Use background images sparingly and make sure they are simple, especially if they are used behind text.

Comments: Background images can make it difficult for users to read foreground text. A single, large, complex background image (including a picture) can substantially slow page download rates. If background images

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

105

must be employed, use small, simple images with 'tiling,' and/or keep the image resolution as low as possible.

17.2 Label Clickable Images

Guideline: Ensure that all clickable images are either labeled or readily understood by typical users.

Comments: Occasional or infrequent users may not use an image enough to understand or remember its meaning. Ensure that images and their associated text are close together so that users can integrate and effectively use them together. Additionally, alt text should accompany every clickable image.

17.3 Ensure that Images Do Not Slow Downloads

Guideline: Take steps to ensure that images on the Web site do not slow page download times unnecessarily.

Comments: User frustration increases as the length of time spent interacting with a system increases. Users tolerate less delay if they believe the task should be easy for the computer. One study reported that users rated latencies of up to five seconds as 'good.' Delays over ten seconds were rated as 'poor.' Users rate pages with long delays as being less interesting and more difficult to scan. One study reported no relationship between slow page download times and users giving up.

To speed download times, use several small images rather than a single large image on a page; use interlacing or progressive images; and use several of the same images. Designers should also minimize the number of different colors used in an image and put HEIGHT and WIDTH pixel dimension tags in an image reference. To achieve faster response time for users with dial-up modems, limit page size to less than 30,000 bytes.

17.4 Use Video, Animation, and Audio Meaningfully

Guideline: Use video, animation, and audio only when they help to convey,

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                    Standards

106

or are supportive of, the Web site's message or other content.

Comments: Multimedia elements (such as video, animation, and audio) can easily capture the attention of users; therefore, it is important to have clear and useful reasons for using multimedia to avoid unnecessarily distracting users. Some multimedia elements may take a long time to download, so it is important that they be worth the wait.

Used productively, multimedia can add great value to a site's content and help direct users' attention to the most important information and in the order that it is most useful.

17.5 Include Logos

Guideline: Place your organization's logo in a consistent place on every page.

Comments: Users are frequently unaware when they click through to a different Web site. Having a logo on each page provides a frame of reference throughout a Web site so that users can easily confirm that they have not left the site. Ideally, the logo should be in the same location on each page: many designers place the logo in the top left corner.

17.6 Graphics Should Not Look like Banner Ads

Guideline: Do not make important images look like banner advertisements or gratuitous decorations.

Comments: In a recent study, a graphic developed to inform users about access to live help was not clicked because many users thought it was an advertisement. Even though the graphic was larger than most other graphics on the page, some users missed the item completely because the graphic looked too much like a decoration or a banner advertisement.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                            Standards

107

17.7 Limit Large Images Above the Fold

Guideline: Do not fill the entire first screenful with one image if there are screensful of text information below the fold.

Comments: Large graphics that cover most of the screen at the top of the page suggest to users that there is no more information below the graphic. In one study, because a graphic filled the screen, some users did not use the scrollbar to scroll down to more content. In fact, some users did not even suspect that more information might be located below the fold.

17.8 Ensure Web Site Images Convey Intended Messages

Guideline: Ensure that Web site images convey the intended message to users, not just to designers.

Comments: Users and designers tend to differ in what they think is appropriate to convey a message. When attempting to select the best graphic from a set of graphics, users tend to select those that most other users would have selected (i.e., those that look familiar), while most developers favor graphics that look more artistic. One study found that seventy-five percent of users are able to find information on a content and link-rich site, whereas only seventeen percent could find the same information on a graphic-intensive site.

17.9 Limit the Use of Images

Guideline: Use images only when they are critical to the success of a Web site.

Comments: Ensure that a Web site's graphics add value and increase the clarity of the information on the site. Certain graphics can make some Web sites much more interesting for users, and users may be willing to wait a few extra seconds for them to load. Users tend to be most frustrated if they wait several seconds for a graphic to download, and then find that the image does not add any value. Some decorative graphics are acceptable when they do

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

108

not distract the user.

17.10 Include Actual Data with Data Graphics

Guideline: Include actual data values with graphical displays of data when precise reading of the data is required.

Comments: Adjacent numeric annotation might be added to the ends of displayed bars on a bar graph, or to mark the points of a plotted curve. Some displays may require complete data annotation while others may require annotation only for selected data elements.

17.11 Display Monitoring Information Graphically

Guideline: Use a graphic format to display data when users must monitor changing data.

Comments: Whenever possible, the computer should handle data monitoring and should call abnormalities to the users' attention. When that is not possible, and a user must monitor data changes, graphic displays will make it easier for users to detect critical changes and/or values outside the normal range.

17.12 Introduce Animation

Guideline: Provide an introductory explanation for animation prior to it being viewed.

Comments: Providing an explanation of animation before it begins will help users better integrate the animation and associated content. In other words, briefly explain to users what they are about to see before they see it. Also, allow animation to be user-controlled. The user should be able to pause, stop, replay, or ignore animation or other multimedia elements.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                    Standards

109

17.13 Emulate Real-World Objects

Guideline: Use images that look like real-world items when appropriate.

Comments: Images (e.g., pushbuttons and navigation tabs) are likely to be considered as links when they are designed to emulate their real-world analogues. If a designer cannot make such images emulate real-world objects, the image may require at least one additional clickability cue, such as a descriptive label (like 'Home' or 'Next') or placement on the page. A text label can help inform users about a link's destination, but in one study some users missed this type of image link, even those that contained words, because the words were not underlined.

17.14 Use Thumbnail Images to Preview Larger Images

Guideline: When viewing full-size images is not critical, first provide a thumbnail of the image.

Comments: By providing thumbnails of larger images, users can decide whether they want to wait for the full image to load. By using thumbnails, those who do not need or want to see the full image are not slowed down by large image downloads. Link the thumbnail image to the full-size copy.

17.15 Use Images to Facilitate Learning

Guideline: To facilitate learning, use images rather than text whenever possible.

Comments: The superiority of pictures over text in a learning situation appears to be strong. For example, pictures of common objects are recognized and recalled better than their textual names. Exceptions seem to occur when the items are conceptually very similar (e.g., all animals or tools), or when items are presented so quickly that learners cannot create verbal labels.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

110

17.16 Using Photographs of People

Guideline: Photographs of people may or may not help build trust in Web sites.

Comments: In one e-commerce study, having a labeled photograph on the Web site was perceived as more trustworthy than having a photograph with no label. Further, having a photograph with no label was perceived as more trustworthy than having no photograph at all. Highly experienced users showed the same degree of trust as users that were moderately experienced or inexperienced.

However, another study recommended that photos not be used to increase the trustworthiness of a Web site. They found that the presence of a photo did not affect the trust of a site, or user preferences for a site.

18. Writing Web Content

"Vigorous writing is concise. A sentence should contain no unnecessary words, a paragraph no unnecessary sentences, for the same reason that a drawing should have no unnecessary lines and a machine no unnecessary parts."– William Strunk Jr., in Elements of Style

Content is the most important part of a Web site.
If the content does not provide the information needed by users,
the Web site will provide little value no matter how easy it is to use
the site.

When preparing prose content for a Web site, use familiar words and avoid the use of jargon. If acronyms and abbreviations must be used, ensure that they are clearly understood by typical users and defined on the page.

Minimize the number of words in a sentence and sentences in a paragraph. Make the first sentence (the topic sentence) of each paragraph descriptive of the remainder of the paragraph. Clearly state the temporal sequence of instructions. Also, use upper- and lowercase letters appropriately, write in an affirmative, active voice, and limit prose text on navigation pages.

18.1 Make Action Sequences Clear

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

111

Guideline: When describing an action or task that has a natural order or sequence (assembly instructions, troubleshooting, etc.), structure the content so that the sequence is obvious and consistent.

Comments: Time-based sequences are easily understood by users. Do not force users to perform or learn tasks in a sequence that is unusual or awkward.

18.2 Avoid Jargon

Guideline: Do not use words that typical users may not understand.

Comments: Terminology plays a large role in the user's ability to find and understand information. Many terms are familiar to designers and content writers, but not to users. In one study, some users did not understand the term 'cancer screening.' Changing the text to 'testing for cancer' substantially improved users' understanding.

To improve understanding among users who are accustomed to using the jargon term, it may be helpful to put that term in parentheses. A dictionary or glossary may be helpful to users who are new to a topic, but should not be considered a license to frequently use terms typical users do not understand.

18.3 Use Familiar Words

Guideline: Use words that are frequently seen and heard.

Comments: Use words that are familiar to, and used frequently by, typical users. Words that are more frequently seen and heard are better and more quickly recognized. There are several sources of commonly used words (see Kucera and Francis, 1967 and Leech et al., 2001 in the Sources section).

Familiar words can be collected using open-ended surveys, by viewing search terms entered by users on your site or related sites, and through other forms of market research.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                    Standards

112

18.4 Define Acronyms and Abbreviations

Guideline: Do not use unfamiliar or undefined acronyms or abbreviations on Web sites.

Comments: Acronyms and abbreviations should
be used sparingly and must be defined in order
to be understood by all users. It is important to remember that users who are new to a topic are likely to be unfamiliar with the topic's related acronyms and abbreviations. Use the following format when defining acronyms or abbreviations: Physician Data Query (PDQ). Acronyms and abbreviations are typically defined on first mention, but remember that users may easily miss the definition if they scroll past it or enter the page below where the acronym or abbreviation is defined.

18.5 Use Abbreviations Sparingly

Guideline: Show complete words rather than abbreviations whenever possible.

Comments: The only times to use abbreviations are when they are significantly shorter, save needed space, and will be readily understood by typical users. If users must read abbreviations, choose only common abbreviations.

18.6 Use Mixed Case with Prose

Guideline: Display continuous (prose) text using mixed upper- and lowercase letters.

Comments: Reading text is easier when capitalization is used conventionally to start sentences and to indicate proper nouns and acronyms. If an item is intended to attract the user's attention, display the item in all uppercase, bold, or italics. Do not use these methods for showing emphasis for more than one or two words or a short phrase because they slow reading performance when used for extended prose.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

113

18.7 Limit the Number of Words and Sentences

Guideline: To optimize reading comprehension, minimize the number of words in sentences, and the number of sentences in paragraphs.

Comments: To enhance the readability of prose text, a sentence should not contain more than twenty words. A paragraph should not contain more than six sentences.

18.8 Limit Prose Text on Navigation Pages

Guideline: Do not put a lot of prose text on navigation pages.

Comments: When there are many words on navigation pages, users tend to rapidly scan for specific words or begin clicking on many different links, rather than reading the text associated with the links.

18.9 Use Active Voice

Guideline: Compose sentences in active rather than passive voice.

Comments: Users benefit from simple, direct language. Sentences in active voice are typically more concise than sentences in passive voice. Strong verbs help the user know who is acting and what is being acted upon. In one study, people who had to interpret federal regulation language spontaneously translated passive sentences into active sentences in order to form an understanding of the passages.

18.10 Write Instructions in the Affirmative

Guideline: As a general rule, write instructions in affirmative statements rather than negative statements.

Comments: When giving instructions, strive to tell users what to do (see a dentist if you have a toothache), rather than what to avoid doing (avoid

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

114

skipping your dentist appointment if you have a toothache). If the likelihood of making a wrong step is high or the consequences are dire, negative voice may be clearer to the user.

18.11 Make First Sentences Descriptive

Guideline: Include the primary theme of a paragraph, and the scope of what it covers, in the first sentence of each paragraph.

Comments: Users tend to skim the first one or two sentences of each paragraph when scanning text.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
            Standards

115

19. Content Organization

After ensuring that content is useful, well-written, and in a format that is suitable for the Web, it is important to ensure that the information is clearly organized. In some cases, the content on a site can be organized in multiple ways to accommodate multiple audiences.

Organizing content includes putting critical information near the top of the site, grouping related elements, and ensuring that all necessary information is available without slowing the user with unneeded information. Content should be formatted to facilitate scanning, and to enable quick understanding.

19.1 Organize Information Clearly

Guideline: Organize information at each level of the Web site so that it shows a clear and logical structure to typical users.

Comments: Designers should present information in a structure that reflects user needs and the site's goals. Information should be well-organized at the Web site level, page level, and paragraph or list level.

Good Web site and page design enables users to understand the nature of the site's organizational relationships and will support users in locating information efficiently. A clear, logical structure will reduce the chances of users becoming bored, disinterested, or frustrated

19.2 Facilitate Scanning

Guideline: Structure each content page to facilitate scanning: use clear, well-located headings; short phrases and sentences; and
small readable paragraphs.

Comments: Web sites that are optimized for scanning can help users find desired information. Users that scan generally read headings, but do not read full text prose–this results in users missing information when a page contains

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

116

dense text.

Studies report that about eighty percent of users scan any new page. Only sixteen percent read each word. Users spend about twelve percent of their time trying to locate desired information on a page.

To facilitate the finding of information, place important headings high in the center section of a page. Users tend to scan until they find something interesting and then they read. Designers should help users ignore large chunks of the page in a single glance. Keep in mind that older users (70 and over) will tend to scan much more slowly through a web page than will younger users (ages 39 and younger).

19.3 Ensure that Necessary Information is Displayed

Guideline: Ensure that all needed information is available and displayed on the page where and
when it is needed.

Comments: Users should not have to remember data from one page to the next or when scrolling from one screenful to the next. Heading information should be retained when users scroll data tables, or repeated often enough so that header information can be seen on each screenful.

19.4 Group Related Elements

Guideline: Group all related information and functions in order to decrease time spent searching or scanning.

Comments: All information related to one topic should be grouped together. This minimizes the need for users to search or scan the site for related information. Users will consider items that are placed in close spatial proximity to belong together conceptually. Text items that share the same background color typically will be seen as being related to each other.

19.5 Minimize the Number of Clicks or Pages

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                        Standards

117

Guideline: To allow users to efficiently find what they want, design so that the most common tasks can be successfully completed in the fewest number of clicks.

Comments: Critical information should be provided as close to the homepage as possible. This reduces the need for users to click deep into the site and make additional decisions on intervening pages. The more steps (or clicks) users must take to find the desired information, the greater the likelihood they will make an incorrect choice. Important information should be available within two or three clicks of the homepage.

One study found that the time to complete a task was closely related to the number of clicks made by users. It appears that users will keep clicking as long as they feel like they are getting closer to their goal. Another study showed that when users were trying to find a target, they were no more likely to quit after three clicks than after 12 clicks.

19.6 Design Quantitative Content for Quick Understanding

Guideline: Design quantitative information to reduce the time required to understand it.

Comments: Make appropriate use of tables, graphics, and visualization techniques to hasten the understanding of information. Presenting quantitative information in a table (rather than a graph) generally elicits the best performance; however, there are situations where visualizations will elicit even better performance. Usability testing can help to determine when users will benefit from using tabular data, graphics, tables, or visualizations.

19.7 Display Only Necessary Information

Guideline: Limit page information only to that which is needed by users while on that page.

Comments: Do not overload pages or interactions with extraneous information. Displaying too much information may confuse users and hinder assimilation of needed information. Allow users to remain focused on the desired task by excluding information that task analysis and usability testing

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

118

indicates is not relevant to their current task. When user information requirements cannot be precisely anticipated by the designer, allow users to tailor displays online.

19.8 Format Information for Multiple Audiences

Guideline: Provide information in multiple formats if the Web site has distinct audiences who will be interested in the same information.

Comments: Information can be provided in varying formats and at different levels of detail on the same site. For example, information about cancer can be presented in differing ways for physicians and patients.

When segmenting content for two or more distinct groups of users, allow users from each audience to easily access information intended for other audiences. One study showed that users want to see information that is intended for a health professional audience, as well as for a patient or consumer audience. Users want access to all versions of the information without first having to declare themselves as a health professional, a patient, a caregiver, etc. To accommodate these users, audiences were not segmented until they reached a page where links to multiple versions of a document (i.e., technical, non-technical) were provided.

19.9 Use Color for Grouping

Guideline: Use color to help users understand what does and does not go together.

Comments: Color coding permits users to rapidly scan and quickly perceive patterns and relationships among items. Items that share the same color will be considered as being related to each other, while items with prominent color differences will seem to be different.

People can distinguish up to ten different colors that are assigned to different categories, but it may be safer to use no more than five different colors for

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

119

category coding. If more than ten different colors are used, the effects of any particular relationship will be lost.

Do not use color alone to convey information.

20. Search

Many Web sites allow users to search for information contained in the site. Users access the search capability by entering one or more keywords into an entry field—usually termed a 'search box.' When there are words in the Web site that match the words entered by users, users are shown where in the Web site those words can be found.

Each page of a Web site should allow users to conduct a search. Usually it is adequate to allow simple searches without providing for the use of more advanced features. Users should be able to assume that both upper- and lowercase letters will be considered as equivalent when searching. The site's search capability should be designed to respond to terms typically entered by users. Users should be notified when multiple search capabilities exist.

Where many users tend to conduct similar searches, sometimes it works best to provide search templates. Users tend to assume that any search they conduct will cover the entire site and not a subsite. The results presented to users as a result of searching should be useful and usable.

20.1 Ensure Usable Search Results

Guideline: Ensure that the results of user searches provide the precise information being sought, and in a format that matches users' expectations.

Comments: Users want to be able to use the results of a search to continue solving their problem. When users are confused by the search results, or do not immediately find what they are searching for, they become frustrated.

20.2 Design Search Engines to Search the Entire Site

Guideline: Design search engines to search the entire site, or clearly communicate which part of the site will be searched.

Comments: Designers may want to allow users to control the range of their

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

121

searches. However, users tend to believe that a search engine will search the entire Web site. Do not have search engines search only a portion of the site without clearly informing users which parts of the site are being searched.

Keep in mind that what a designer may consider to be the entirety of a site may not be the same as what the user thinks is the 'whole' site. For example, many large sites have various subsections that are maintained by different designers, so the user may think of a site as something that designers think of as several sites. Make sure it is clear to users what part(s) of the Web site are being searched. Provide a means for users to narrow the scope of searches on large Web sites by providing easy access to specific subsites when searching.

20.3 Make Upper- and Lowercase Search Terms Equivalent

Guideline: Treat user-entered upper- and lowercase letters as equivalent when entered as search terms.

Comments: For example, 'STRING,' 'String,' and 'string' should be recognized and accepted equally by the Web site. When searching, users will generally be indifferent to any distinction between upper- and lowercase.
The site should not compel a distinction that users do not care or know about, or that the user may find difficult to make. In situations when case actually is important, allow users to specify case as a selectable option in the string search.

20.4 Provide a Search Option on Each Page

Guideline: Provide a search option on each page of a content-rich Web site.

Comments: A search option should be provided on all pages where it may be useful–users should not have to return to the homepage to conduct a search. Search engines can be helpful on content-rich Web sites, but do not add value on other types of sites.

Designers should be careful not to rely too heavily on search engines. They are not a substitute for good content organization, and do not always improve users' search performance. Designers should carefully consider the

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

122

advantages and disadvantages of including a search engine, and whether their Web site lends itself to automated searches.

20.5 Design Search Around Users' Terms

Guideline: Construct a Web site's search engine to respond to users' terminology.

Comments: Users seem to rely on certain preferred keywords when searching. They will generally conduct one or two searches before trying another site or search engine (or abandoning the search altogether). Therefore, it is important that users succeed on their first try.

Determining the keywords users are using may require considerable data collection. Designers should make use of search engine logs, surveys, and other techniques to determine the preferred search words for their site, and make information relevant to those terms easy to find through the site's search engine. Keep in mind that designers' preferred keywords may not match users' preferred keywords, and content writers may overestimate the specialized vocabulary of their audience. For the most common searches, provide a 'best bets' set of results. Ensure that the 'best bets' do not appear as advertising or paid links.

In addition to responding to users' keywords, try to design the site's search engine to accommodate common misspellings, extra spaces, alternative punctuation, misused plurals, and other common user search errors.

20.6 Allow Simple Searches

Guideline: Structure the search engine to accommodate users who enter a small number of words.

Comments: The search function should be easy to use and allow for users to be successful when searching. Most users tend to employ simple search strategies. They rarely use advanced search features (such as Boolean operators), so it is important not to rely on those to improve the effectiveness of the site's search engine. If most of the site's users are inexperienced Web searchers, provide simple instructions and examples to help guide users'

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

123

searching and use of the search results.

Provide a box (entry field) for entering search terms that is at least 35 to 40 characters wide. Users will self-detect more errors when they see what they have entered.

20.7 Notify Users when Multiple Search Options Exist

Guideline: If more than one type of search
option is provided, ensure that users are aware
of all the different types of search options and how each is best used.

Comments: Most users assume that a Web site has only one type of search. In one study, when there were multiple search types available, users tended to miss some of the search capabilities.

20.8 Include Hints to Improve Search Performance

Guideline: Include specific hints to improve search performance.

Comments: A major tradeoff that must be
considered in the design of a search input interface is related to the need to provide sufficient instructions for users to take advantage of the power of the search engine, while keeping in mind the reluctance of users to read instructions.

One study found a direct link between the content of search hints and task effectiveness. When syntactic information was included in the search hint, participants achieved significantly greater syntactic performance. When semantic information was included in the search hint, participants achieved significantly greater semantic performance. In addition, participants' confidence that their queries would retrieve the correct answer was reliably enhanced by the presence of semantic search hints (but not syntactic hints). The presence of examples improved semantic performance, but had no effect on syntactic performance. When hints contained more than one type of information (syntactic, semantic, or examples), performance was generally lower than when only one hint type was presented. Also, participants were able to complete the search tasks faster when only one hint was presented.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

124

20.9 Provide Search Templates

Guideline: Provide templates to facilitate the use of search engines.

Comments: Search templates assist users in formulating better search queries. A template consists of predefined keywords that help users select their search terms. The keywords can be used directly, or can help users formulate their own queries. Each template should be organized as a hierarchy of predefined keywords that could help to restrict the users' initial search sets, and improve the relevance of the returned 'hits.' One study reported that people using templates find seventy percent more target Web sites than those not using templates.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

125

21. Usability Testing

There are two major considerations when conducting usability testing. The first is to ensure that the best possible method for testing is used. Generally, the best method is to conduct a test where representative participants interact with representative scenarios. The tester collects data on the participant's success, speed of performance, and satisfaction. The findings, including both quantitative data and qualitative observations information, are provided to designers in a test report. Using 'inspection evaluations,' in place of well-controlled usability tests, must be done with caution. Inspection methods, such as heuristic evaluations or expert reviews, tend to generate large numbers of potential usability 'problems' that never turn out to be actual usability problems.

The second major consideration is to ensure that an iterative approach is used. After the first test results are provided to designers, they should make changes and then have the Web site tested again. Generally, the more iterations, the better the Web site.

21.1 Use an Iterative Design Approach

Guideline: Develop and test prototypes through an iterative design approach to create the most useful and usable Web site.

Comments: Iterative design consists of creating paper or computer prototypes, testing the prototypes, and then making changes based on the test results. The 'test and make changes' process is repeated until the Web site meets performance benchmarks (usability goals). When these goals are met, the iterative process ends.

The iterative design process helps to substantially improve the usability of Web sites. One recent study found that the improvements made between the original Web site and the redesigned Web site resulted in thirty percent more task completions, twenty-five percent less time to complete the tasks, and sixty-seven percent greater user satisfaction. A second study reported that eight of ten tasks were performed faster on the Web site that had been iteratively designed. Finally, a third study found that forty-six percent of the

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

126

original set of issues were resolved by making design changes to the interface.

21.2 Solicit Test Participants' Comments

Guideline: Solicit usability testing participants' comments either during or after the performance
of tasks.

Comments: Participants may be asked to give their comments either while performing each task ('think aloud') or after finishing all tasks (retrospectively). When using the 'think aloud' method, participants report on incidents as soon as they happen. When using the retrospective approach, participants perform all tasks uninterrupted, and then watch their session video and report any observations (critical incidents).

Studies have reported no significant difference between the 'think aloud' versus retrospective approaches in terms of the number of useful incident reports given by participants. However, the reports (with both approaches) tended to be positively biased and 'think aloud' participants may complete fewer tasks. Participants tend not to voice negative reports. In one study, when using the 'think aloud' approach, users tended to read text on the screen and verbalize more of what they were doing rather than what they were thinking.

21.3 Evaluate Web Sites Before and After Making Changes

Guideline: Conduct 'before and after' studies when revising a Web site to determine changes in usability.

Comments: Conducting usability studies prior to and after a redesign will help designers determine if changes actually made a difference in the usability of the site. One study reported that only twenty-two percent of users were able to buy items on an original Web site. After a major redesign effort, eighty-eight percent of users successfully purchased products on that site.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
        Standards

127

21.4 Prioritize Tasks

Guideline: Give high priority to usability issues preventing 'easy' tasks from being easy.

Comments: When deciding which usability issues to fix first, address the tasks that users believe to be easy but are actually difficult. The Usability Magnitude Estimation (UME) is a measure that can be used to assess user expectations of the difficulty of each task. Participants judge how difficult or easy a task will be before trying to do it, and then make a second judgment after trying to complete the task. Each task is eventually put into one of four categories based on these expected versus actual ratings:

- Tasks that were expected to be easy, but were actually difficult;
- Tasks that were expected to be difficult, but were actually easy;
- Tasks that were expected to be easy and were actually easy; and
- Tasks that were expected to be difficult and were difficult to complete.

21.5 Distinguish Between Frequency and Severity

Guideline: Distinguish between frequency and severity when reporting on usability issues and problems.

Comments: The number of users affected determines the frequency of a problem. To be most useful, the severity of a problem should be defined by analyzing difficulties encountered by individual users. Both frequency and severity data can be used to prioritize usability issues that need to be changed. For example, designers should focus first on fixing those usability issues that were shown to be most severe. Those usability issues that were encountered by many participants, but had a severity rating of 'nuisance,' should be given much less priority.

21.6 Select the Right Number of Participants

Guideline: Select the right number of participants when using different usability techniques. Using too few may reduce the usability of a Web site;

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

128

using too many wastes valuable resources.

Comments: Selecting the number of participants to use when conducting usability evaluations depends on the method being used:

Inspection evaluation by usability specialists:

– The typical goal of an inspection evaluation is to have usability experts separately inspect a user interface by applying a set of broad usability guidelines. This is usually done with two to five people.

– The research shows that as more experts are involved in evaluating the usability of the product, the greater the number of usability issues will be identified. However, for every true usability problem identified, there will be at least one usability issue that is not a real problem. Having more evaluators does decrease the number of misses, but is also increases the number of false positives. Generally, the more expert the usability specialists, the more useful the results.

Performance usability testing with users:

– Early in the design process, usability testing with a small number of users (approximately six) is sufficient to identify problems with the information architecture (navigation) and overall design issues. If the Web site has very different types of users (e.g., novices and experts), it is important to test with six or more of each type of user. Another critical factor in this preliminary testing is having trained usability specialists as the usability test facilitator and primary observers.

– Once the navigation, basic content, and display features are in place, quantitative performance testing (measuring times, wrong pathways, failure to find content, etc.) can be conducted to ensure that usability objectives are being met. To measure each usability objective to a particular confidence level, such as ninety-five percent, requires a larger number of users in the usability tests.

– When the performance of two sites is compared (i.e., an original site and a revised site), quantitative usability testing should be employed. Depending on how confident the usability specialist wants to be in the results, the tests could require a larger number of participants.

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and Standards

129

– It is best to perform iterative cycles of usability testing over the course of the Web site's development. This enables usability specialists and designers to observe and listen to many users.

21.7 Use the Appropriate Prototyping Technology

Guideline: Create prototypes using the most appropriate technology for the phase of the design, the required fidelity of the prototype, and skill of the person creating the prototype.

Comments: Designers can use either paper-based or computer-based prototypes. Paper-based prototyping appears to be as effective as computer-based prototyping when trying to identify most usability issues. Several studies have shown that there was no reliable difference in the number of usability issues detected between computer and paper prototypes. However, usability test participants usually prefer interacting with computer-based prototypes. Paper prototypes can be used when it is necessary to view and evaluate many different (usually early) design ideas, or when computer-based prototyping does not support the ideas the designer wants to implement, or when all members of the design team need to be included– even those that do not know how to create computer-based prototypes.

Software tools that are available to assist in the rapid development of prototypes include PowerPoint, Visio, including other HTML base tools. PowerPoint can be used to create medium fidelity prototypes. These prototypes can be both interactive and dynamic, and are useful when the design requires more than a 'pencil-and-paper' prototype.

21.8 Use Inspection Evaluation Results Cautiously

Guideline: Use inspection evaluation results with caution.

Comments: Inspection evaluations include heuristic evaluations, expert reviews, and cognitive walkthroughs. It is a common practice to conduct an inspection evaluation to try to detect and resolve obvious problems before

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
                Standards

130

conducting usability tests. Inspection evaluations should be used cautiously because several studies have shown that they appear to detect far more potential problems than actually exist, and they also tend to miss some real problems. On average, for every hit there will be about 1.3 false positives and .5 misses.

Another recent study concluded that the low effectiveness of heuristic evaluations as a whole was worrisome because of the low problem detection rate (p=.09), and the large number of evaluators required (16) to uncover seventy-five percent of the potential usability issues.

Another difficulty when conducting heuristic evaluations is that evaluators frequently apply the wrong heuristic, which can mislead designers that are trying to fix the problem. One study reported that only thirty-nine percent of the heuristics were appropriately applied.

Evaluators seem to have the most success identifying usability issues that can be seen by merely looking at the display, and the least success finding issues that require users to take several steps (clicks) to a target.

Heuristic evaluations and expert reviews may best be used to identify potential usability issues to evaluate during usability testing. To improve somewhat on the performance of heuristic evaluations, evaluators can use the 'usability problem inspector' (UPI) method or the 'Discovery and Analysis Resource' (DARe) method.

21.9 Recognize the 'Evaluator Effect'

Guideline: Beware of the 'evaluator effect' when conducting inspection evaluations.

Comments: The 'evaluator effect' occurs when multiple evaluators evaluating the same interface detect markedly different sets of problems. The evaluators may be doing an expert review, heuristic evaluation, or cognitive walkthrough.
The evaluator effect exists for evaluators who are novice or experienced, while detecting cosmetic and severe problems, and when evaluating simple or complex Web sites. In fact, when using multiple evaluators, any one evaluator is unlikely to detect the majority of the 'severe' problems that will

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
          Standards

131

be detected collectively by all evaluators. Evaluators also tend to perceive the problems they detected as more severe than the problems detected by others.

The main cause of the 'evaluator effect' seems to be that usability evaluation is a complex cognitive activity that requires evaluators to exercise difficult judgments.

21.10 Apply Automatic Evaluation Methods

Guideline: Use appropriate automatic evaluation methods to conduct initial evaluations on Web sites.

Comments: An automatic evaluation method is
one where software is used to evaluate a Web
site. An automatic evaluation tool can help find certain types of design difficulties, such as pages that will load slowly, missing links, use of jargon, potential accessibility problems, etc. While automatic evaluation methods are useful, they should not be used as a substitute for evaluations or usability testing with typical users. There are many commercially available automatic evaluation methods available for checking on a variety of Web site parameters.

21.11 Use Cognitive Walkthroughs Cautiously

Guideline: Use cognitive walkthroughs with caution.

Comments: Cognitive walkthroughs are often conducted to resolve obvious problems before conducting performance tests. The cognitive walkthrough appears to detect far more potential problems than actually exist, when compared with performance usability testing results. Several studies have shown that only about twenty-five percent of the potential problems predicted by the cognitive walkthrough were found to be actual problems in a performance test. About thirteen percent of actual problems in the performance test were missed altogether in the cognitive walkthrough. Cognitive walkthroughs may best be used to identify potential usability

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
      Standards

132

issues to evaluate during usability testing.

21.12 Choosing Laboratory vs. Remote Testing

Guideline: Testers can use either laboratory or remote usability testing because they both elicit similar results.

Comments: In laboratory-based testing, the participant and the tester are in the same physical location. In remote testing, the tester and the participant are in different physical locations. Remote testing provides the opportunity for participants to take a test in their home or office. It is convenient for participants because it requires no travel to a test facility.

Studies have evaluated whether remote testing is as effective as traditional, lab-based testing. To date, they have found no reliable differences between lab-based and remote testing in terms of the number of types of usability issues identified. Also, they report no reliable differences in task completion rate, time to complete the tasks, or satisfaction scores.

21.13 Use Severity Ratings Cautiously

Guideline: Use severity ratings with caution.

Comments: Most designers would like usability specialists to prioritize design problems that they found either by inspection evaluations or expert reviews. So that they can decide which issues to fix first, designers would like the list of potential usability problems ranked by each one's 'severity level'. The research literature is fairly clear that even highly experienced usability specialists cannot agree on which usability issues will have the greatest impact on usability.

One study had 17 expert review and usability test teams evaluate and test the same Web page. The teams had one week to do an expert review, or two weeks to do a usability test. Each team classified each usability issue as a minor problem, serious problem, or critical problem.   There was considerable disagreement in which problems the teams judged as minor, serious or critical, and there was little agreement on which were the 'top five problems'. Another study reported that heuristic evaluators overestimated severity twenty-two

National Information Center- General Department of Information Technology   Information Systems Department - Section Policies and
           Standards

133

percent of the time, and underestimated severity seventy-eight percent of the time when compared with usability testing results.