Research-Based Web Design & Usability Guidelines

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Foreword—Secretary Thompson

These Research-Based Web Design & Usability

Guidelines are an excellent example of how we can quickly and effectively respond to the President's Management Agenda and his E-government Act of 2002. The National Cancer Institute's Communication Technologies Branch in the U.S. Department of Health and Human Services (HHS) anticipated that all federal agencies would need such information and began the ambitious process of producing these research-based Guidelines.

Given the high level of Internet use by the public, there is a critical need for authoritative guidance in designing federal websites. The President's Management Agenda noted that the federal government is the world's largest single consumer of information technology (IT). A large portion of federal IT spending is devoted to Internet initiatives, which yield more than 35 million Web pages at more than 22,000 websites. More than sixty percent of all Internet users interact with government websites throughout the year, and they use the Internet to access government services 24 hours a day, seven days a week.

Unfortunately, too many federal agencies have developed their websites according to their own needs, not the needs of the citizens they serve. For this and other reasons, the President's E-Government Act indicated that federal IT systems should be "citizen-centered." An important part of creating a citizen-centered website is the use of research on how citizens interact with websites. This book, which translates research into practical, easy-to-understand guidelines, helps those in charge of federal websites save time and valuable resources.

Because HHS offers high-quality information about health and human services, we felt it was essential that the HHS website – www.hhs.gov – meet the needs and expectations of all citizens who turn to us for help. Through "usability engineering" and these Guidelines, we have tested and redesigned our own site to reflect a citizen-centered approach.

I see these Guidelines as a wonderful resource for improving the communication capabilities of HHS, as well as all government agencies. I recommend that these Guidelines be used by all who deliver information and services to the American public.

– **Tommy G. Thompson**
Secretary of Health and Human Services
June 2003

Foreword—Professor Shneiderman

Background

These new NCI Web usability Guidelines carry

forward one of the most enduring success stories in user interface design. They continue the noble tradition of thoughtful practitioners who have hacked their way through the unruly design landscape and then distilled their experience into compact and generalizable aphorisms or patterns.

Compilations of such guidelines offer newcomers a clearer roadmap to follow, helping them to avoid some of the swamps and potholes. Guidelines serve experienced experts and busy managers by giving them an overview and reminding them of the wide range of issues. Most importantly, guidelines provoke discussions among designers and researchers about which guidelines are relevant and whether a refined or new guideline should be added.

Guidelines should be more than one person's lightly-considered opinion, but they are not rigid standards that can form the basis of a contract or a lawsuit. Guidelines are not a comprehensive academic theory that has strong predictive value, rather they should be prescriptive, in the sense that they prescribe practice with useful sets of DOs and DON'Ts. Guidelines should be presented with justifications and examples.

Like early mapmakers, the pioneering developers of user interface guidelines labored diligently. Working for IBM in the mid-1970s, Stephen Engel and Richard Granda recorded their insights in an influential document. Similarly, Sid Smith and Jane Mosier in the early 1980s, collected 944 guidelines in a 500-page volume (available online at http://hcibib.org/sam/contents.html). The design context in those days included aircraft cockpits, industrial control rooms, and airline reservation systems and the user community emphasized regular professional users. These admirable efforts influenced many designers and contributed to the 1980s corporate design guidelines from Apple, Microsoft, and others covering personal computers, desktop environments, and public access kiosks.

Then, the emergence of the World Wide Web changed everything. The underlying principles were similar, but the specific decisions that designers had to make required new guidelines. The enormously growing community of designers eagerly consulted useful guidelines from sources as diverse as Yale University, Sun Microsystems, the Library of Congress, and Ameritech. Many of these designers had little experience and were desperate for any guidance about screen features and usability processes. Sometimes they misinterpreted or mis-applied the guidelines, but at least they could get an overview of the issues that were important.

As Web usability guidelines became more widely used and consulted, discrepancies and contradictions became subjects of lively discussion at usability conferences and human-computer interaction research seminars. For example, many early Web guidelines documents were vague about appropriate numbers of links per page, sometimes falling back to mention George Miller's famous notion of seven plus or minus two. His work dealt with short-term memory capacity, but in studying a Web page, this factor has little bearing. As controversy grew, researchers collected dramatic empirical evidence that broader shallow trees were superior in information presentation websites.

Fortunately, the remarkable growth of the professional community of Web designers was matched by a healthy expansion of the academic community in psychology, computer science, information systems, and related disciplines. The research community went to work on the problems of menu design, navigation, screen layout, response time, and many more. Not every experiment is perfect, but the weight of validated results from multiple studies provides crucial evidence that can be gainfully applied in design.

This newest set of guidelines from the prestigious team assembled by the National Cancer Institute makes important contributions that will benefit practitioners and researchers. They have done the meticulous job of scouring the research literature to find support for design guidelines, thereby clarifying the message, resolving inconsistencies, and providing sources for further reading. Researchers will also benefit by this impressive compilation that will help them understand the current state of the art and see what problems are unresolved. Another impact will be on epistemologists and philosophers of science who argue about the relevance of research to practice. It is hard to recall a project that has generated as clear a demonstration of the payoff of research for practice.

The educational benefits for those who read the guidelines will be enormous. Students and newcomers to the field will profit from the good survey of issues that reminds them of the many facets of Web design. Experienced designers will find subtle distinctions and important insights. Managers will appreciate the complexity of the design issues and gain respect for those who produce effective websites.

Enthusiasms and Cautions

My enthusiasms for this NCI guidelines project and its product are great, but they are tempered by several cautions. To put it more positively, the greatest benefits from these research-based guidelines will accrue to those who create effective processes for their implementation. My advice is to recognize the *Guidelines* as a "living document" and then apply the four Es: education, enforcement, exemption, and enhancement.

Education: Delivering a document is only the first stage in making an organization's guidelines process effective. Recipients will have to be motivated to read it, think about it, discuss it, and even complain about it.

Often a live presentation followed by a discussion can be effective in motivating use of guidelines.

Enforcement: While many designers may be willing to consider and apply the guidelines, they will be more diligent if there is a clear process of interface review that verifies that the guidelines have been applied. This has to be done by a knowledgeable person and time has to be built into the schedule to handle deviations or questions.

Exemption: Creative designers may produce innovative compelling Web page designs that were not anticipated by the *Guidelines* writers. To support creative work, managers should balance the enforcement process with an exemption process that is simple and rapid.

Enhancement: No document is perfect or complete, especially a guidelines document in a fast changing field like information technology. This principle has two implications. First, it means that the NCI or another organization should produce an annual revision that improves the *Guidelines* and extends them to cover novel topics. Second, it means that adopting organizations should consider adding local guidelines keyed to the needs of their community. This typically includes guidelines for how the organization logo, colors, titles, employee names, contact information, etc. are presented. Other common additions are style guides for terminology, templates for information, universal usability requirements, privacy policies, and legal guidance.

Finally, it is important to remember that as helpful as these research-based guidelines are, that they do not guarantee that every website will be effective. Individual designers make thousands of decisions in crafting websites. They have to be knowledgeable about the content, informed about the user community, in touch with the organizational goals, and aware of the technology implications of design decisions. Design is difficult, but these new research-based guidelines are an important step forward in providing assistance to those who are dedicated to quality.

– **Ben Shneiderman, Ph.D.**
University of Maryland
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Special thanks to the following researchers who created the 'Strength of Evidence' Scale, assigned 'Strength of Evidence' ratings for each guideline, and provided many sources listed in this book.

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Introduction

The Research-Based Web Design and Usability Guidelines (*Guidelines*) were developed by the Communication Technologies Branch (CTB) of the National Cancer Institute (NCI) in the U.S. Department of Health and Human Services. The *Guidelines* were developed to assist those involved in the creation of websites base their decisions on the current and best available evidence. The *Guidelines* are particularly relevant to the design of information-oriented sites, but can be applied across the wide spectrum of websites.

Who Are the *Guidelines* for?
The primary audiences for the *Guidelines* are website designers, managers, and others involved in the creation or maintenance of websites. A secondary audience is researchers who investigate Web design issues. This resource will help them determine what research has been conducted and where none exists. To learn more about how these audiences may benefit from the *Guidelines*, see page xvii.

Why Did NCI Create the *Guidelines*?
NCI created this set of guidelines for several reasons:

1) To create better and more usable cancer information websites. NCI is mandated to provide clear information in an efficient and effective manner to cancer patients, health professionals, researchers, and the public. Translating the latest Web design research into a practical, easy-to-use format is essential to the effective design of NCI's numerous websites. The approach taken to produce the *Guidelines* is consistent with NCI's overall cancer information dissemination model—rapidly collect, organize, and distribute information in a usable format to those who need it.

2) To provide quantified, peer-reviewed website design guidelines. This resource does not exist anywhere else. Most Web design guidelines are lacking key information needed to be effective. For example, many guideline sets:

   - Are based on the personal opinions of a few experts;
   - Do not provide references to support them;
   - Do not provide any indication as to whether a particular guideline represents a consensus of researchers, or if it has been derived from a one-time, non-replicated study; and
   - Do not give any information about the relative importance of individual guidelines.

By addressing these issues, the *Guidelines* will help enable NCI and other organizations to make more effective design decisions.

Each guideline in this book shows a rating of its "Relative Importance" to the success of a website, and a rating of the "Strength of Evidence" supporting the guideline. Carefully selected panels of professional Web designers, usability specialists, and academic researchers contributed to these ratings. The ratings allow the user to quickly ascertain which guidelines have the greatest impact on the success of a website, and to determine the nature and quality of the supporting evidence. The "Relative Importance" and "Strength of Evidence" ratings are unique to the NCI *Guidelines*.

3) To stimulate research into areas that will have the greatest influence on the creation of usable websites. There are numerous Web design questions for which a research-based answer cannot be given. While there are more than 1,000 papers published each year related to Web design and usability, much of this research is not based on the most important (or most common) questions being asked by Web designers. By providing an extensive list of sources and "Strength of Evidence" ratings in the *Guidelines*, NCI hopes to highlight issues for which the research is conclusive and attract researchers' attention to the issues most in need of answers.

How to Contribute Additional References?
The authors of the *Guidelines* attempted to locate as many references and source documents as possible. However, some important guidelines may not have been created, and some applicable references may have been missed. Readers who are aware of an original reference pertaining to an existing guideline, or who have a suggestion for a new research-based guideline, should submit an email to: webguidelines@mail.nih.gov.

Please include the following information in an email:

- Reference information—author, title, publication date, source, etc. (Remember, books are usually not original references.);
- The guideline to which the reference applies;
- If suggesting a new guideline, a draft of the guideline; and
- A copy of the source (or a link to it), if available.

This information will help NCI maintain the *Guidelines* as a current and accurate resource.

How to Use this Book and the Guidelines

Successful use of the *Guidelines* depends on how they are disseminated and used within an organization. Simply providing the *Guidelines* to designers and managers may not be enough to spur the adoption and use of the *Guidelines*.

How Audiences Will Benefit

The *Guidelines* offer benefits to four key audiences:

- **Designers**
  The *Guidelines* provide a clear sense of the range of issues that designers—especially those new to the field—need to consider when planning and designing a website. Applying the *Guidelines* will help to reduce the negative impacts of "opinion-driven" design, and referring to evidence-based guidance can reduce the clashes resulting from differences of opinion between design team members.
- **Usability Specialists**
  The *Guidelines* will help usability specialists evaluate the designs of websites. For example, usability specialists can use the *Guidelines* as a checklist to aid them during their review of websites. They also can create customized checklists that focus on the "Relative Importance" and "Strength of Evidence" scales associated with each guideline. For example, a usability specialist can create a checklist that only focuses on the top 25 most important issues related to the success of a website.
- **Managers**
  The *Guidelines* will provide managers with a good overview and deep understanding of the wide range of usability and Web design issues that designers may encounter when creating websites. The *Guidelines* also provide managers with a "standard of usability" for their designers. Managers can request that designers follow relevant portions of the *Guidelines* and can use the *Guidelines* to set priorities. For example, during timeframes that require rapid design, managers can identify guidelines deemed most important to the success of a website—as defined by the "Relative Importance" score associated with each guideline—and require designers to focus on implementing those selected guidelines.
- **Researchers**
  Researchers involved in evaluating Web design and Web process issues can use this set of guidelines to determine where new research is needed. Researchers can use the sources of evidence

provided for each guideline to assess the research that has been conducted, and to determine the need for additional research to increase the validity of the previous findings, or to challenge those findings. Perhaps more importantly, researchers also can use the *Guidelines* and their sources to formulate new and important research questions.

Options for Implementing the *Guidelines*

There are a variety of ways to use the *Guidelines* in website development efforts. Users can read the book from beginning to end to become familiar with all of the guidelines. The book also can be used as a reference to answer specific website design questions.

The *Guidelines* can be customized to fit most organizations' needs. The customization process can be approached in several ways:

- Encourage key stakeholders and/or decision makers to review the full set of guidelines and identify key guidelines that meet their Web design needs. For example, an organization may develop portal websites that focus exclusively on linking to other websites (as opposed to linking to content within its own website). Therefore, it may focus more on selecting guidelines from the "Links" and "Navigation" chapters and less from the content-related chapters.
- Selected guidelines can be merged with existing standards and guidelines currently used within an organization. This may reduce the number of documents or online tools that designers must reference, and thus improve the adoption and use of both the NCI *Guidelines* and existing standards and guidelines.

The "Relative Importance" and "Strength of Evidence" scales can be used to prioritize which guidelines to implement. For example, on page 177 of this book, the guidelines are listed in order of relative importance. Using this list, designers can focus on implementing the 25 or 50 most important guidelines. In turn, the "Strength of Evidence" ratings on page 182 can be used to determine the guidelines in which a designer can place the greatest confidence. Conversely, the guidelines with the lowest "Strength of Evidence" ratings could indicate where more time should be devoted during usability testing.

Additionally, Ben Shneiderman suggests four ways to enhance the application of the *Guidelines*: education; enforcement; exemption; and, enhancement. Please read his Foreword to consider other ways to successfully implement the *Guidelines*.

To share additional ideas for implementing or customizing the *Guidelines*, send them to webguidelines@mail.nih.gov.

Considerations before Using the *Guidelines*

The *Guidelines* are intended to improve the design and usability of information-based websites, but also can be applied across the wide spectrum of websites. When using the *Guidelines*, it is helpful to remember that:

- Within each chapter of this book, the guidelines are ordered according to their "Relative Importance" ratings. That is, the most important guidelines are toward the beginning of a chapter and the less important ones are toward the end. Readers may have a tendency to think that guidelines with one or two bullets on the "Relative Importance" scale are not important. However, it is crucial to note that all guidelines in this book were rated as at least "somewhat important" by the review team, otherwise they would not have been selected for inclusion in the book. Therefore, a guideline with one or two bullets is still important, just relatively less so than a guideline with four or five bullets.
- The *Guidelines* may not be applicable to all audiences and contexts. For example, they may not apply to websites used by audiences with low literacy skills that have special terminology and layout needs. In general, these guidelines apply to English language websites designed for adults who are between 18 and 75 years of age.
- The *Guidelines* may not adequately consider the experience of the designer. For example, a designer may have specialized knowledge about designing for a particular audience or context. These guidelines are adaptable and are not fixed rules.
- The *Guidelines* may not reflect all evidence from all disciplines related to Web design and usability. Considerable effort has been made to include research from a variety of fields including human factors, cognitive psychology, computer science, usability, and technical communication. However, other disciplines may have valuable research that is not reflected in these guidelines.
- Some "Strength of Evidence" ratings are low because there is a lack of research for that particular issue. The "Strength of Evidence" scale used to rate each guideline was designed to value research-based evidence, but also to acknowledge experience-based evidence including expert opinion. Low "Strength of Evidence" ratings should encourage the research of issues that are not currently investigated.

Background and Methodology

The National Cancer Institute's (NCI) Research-Based Web Design and Usability Guidelines project began in March of 2000. Since that time, each guideline presented in this book has undergone an extensive internal and external review. The process used to create the *Guidelines* is presented here.

Step 1: Creating the Initial Set of Guidelines

The NCI's Communication Technologies Branch (CTB) needed to develop a set of guidelines that would help designers build websites that are based on the best available research. The initial set of guidelines were drawn from existing Web design guideline and style guides, published research articles, research summaries, publicly available usability test reports, and lessons learned from in-house usability tests. This effort resulted in more than 500 guidelines.

Step 2: Reviewing the Initial Set of Guidelines

The initial set of 500 guidelines was far too many for website designers to use effectively. CTB initiated an internal review process to:

- Identify and combine similar guidelines;
- Identify and resolve guidelines that conflicted with each other; and
- Reword unclear guidelines.

This internal review was conducted by CTB staff and consultants. Each of the reviewers had experience in website design, usability engineering, technical communication, software design, computer programming and/or human-computer interaction. The internal review reduced the initial set of guidelines to 398.

Step 3: Determining the "Relative Importance" of Each Guideline

To determine the 'Relative Importance' of each guideline, sixteen external reviewers were recruited. Half of these reviewers were website designers and half were usability specialists. Reviewers evaluated each guideline and then answered the question, "How important is this guideline to the overall success of a website?" by assigning a score from a scale that ranged from "Extremely Important" to "Not Important."

Step 4: Validating the Initial "Relative Importance" Ratings

After the initial review by the 16 website practitioners (designers and usability specialists), the set of guidelines was reduced to 287. Those guidelines that were rated as having little importance to the success of a website were eliminated. Many guidelines were edited and clarified based on feedback from the reviewers. Also, a few new guidelines were added as new research was gathered.

To validate the "Relative Importance" ratings, the same 16 evaluators were asked to confirm or modify their previous ratings with knowledge of their own and the average rating from the previous review.

Step 5: Determining the "Strength of Evidence" for Each Guideline

The next step was to generate a reliable 'Strength of Evidence' rating for each guideline. To do this, CTB recruited a group of eight researchers from a variety of fields—including usability, user experience, documentation, computer science, and cognitive psychology—that have an influence on Web design. These reviewers were all published researchers with doctoral degrees, experienced peer reviewers, and knowledgeable of experimental design.

Developing the "Strength of Evidence" ratings for each guideline was conducted in three parts. In Part One, reviewers were asked to classify each guideline as having "strong," "weak," or "no" research evidence to support it. The goal was to determine which guidelines had no research evidence so that they could be pulled out, and hence, help reviewers focus on rating the remaining set. Reviewers also were asked to provide new sources of evidence for each guideline (if available).

Based on the results of Part One, the project team learned that there was very little agreement on what constitutes "strong," "weak," or "no" research evidence.

Therefore, the project team planned Part Two to generate a common framework among the reviewers.

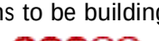
Part Two had the reviewers attend a one-day meeting and agree on the following scale for rating the "Strength of Evidence" for each guideline.

5 – Strong Research Support 

- Cumulative and compelling, supporting research-based evidence
- At least one formal, rigorous study with contextual validity
- No known conflicting research-based findings
- Expert opinion agrees with the research

4 – Moderate Research Support 

- Cumulative research-based evidence
- There may or may not be conflicting research-based findings
- Expert opinion
  - Tends to agree with the research, and
  - A consensus seems to be building

3 – Weak Research Support 

- Limited research-based evidence
- Conflicting research-based findings may exist
  - and/or -
- There is mixed agreement of expert opinions

2 – Strong Expert Opinion Support 

- No research-based evidence
- Experts tend to agree, although there may not be a consensus
- Multiple supporting expert opinions in textbooks, style guides, etc.)
- Generally accepted as a 'best practice' or reflects 'state of practice'

1 – Weak Expert Opinion Support 

- No research-based evidence
- Limited or conflicting expert opinion

The reviewers also agreed upon a set of categories to classify the many sources that had been collected. The reviewers assigned each reference to one of the following categories:

- Rigorous observational study (e.g., ethnographic evaluation)
- Hypothesis-oriented experiment
- Model-based evaluation
- Expert opinion with no or few references
- Reference-base literature review, chapter in a book, or meta-analysis
- Survey
- Textbook with many references
- Usability test results or summary of several usability tests (e.g., lessons learned)
- Exploratory study (e.g., "How long will people wait for a page to download?")

Part Three had reviewers evaluate the available evidence for each guideline, and then assign a rating based on the 5-point scale described above. Because of the activities in Part Two, agreement among reviewers in classifying the evidence for each guideline substantially increased.

Step 6: Finding Graphic Examples for the Guidelines

To ensure that users clearly understand the meaning of the guideline, the project team identified and reviewed several possible examples for each guideline, and selected the strongest examples.

Step 7: Grouping, Organizing, and Usability Testing the Guidelines

To ensure that the information about specific Web design issues is easy to find, a group of twenty website designers were asked to participate in a formal "grouping" of the guidelines by using a card-sorting exercise. Each of the twenty individuals put the guidelines into groups that reflected how they think about Web design issues, and then provided a name for each group. Data from this exercise was analyzed with specially developed software and formed the chapters of this book.

Several draft page layouts in print format were developed for this book. These drafts were usability tested to determine how best to facilitate readers' ability to locate and understand information on a page. These findings, as well as readers' preferences, served as the basis for the final page layout.

Design Process and Evaluation

There are several usability-related issues,

methods, and procedures that require careful consideration when designing, developing, and testing websites. The most important of these are presented in this chapter, including "up-front" issues such as setting clear and concise goals for a website, determining a correct and exhaustive set of user requirements, ensuring that the website meets user's expectations, setting usability goals, taking usability measurements of the existing site for later comparison, 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 website that enables the best possible human performance. The current research suggests that the best way to begin the construction of a website 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 website.

There are two major considerations when conducting usability testing. The first is to ensure that the correct number of test participants are used; and the second is to reduce "tester bias" as much as possible. Software-based automatic usability evaluation tools are available and should be used in addition to traditional usability testing. However, some popular usability testing methods (particularly heuristic evaluations and cognitive walkthroughs) must be used with caution.

1:1 Set and State Goals

Relative Importance: 1 2 3 4 5
Strength of Evidence: 1 2 ○ ○ ○

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

Comments: Before starting design work, identify the primary goals of the website (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 website.

Sources: Badre, 2002; Coney and Steehouder, 2000; Detweiler and Omanson, 1996.

1:2 Use an Iterative Design Approach

Relative Importance: 1 2 3 4 5
Strength of Evidence: 1 2 3 4 5

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

Comments: Iterative design consists of creating paper and software prototypes, testing the prototypes, and then making changes based on the test results. The "test and make changes" process is repeated until the website meets performance benchmarks ("usability goals"). When these goals are met, the iterative process ends. Software tools are available to assist and facilitate the development of prototypes.

Sources: Badre, 2002; Bailey, 1993; Bradley and Johnk, 1995; Egan, Remde, Gomez, et al., 1989; Hong, et al., 2001; Jeffries, et al., 1991; Karat, Campbell and Fiegel, 1992; Redish and Dumas, 1993; Tan, et al., 2001.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

1:3 Evaluate Websites Before and After Making Changes

Relative Importance: 1 2 3 4 5
Strength of Evidence: 1 2 3 ○ ○

Guideline: Conduct "before and after" studies when revising a website 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 website. After a major redesign effort, eighty-eight percent of users successfully purchased products on that site.

Keep in mind that not all changes made by designers in each iteration may be beneficial—this will require additional, iterative rounds of testing.

Sources: John and Marks, 1997; Karat, 1994a; Ramey, 2000; Rehman, 2000; Williams, 2000; Wixon and Jones, 1996.

1:4 Provide Useful Content

Relative Importance: 1 2 3 4 5
Strength of Evidence: 1 2 3 4 5

Guideline: Provide content that is engaging, relevant, and appropriate to the audience.

Comments: Content is the information provided on a website. 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 website. Other studies have reported that content is more important than navigation, visual design, functionality, and interactivity.

Sources: Asher, 1980; Badre, 2002; Baldwin, Peleg-Bruckner and McClintock, 1985; Celsi and Olson, 1988; Evans, 1998; Levine, 1996; Nielsen and Tahir, 2002; Nielsen, 1997b; Nielsen, 2000; Rajani and Rosenberg, 1999; Sano, 1996; Sinha, et al., 2001; Spyridakis, 2000; Stevens, 1980.

1:5 Understand and Meet Users' Expectations

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 ○ ○ ○

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

Comments: 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 website frequently enough to learn to use it efficiently. Therefore, using familiar conventions works best.

Sources: Carroll, 1990; Detweiler and Omanson, 1996; Lynch and Horton, 2002; Spool, et al., 1997; Wilson, 2000.

Example:

The Copyright Office website meets user expectations—links to the most likely user activities or queries (searching records, licensing and registering works, etc.) are prominently displayed and logically ordered, and there are very few distractions on the page.

1:6 Establish User Requirements

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 3 4 ○

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

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 website. 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.

Sources: Adkisson, 2002; Brinck, Gergle and Wood, 2002; Buller, et al., 2001; Coble, Karat and Kahn, 1997; Keil and Carmel, 1995; Norman, 1993; Osborn and Elliott, 2002; Ramey, 2000; Vora, 1998; Zimmerman, et al., 2002.

1:7 Use Parallel Design

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 3 4 ○

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.

Sources: Ball, Evans and Dennis, 1994; Buller, et al., 2001; Macbeth, Moroney and Biers, 2000; McGrew, 2001; Ovaska and Raiha, 1995; Zimmerman, et al., 2002.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

1:8 Consider Many User Interface Issues

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 ○ ○

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

Comments: Consider numerous usability-related issues during the creation of a website. These can include: the context within which users will be visiting a website; 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.

Sources: Bailey, 1996; Buller, et al., 2001; Graham, Kennedy and Benyon, 2000; Mayhew, 1992; Miller and Stimart, 1994; Zimmerman, et al., 2002.

1:9 Focus on Performance Before Preference

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Baca and Cassidy, 1999; Grose, et al., 1999; Tractinsky, 1997.

1:10 Set Usability Goals

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 ○ ○

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 websites. It can also help make usability testing more effective. For example, some intranet websites have set the goal that information will be found eighty percent of the time and in less than one minute.

Sources: Baca and Cassidy, 1999; Bradley and Johnk, 1995; Grose, et al., 1999; Sears, 1995.

1:11 Select the Right Number of Participants

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 ○

Guideline: Select the right number of participants when using different usability techniques. Using too few may reduce the usability of a website; 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 a 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 it 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 website 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 time, 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 95%, 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, these tests could require a larger number of participants.
  - It is best to perform iterative cycles of usability testing over the course of the website's development. This enables usability specialists and designers to observe and listen to many users.

Sources: Bailey, 1996; Bailey, 2000c; Brinck and Hofer, 2002; Chin, 2001; Dumas, 2001; Gray and Salzman, 1998; Lewis, 1993; Lewis, 1994; Nielsen and Landauer, 1993; Perfetti and Landesman, 2001b; Virzi, 1990; Virzi, 1992.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

1:12 Be Easily Found on the Web

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 ○

Guideline: In order to have a high probability of being accessed, ensure that a website is in the "top thirty" references presented from a major search engine.

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

Sources: Amento, et al., 1999; Dumais, Cutrell and Chen, 2001; Lynch and Horton, 2002; Spink, Bateman and Jansen 1999.

Example:

The below snippet of html code illustrates one important way of ensuring that a website will be found by search engines—embedding keyword metatags. These keywords are read by search engines and used to categorize websites; understanding typical users will provide clues as to what keywords should be used.

```
<meta name="description" content="U. S. Department of
State Home Page">

<meta name="keywords" content="DOS, Department of
State, Public Diplomacy, Country, Bureau, Government,
United States Foreign Policy, Powell, Secretary of State, U.S.
Department of State, Embassy, Consulate, American Culture,
Society, Values, International, Public Affairs, Economic">
```

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

1:13 Recognize Tester Bias

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 5

Guideline: Recognize that a strong individual and group tester bias seems to exist when evaluating the usability of websites.

Comments: All testers seem to have a bias toward finding certain numbers and types of usability problems. One study reported that four testing teams found a range of four to ninety-eight usability problems when performance testing the exact same system. More than ninety percent of the problems found by each team were found only by the one team.

Another study reported that nine independent testing teams found a range of 10 to 150 usability problems when performance testing the exact same website. In this study, more than half of the problems found by each team were found only by that team.

Designers should precisely indicate the usability objectives of their websites to usability testers and evaluators.

Sources: Hertzum and Jacobsen, 2001; Jacobsen, Hertzum and John, 1998; Molich, et al., 1998; Molich, et al., 1999; Nielsen and Molich, 1990; Nielsen, 1992; Nielsen, 1993; Redish and Dumas, 1993; Selvidge, 2000.

1:14 Use Heuristics Cautiously

Relative Importance: 1 2 ○ ○ ○

Strength of Evidence: 1 2 3 4 5

Guideline: Use heuristic evaluations and expert reviews with caution.

Comments: It is a common practice to conduct a heuristic evaluation (i.e., expert review) and resolve obvious problems before conducting usability performance tests. Heuristic evaluations should be used cautiously because they appear to detect far more potential problems than actually exist, when compared with performance testing results. Of the potential problems predicted by heuristic evaluations, studies have shown that less than fifty percent were found to be actual problems in a performance usability test. In addition, more than thirty-five percent of actual problems in the performance test were missed altogether by several heuristic evaluators. Heuristic reviews may best be used to identify potential usability issues to evaluate during usability testing.

Sources: Bailey, Allen and Raiello, 1992; Catani and Biers, 1998; Cockton and Woolrych, 2001; Nielsen and Landauer, 1993; Rooden, Green and Kanis, 1999; Stanton and Stevenage, 1998.

1:15 Use Cognitive Walkthroughs Cautiously

Guideline: Use cognitive walkthroughs with caution.

Relative Importance: 1 2 ○ ○ ○

Strength of Evidence: 1 2 3 4 5

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 issues to evaluate during usability testing.

Sources: Blackmon, et al., 2002; Desurvire, Kondziela and Atwood, 1992; Hassenzahl, 2000; Jacobsen and John, 2000; Jeffries and Desurvire, 1992; John and Mashyna, 1997; Karat, 1994b; Karat, Campbell and Fiegel, 1992; Spencer, 2000.

1:16 Apply Automatic Evaluation Methods

Guideline: Use appropriate 'automatic evaluation' methods to conduct initial evaluations on websites.

Relative Importance: 1 ○ ○ ○ ○

Strength of Evidence: 1 2 3 ○ ○

Comments: An 'automatic evaluation' method is one where software is used to evaluate a website. 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 website parameters.

Sources: Brajnik, 2000; Campbell and Stanley, 1963; Gray and Salzman, 1998; Holleran, 1991; Ivory and Hearst, 2002; Ramey, 2000; Scholtz, 1998; World Wide Web Consortium, 2001.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

Research-Based Web Design & Usability Guidelines

Optimizing the User Experience

Websites 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 websites 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.

2:1 Display Information in a Directly Usable Format

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

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 ○ ○

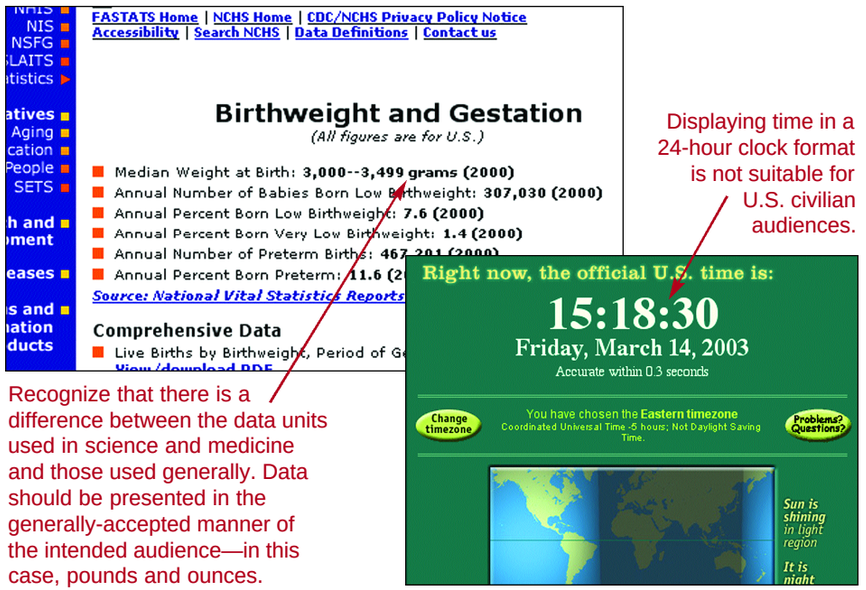
Comments: Present information to users in the most useful and usable format possible. Do not require users to convert or summarize information in order for it to be immediately useful. It is best to display data in a manner that is consistent with the standards and conventions most familiar to users.

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 (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.

Sources: Ahlstrom and Longo, 2001; Casner and Larkin, 1989; Galitz, 2002; Gerhardt-Powals, 1996; Navai, et al., 2001; Smith and Mosier, 1986.

Example:



Displaying time in a 24-hour clock format is not suitable for U.S. civilian audiences.

Recognize that there is a difference between the data units used in science and medicine and those used generally. Data should be presented in the generally-accepted manner of the intended audience—in this case, pounds and ounces.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

2:2 Do Not Display Unsolicited Windows or Graphics

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

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Ahmadi, 2000.

2:3 Provide Assistance to Users

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

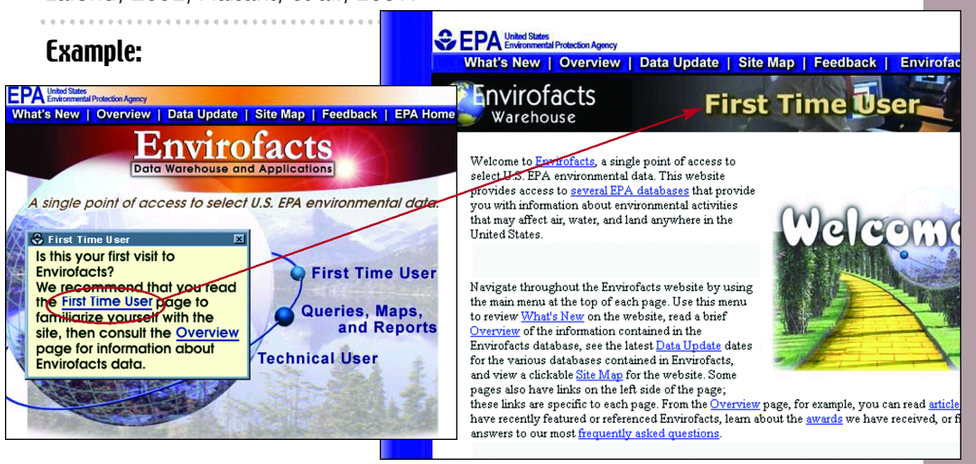
Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 ○ ○

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 website 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.

Sources: Covi and Ackerman, 1995; Morrell, et al., 2002; Nall, Koyani and Lafond, 2001; Plaisant, et al., 1997.

Example:



2:4 Provide Printing Options

Relative Importance: 1 2 3 4 ○

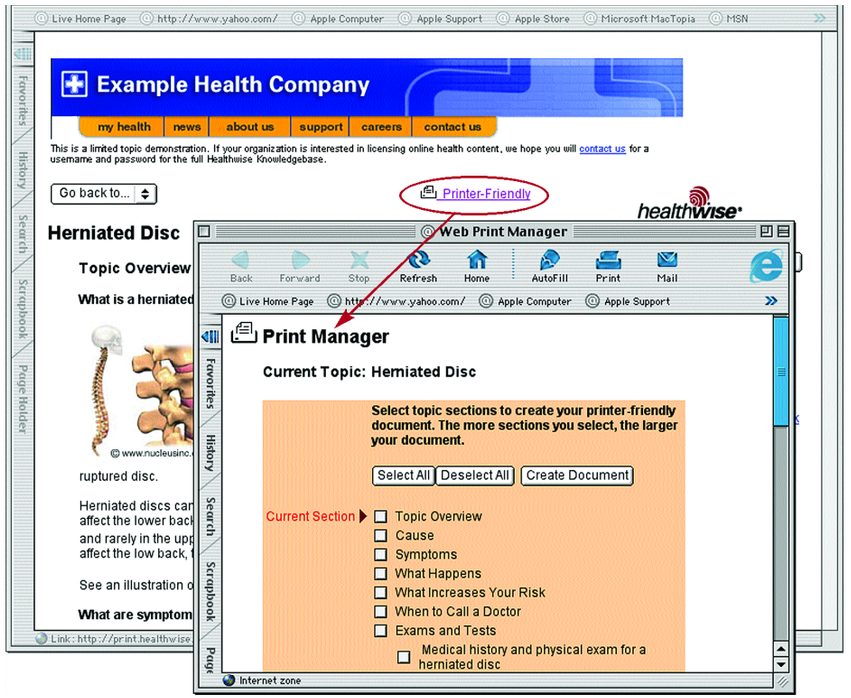
Strength of Evidence: 1 2 ○ ○ ○

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 website to have pages for them at a later date, or they think they will not be able to find them again.

Sources: Detweiler and Omanson, 1996; Levine, 1996; Lynch and Horton, 2002; Nielsen, 1997e.

Example: Clicking on the "Print Friendly" link will open a new browser window that allows the user to choose the sections of the document they wish to print. This is particularly useful for long documents, where users may only be interested in a particular section.



2:5 Standardize Task Sequences

Relative Importance: 1 2 3 4 ○

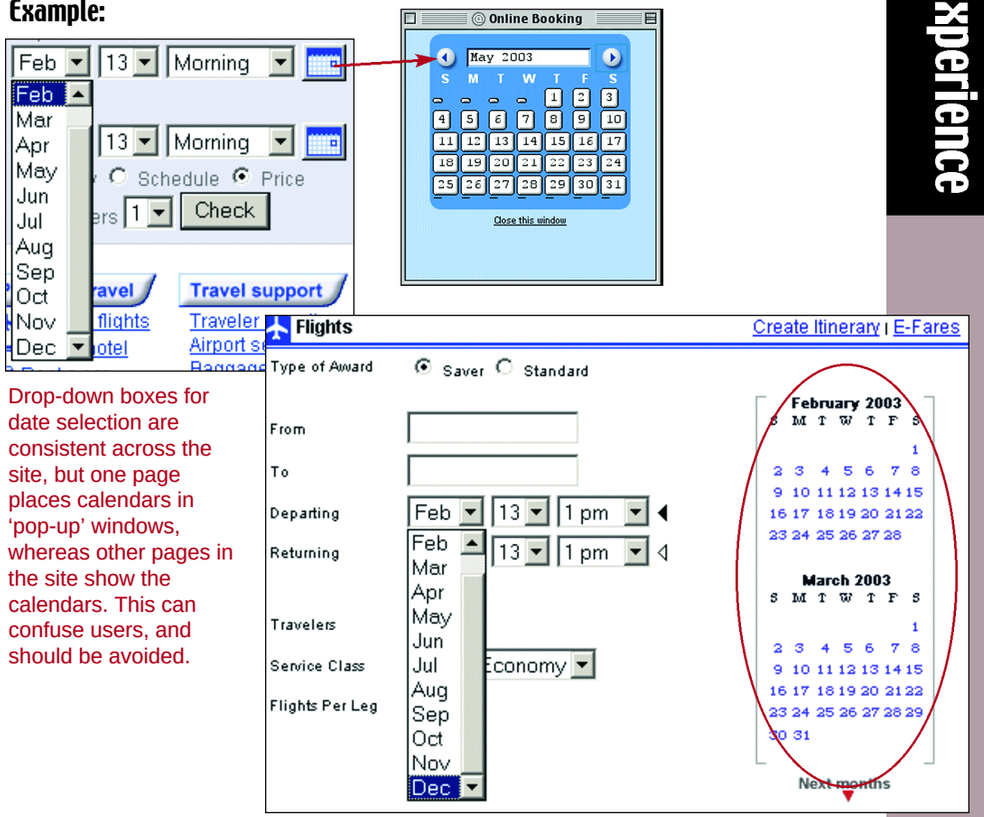
Strength of Evidence: 1 2 3 4 5

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.

Sources: Bovair, Kieras and Polson, 1990; Czaja and Sharit, 1997; Detweiler and Omanson, 1996; Foltz, et al., 1988; Kieras, 1997; Polson and Kieras, 1985; Polson, Bovair and Kieras, 1987; Polson, Muncher and Engelbeck, 1986; Smith, Bubb-Lewis and Suh, 2000; Sonderegger, et al., 1999; Ziegler, Hoppe and Fahnrich, 1986.

Example:



Drop-down boxes for date selection are consistent across the site, but one page places calendars in 'pop-up' windows, whereas other pages in the site show the calendars. This can confuse users, and should be avoided.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

2:6 Minimize Page Download Time

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 3 4 ○

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

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

Sources: Barber and Lucas, 1983; Bouch, Kuchinsky and Bhatti, 2000; Byrne, John, et al., 1999; Evans, 1998; Lynch and Horton, 2002; Nielsen, 1997d; Spool, et al., 1997; Tiller and Green, 1999.

2:7 Warn of 'Time Outs'

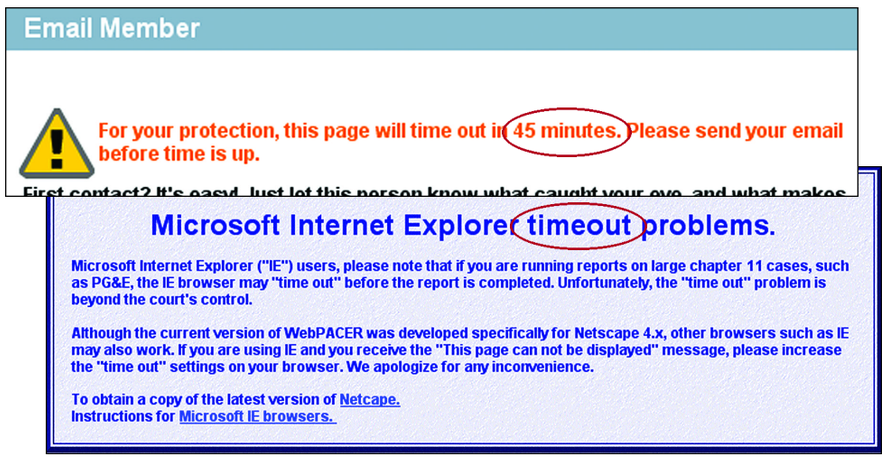
Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 3 ○ ○

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 that read slowly or make entries slowly.

Sources: Koyani, 2001a; United States Government, 1998.

Example:



See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

2:8 Reduce the User's Workload

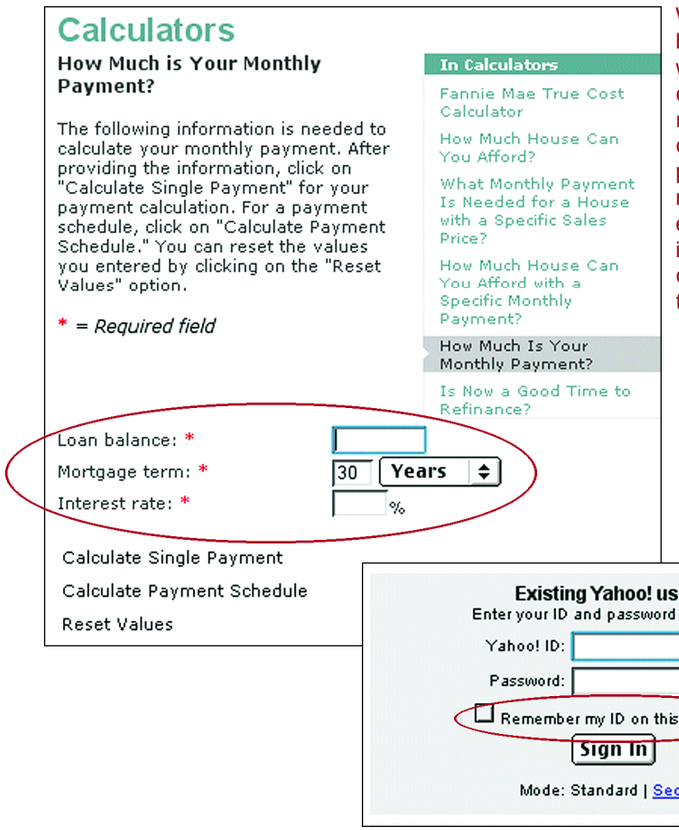
Relative Importance: 1 2 3 ○ ○
Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Gerhardt-Powals, 1996; Moray and Butler, 2000; Sheridan, 1997.

Example:



When looking to buy a house, users will know the value of variables necessary to calculate a monthly payment (interest rate, loan amount, etc.), but are incapable of quickly calculating it themselves.

2:9 Use Users' Terminology in Help Documentation

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

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 ○ ○

Comments: There is varied understanding among users as to what many website 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.

Sources: Bailey, Koyani and Nall, 2000; Foley and Wallace, 1974; Furnas, et al., 1987; Scanlon and Schroeder, 2000.

2:10 Provide Feedback When Users Must Wait

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

Relative Importance: 1 2 3 ○ ○

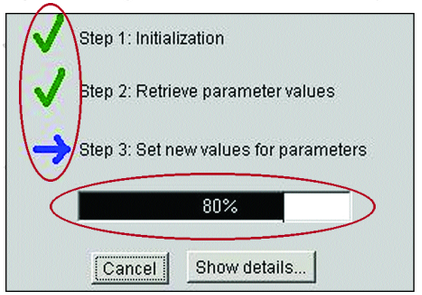
Strength of Evidence: 1 2 3 4 ○

Comments: If processing will take less than ten 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).

Sources: Bouch, Kuchinsky and Bhatti, 2000; Meyer, Shinar and Leiser, 1990; Smith and Mosier, 1986.

Example:



2:11 Inform Users of Long Download Times

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

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 ○ ○

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 website navigation performance.

Sources: Campbell and Maglio, 1999; Detweiler and Omanson, 1996; Evans, 1998; Nielsen, 2000.

Example:

Download Options:

Click here to download entire report without images (pdf format)
File size: 1.5 mb
Approx. download time using 56K modem: 4 minutes
Approx. download time using T1: 10 seconds

Click here to download entire report without images (zip format)
File size:1.15 mb
Approx. download time using 56K modem: 3 minutes
Approx. download time using T1: 6 seconds

Click here to download entire report with images (pdf format)
File size 82 mb
Approx. download time using 56K modem: 3.5 hours
Approx. download time using T1: 8 minutes

Click here to download entire report with images (zip format)
File size: 62.9 mb
Approx. download time using 56K modem: 2.5 hours
Approx. download time using T1: 6 minutes

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

2:12 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.

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 ○

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.

Sources: Baddeley, 1986; Evans, 1998; Mayes, Sims and Koonce, 2000; Spyridakis, 2000.

2:13 Design For Working Memory Limitations

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

Relative Importance: 1 2 3 ○ ○

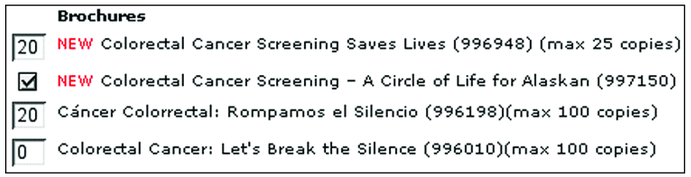
Strength of Evidence: 1 2 3 4 5

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.

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.

Sources: Ahlstrom and Longo, 2001; Baddeley, 1986; Bailey, 2000a; Broadbent, 1975; Brown, 1958; Cockburn and Jones, 1996; Curry, McDougall and de Bruijn, 1998; Evans, 1998; Kennedy and Wilkes, 1975; LeCompte, 1999; LeCompte, 2000; MacGregor, 1987; McEneaney, 2001; Spyridakis, 2000.

Example:



A user ordering publications from this page is required to remember which of the three similarly-titled fact sheets they want to order. A link to the fact sheet on the order form would allow the user to compare the products during the ordering process.

2:14 Develop Pages that Will Print Properly

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

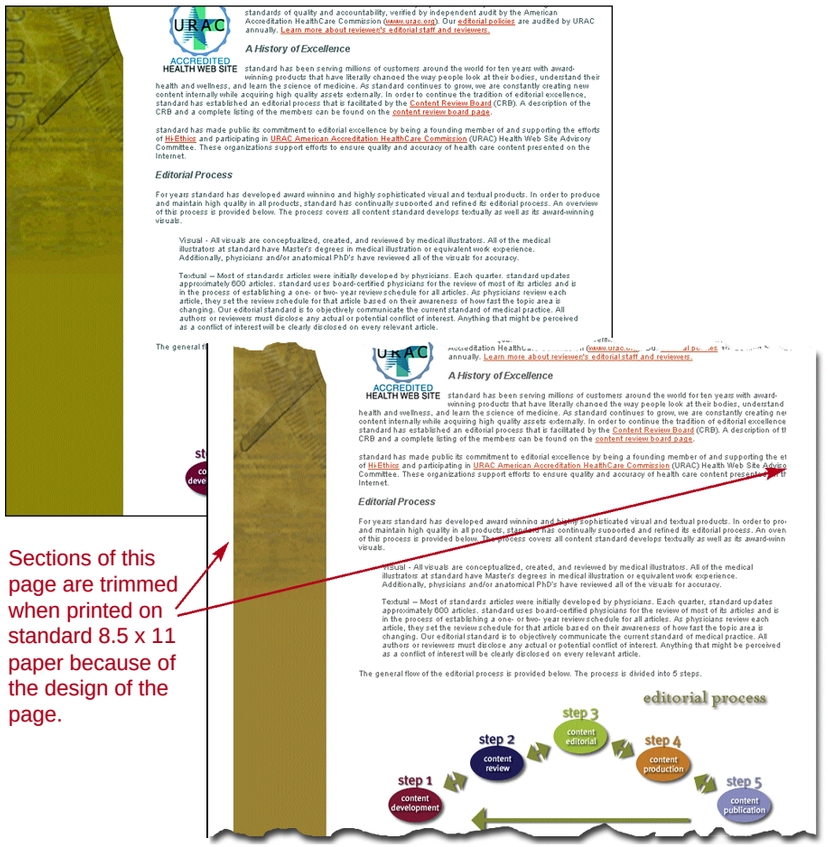
Relative Importance: 1 2 ○ ○ ○

Strength of Evidence: 1 2 ○ ○ ○

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.

Sources: Ahlstrom and Longo, 2001; Evans, 1998; Gerhardt-Powals, 1996; Lynch and Horton, 2002; Spyridakis, 2000; Tullis, 2001; Zhang and Seo, 2001.

Example:



Sections of this page are trimmed when printed on standard 8.5 x 11 paper because of the design of the page.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

Accessibility

Websites 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 websites facilitate the use of common assistive technologies. All United States Federal Government websites must comply with the Section 508 Federal Accessibility Standards.

With the exception of Guideline 2:7 and Guideline 9:3, all accessibility-related guidelines are found in this chapter. The sample of users who organized these guidelines assigned these two guidelines to other chapters. (See page xxii, Step 7 for more on how the guidelines were organized.)

Some of the major accessibility issues to be dealt with include:

- Provide text equivalents for non-text elements;
- Ensure that scripts allow accessibility;
- Provide frame titles;
- Enable users to skip repetitive navigation links;
- Ensure that plug-ins and applets meet the requirements for accessibility; and
- Synchronize all multimedia elements.

Where it is not possible to ensure that all pages of a site are accessible, designers should provide equivalent information to ensure that all users have equal access to all information.

For more information on Section 508 and accessibility, see www.section508.gov and www.usability.gov/accessibility/index.html.

3:1 Comply with Section 508

Relative Importance: * 1 2 3 ○ ○
Strength of Evidence: 1 2 ○ ○ ○

Guideline: If a website is being designed for the United States government, ensure that it meets the requirements of Section 508 of the Rehabilitation Act. Ideally, all websites should strive to be accessible and compliant with Section 508.

Comments: Section 508 requires Federal agencies to ensure that their procurement of information technology takes into account the needs of all users—including people with disabilities. About eight percent of the user population has a disability that may make the traditional use of a website very difficult or impossible. About four percent have vision-related disabilities, two percent have movement-related issues, one percent have hearing-related disabilities, and less than one percent have learning-related disabilities.

Compliance with Section 508 enables Federal employees with disabilities to have access to and use of information and data that is comparable to that provided to others. This also enhances the ability of members of the public with disabilities to access information or services from a Federal agency.

For additional information on Section 508 and accessibility:

- http://www.section508.gov
- http://www.w3.org/WAI/
- http://www.usability.gov/accessibility/index.html

Sources: GVU, Georgia Institute of Technology, 1998; United States Government, 1998.

3:2 Design Forms for Users Using Assistive Technologies

Relative Importance: * 1 2 3 4 ○
Strength of Evidence: 1 2 ○ ○ ○

Guideline: Ensure that users using assistive technology can complete and submit online forms.

Comments: Much of the information collected through the Internet is collected using online forms. All users should be able to access forms and interact with field elements such as radio buttons and text boxes.

Sources: Covi and Ackerman, 1995; Morrell, et al., 2002; United States Government, 1998.

* Regardless of the "Relative Importance" rating assigned by the reviewers, U.S. Federal websites must adhere to all Section 508 guidelines (see Guideline 3:1).

Research-Based Web Design & Usability Guidelines

3:3 Provide Text Equivalents for Non-Text Elements

Relative Importance: * 1 2 3 4 ○
Strength of Evidence: 1 2 ○ ○ ○

Guideline: Provide a text equivalent for every non-text element that conveys information.

Comments: Text equivalents should be used for all non-text elements, including images, graphical representations of text (including symbols), image map regions, animations (e.g., animated GIFs), applets and programmatic objects, ascii art, frames, scripts, images used as list bullets, spacers, graphical buttons, sounds, stand-alone audio files, audio tracks of video, and video.

Sources: Chisholm, Vanderheiden and Jacobs, 1999a; Nielsen, 2000; United States Government, 1998.

Example:

* Regardless of the "Relative Importance" rating assigned by the reviewers, U.S. Federal websites must adhere to all Section 508 guidelines (see Guideline 3:1).

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

3:4 Do Not Use Color Alone to Convey Information

Relative Importance: * 1 2 3 4 5
Strength of Evidence: 1 2 3 4 ○

Guideline: Ensure that all information conveyed with color is also available without color.

Comments: Never use color as the only indicator for critical activities. About eight percent of males and about one-half of one percent of females have difficulty discriminating colors. Most users with color deficiencies have difficulty seeing colors in the green portion of the spectrum.

To accommodate color-deficient users, designers should:

- Select color combinations that can be discriminated by users with color deficiencies;
- Use tools to see what Web pages will look like when seen by color deficient users;
- Ensure that the lightness contrast between foreground and background colors is high;
- Increase the lightness contrast between colors on either end of the spectrum (e.g., blues and reds); and
- Avoid combining light colors from either end of the spectrum with dark colors from the middle of the spectrum.

Sources: Bailey, 1996; Chisholm, Vanderheiden and Jacobs, 1999c; Evans, 1998; Hess, 2000; Levine, 1996; Murch, 1985; Rigden, 1999; Smith and Mosier, 1986; Sullivan and Matson, 2000; Thorell and Smith, 1990; Tullis, 2001; United States Government, 1998; Wolfmaier, 1999; Vischeck, 2003.

3:5 Provide Equivalent Pages

Relative Importance: * 1 2 3 ○ ○
Strength of Evidence: 1 2 ○ ○ ○

Guideline: Provide text-only pages with equivalent information and functionality if compliance with accessibility provisions cannot be accomplished in any other way.

Comments: When no other solution is available, one option is to design, develop and maintain a parallel website that does not contain any graphics. The pages in such a website should be readily accessible, and facilitate the use of screen readers and other assistive devices.

As a rule, ensure that text-only pages are updated as frequently and contain all of the same information as their non-text counterparts. Also inform users that text-only pages are exactly equivalent and as current as non-text counterparts.

Sources: Chisholm, Vanderheiden and Jacobs, 1999e; United States Government, 1998.

3:6 Ensure that Scripts Allow Accessibility

Guideline: When designing for accessibility, ensure that the information provided on pages that utilize scripting languages to display content or to create interface elements can be read by assistive technology.

Relative Importance: * 1 2 3 ○ ○

Strength of Evidence: 1 2 ○ ○ ○

Comments: Whenever a script changes the content of a page, the change must be indicated in a way that can be detected and read by a screen reader. Also, if 'mouseovers' are used, ensure that they can be activated using a keyboard.

Sources: United States Government, 1998.

3:7 Provide Client-Side Image Maps

Guideline: To improve accessibility, provide client-side image maps instead of server-side image maps.

Relative Importance: * 1 2 3 ○ ○

Strength of Evidence: 1 2 3 ○ ○

Comments: Client-side image maps can be made fully accessible, whereas server-side image maps cannot be made accessible without employing a text alternative for each section of the map. To make client-side image maps accessible, each region within the map should be assigned alt text that can be read by a screen reader or other assistive device. Designers must ensure that redundant text links are provided for each active region of a server-side image map.

Sources: United States Government, 1998.

3:8 Enable Users to Skip Repetitive Navigation Links

Guideline: To aid those using assistive technologies, provide a means for users to skip repetitive navigation links.

Relative Importance: * 1 2 3 ○ ○

Strength of Evidence: 1 2 ○ ○ ○

Comments: Developers frequently place a series of routine navigational links at a standard location—usually across the top, bottom or side of a page. For people using assistive devices, it can be a tedious and time-consuming task to wait for all of the repeated links to be read. Users should be able to avoid these links when they desire to do so.

Sources: United States Government, 1998.

3:9 Provide Frame Titles

Guideline: To ensure accessibility, provide frame titles that facilitate frame identification and navigation.

Relative Importance: * 1 2 3 ○ ○

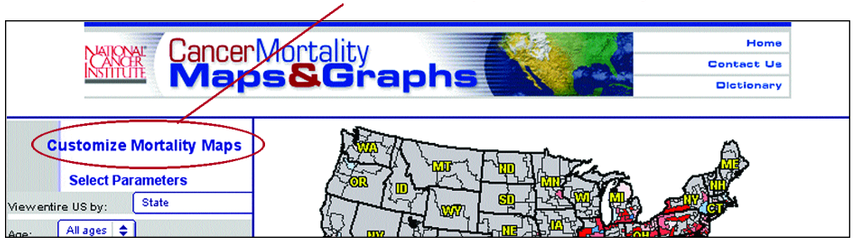
Strength of Evidence: 1 2 ○ ○ ○

Comments: Frames are used to divide the browser screen into separate areas, with each area presenting different, but usually related, information. For example, a designer may use a frame to place navigational links on the left side of a page, and put the main information in a larger frame on the right side. This allows users to scroll through the information section without disturbing the navigation section. Clear and concise frame titles enable people with disabilities to properly orient themselves when frames are used.

Sources: Chisholm, Vanderheiden and Jacobs, 1999f; United States Government, 1998.

Example:

Providing frame titles like that circled will allow visually impaired users to understand the purpose of the frame's content or its function. Note that the right frame does not contain a title, and thus poses accessibility concerns.



3:10 Test Plug-ins and Applets for Accessibility

Guideline: To ensure accessibility, test any applets, plug-ins or other applications required to interpret page content to ensure that they can be used by assistive technologies.

Relative Importance: * 1 2 3 ○ ○

Strength of Evidence: 1 2 ○ ○ ○

Comments: Applets, plug-ins and other software can create problems for people using assistive technologies, and should be thoroughly tested for accessibility.

Sources: United States Government, 1998.

* Regardless of the "Relative Importance" rating assigned by the reviewers, U.S. Federal websites must adhere to all Section 508 guidelines (see Guideline 3:1).

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

3:11 Synchronize Multimedia Elements

Relative Importance: * (1 2 ○ ○ ○)
Strength of Evidence: (1 2 ○ ○ ○)

Guideline: To ensure accessibility, provide equivalent alternatives for multimedia elements that are synchronized.

Comments: For multimedia presentations (e.g., a movie or animation), synchronize captions or auditory descriptions of the visual track with the presentation.

Sources: Ahlstrom and Longo, 2001; Chisholm, Vanderheiden and Jacobs, 1999b; Galitz, 2002; Mayhew, 1992.

3:12 Do Not Require Style Sheets

Relative Importance: * (1 2 ○ ○ ○)
Strength of Evidence: (1 ○ ○ ○ ○)

Guideline: Organize documents so they are readable without requiring an associated style sheet.

Comments: Style sheets are commonly used to control Web page layout and appearance. Style sheets should not hamper the ability of assistive devices to read and logically portray information.

Sources: United States Government, 1998.

3:13 Avoid Screen Flicker

Relative Importance: * (1 2 ○ ○ ○)
Strength of Evidence: (1 ○ ○ ○ ○)

Guideline: Design Web pages that do not cause the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.

Comments: Five percent of people with epilepsy are photosensitive, and may have seizures triggered by certain screen flicker frequencies. Most current monitors are unlikely to provoke seizures.

Sources: United States Government, 1998.

* Regardless of the "Relative Importance" rating assigned by the reviewers, U.S. Federal websites must adhere to all Section 508 guidelines (see Guideline 3:1).

See page xxi for detailed descriptions of the rating scales (1 2 3 4 ○)

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 dominates the personal computer market. Similarly, only two website browsers are favored by the vast majority of users. More than ninety percent of users have their monitor resolutions set to 800x600 or 1024x768 pixels. And while most users at work have high-speed Internet access, most users at home connect at dial-up (56K or less) speeds.

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 website.

4:1 Design for Common Browsers

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 ○ ○ ○

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

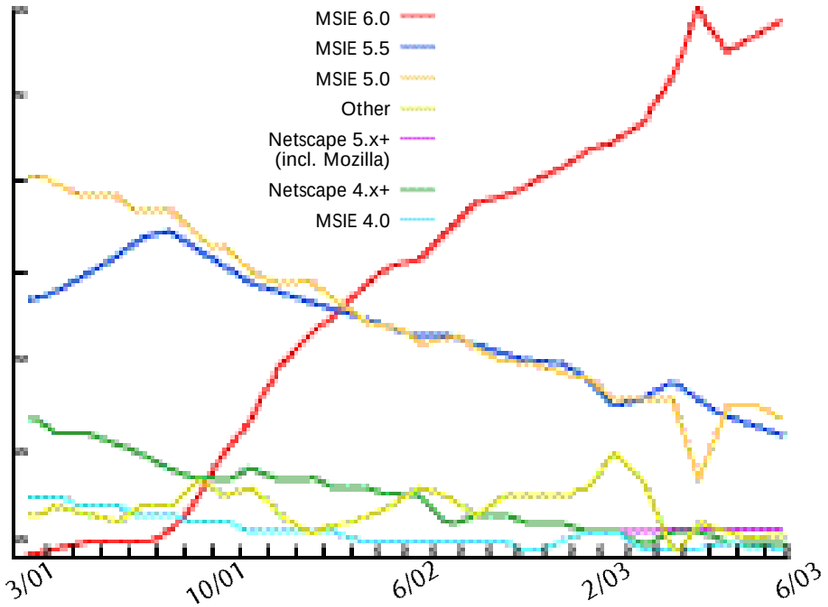
Comments: Designers should attempt to accommodate ninety-five percent of all users. Ensure that all testing of a website is done using the most popular browsers.

Sources of information about the most commonly used browsers:

- http://www.google.com/press/zeitgeist.html
- http://www.thecounter.com/stats

Sources: Evans, 1998; Jupitermedia Corporation, 2003; Morrell, et al., 2002; Nielsen, 1996b.

Example:



Web Browsers Used To Access Google March 2001 – June 2003

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

4:2 Account for Browser Differences

Relative Importance: 1 2 3 4 ○

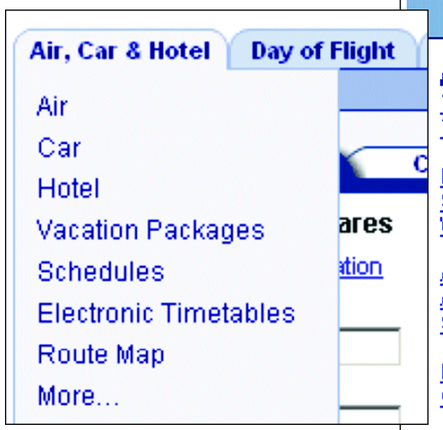
Strength of Evidence: 1 2 ○ ○ ○

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

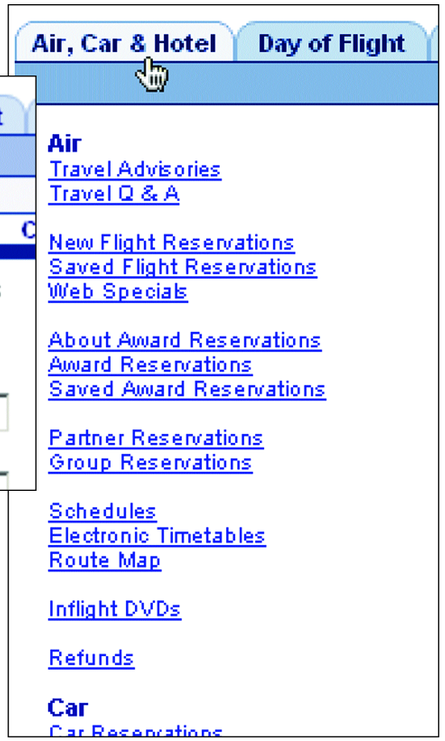
Comments: Visually impaired users tend to select larger fonts, and some users may turn off backgrounds, use fewer colors, or use font overrides. The designer should find out what settings most users are using, and specify on the website exactly what assumptions were made about the browser settings.

Sources: Evans, 1998; Levine, 1996.

Example:



When using one popular browser, moving the mouse over the tabs at the top of the page and left-clicking will reveal a drop-down menu with navigation choices. This functionality is not available when using another popular browser, where a single left click will take you to a new page entitled “Air, Car & Hotel.”



4:3 Design for Popular Operating Systems

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

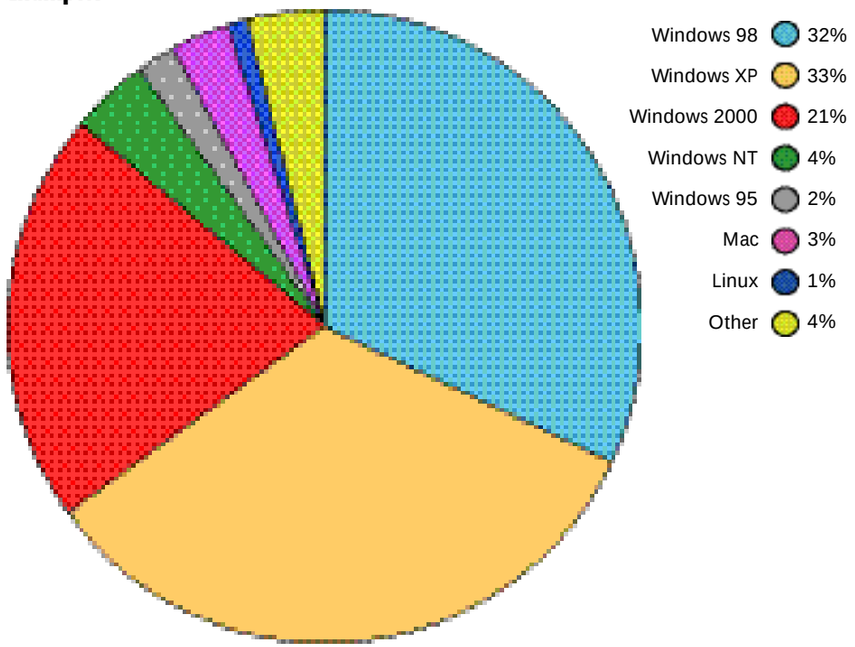
Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 ○ ○ ○

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

Sources: Jupitermedia Corporation, 2003.

Example:



Operating Systems Used To Access Google
June 2003

4:4 Design for User's Typical Connection Speed

Guideline: Design for the connection speed of most users.

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 ○ ○ ○

Comments: At work, more than two-thirds of users have high speed access and thirty-four percent are using 56K (or slower) modems. At home, more than one-third of users have high speed access. These figures are continually changing—designers should consult one of the several sources that maintain up-to-date figures.

Sources: Forrester Research, 2001; Nielsen, 1999a; Web Site Optimization, 2003.

4:5 Design for Commonly Used Screen Resolutions

Guideline: Design for monitors with the screen resolution set at 800x600 pixels.

Relative Importance: 1 2 ○ ○ ○

Strength of Evidence: 1 2 ○ ○ ○

Comments: Designers should attempt to accommodate ninety-five percent of all users. As of 2003, nearly half of users have their screen resolution set at 800x600. By designing for 800x600, designers will accommodate this most common resolution, as well as those at any higher resolution. Ensure that all testing of websites is done using the most common screen resolutions.

Sources: Evans, 1998; Jupitermedia Corporation, 2003.

Example:

Screen Resolution	Apr 02	July 02	Oct 02	Jan 03	May 03
1152x864 or greater	6% of users	7%	7%	7%	7%
1024x768	35% of users	37%	38%	40%	41%
800x600	51% of users	49%	49%	46%	46%
640x480 or less	3% of users	3%	2%	2%	2%
Other or Unknown	5% of users	4%	4%	5%	4%

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

The Homepage

The homepage is different from all other website

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 website. 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.

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

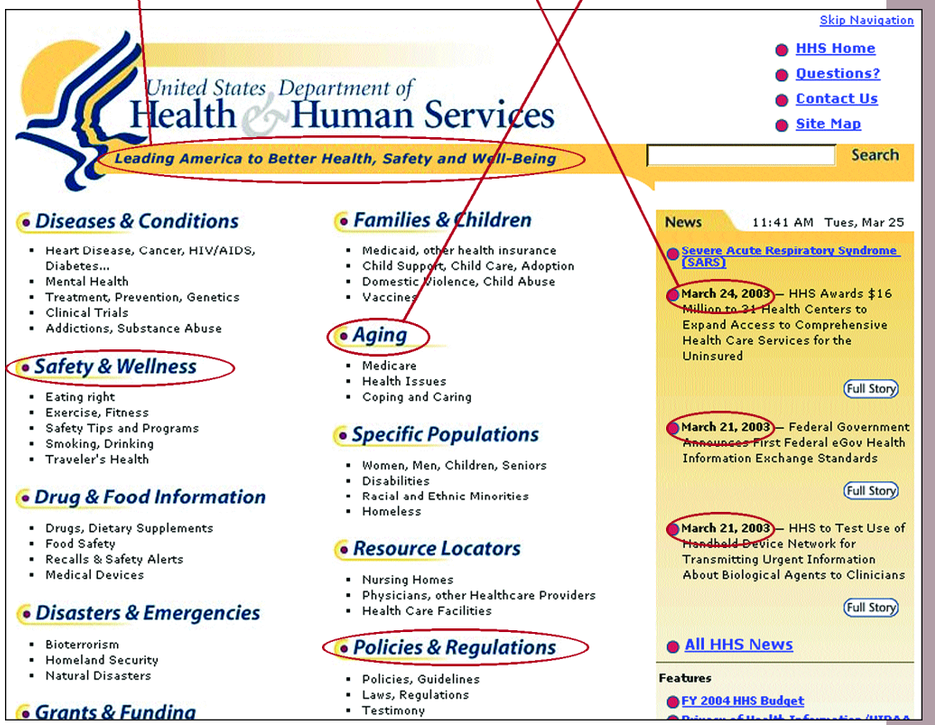
Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4

Comments: In terms of conveying quality, the homepage is probably the most important page on a website. One study found that when asked to find high quality websites, 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.

Sources: Amento, et al., 1999; Coney and Steehouder, 2000; Mahlke, 2002; Nielsen and Tahir, 2002.

Example: This homepage creates a positive first impression:
- Tag line increases users' understanding of site;
- Key topic areas are presented in order of importance and are easy to scan; and
- Up-to-date news stories are available.



Research-Based Web Design & Usability Guidelines

5:2 Ensure the Homepage Looks like a Homepage

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

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 ○

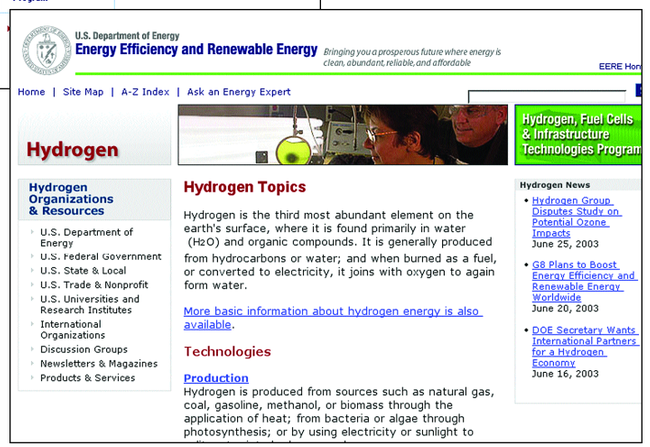
Comments: It is important that pages 'lower' in a site are not confused with the homepage. Users have come to expect that certain actions are possible from the homepage. These actions include, among others, finding important links, accessing a site map or index, and conducting a search.

Sources: Farkas and Farkas, 2000; Ivory and Hearst, 2002; Ivory, Sinha and Hearst, 2000; Lynch and Horton, 2002; Nall, Koyani and Lafond, 2001; Nielsen and Tahir, 2002; Tullis, 2001.

Example:

This homepage has characteristics that help ensure that it is distinct from second and third tier pages:

- Masthead with tagline;
- Distinct and weighted category links listed in order of priority; and
- All major content categories are available.



The second and third tier pages use a less visually imposing masthead and specific content.

5:3 Show All Major Options on the Homepage

Guideline: Present all major options on the homepage.

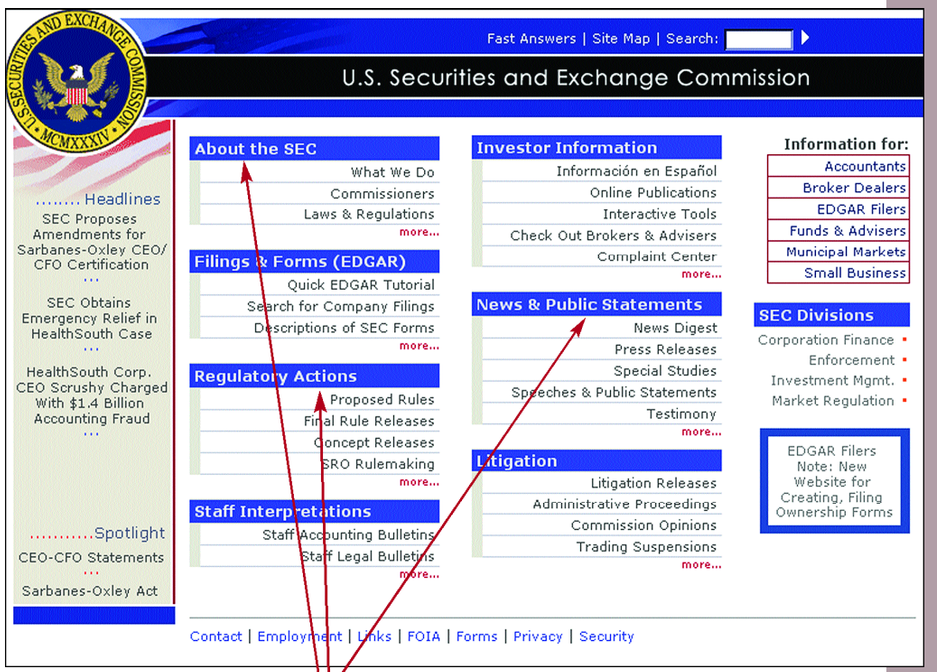
Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 ○ ○ ○

Comments: Users should not be required to click down to the second or third level to discover the full breadth of options on a website. 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.

Sources: Farkas and Farkas, 2000; Koyani, 2001a; Nielsen and Tahir, 2002; Nielsen, 2001b.

Example:



All major topic areas and categories are presented at the homepage level.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

5:4 Enable Access to the Homepage

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 ○ ○

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

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 website 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.

Sources: Bailey, 2000b; Detweiler and Omanson, 1996; IBM, 1999; Levine, 1996; Lynch and Horton, 2002; Nielsen and Tahir, 2002; Spool, et al., 1997; Tullis, 2001.

Example:

This Web page provides links to both the main organization homepage (clickable "National Cancer Institute" logo in the upper left corner) as well as the sub-organization homepage ("Cancer Control Home" link placed in the upper right corner). These logos and their placement remain constant throughout the website.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

5:5 Attend to Homepage Panel Width

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 ○ ○

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 website. 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.

Sources: Evans, 1998; Farkas and Farkas, 2000; Nall, Koyani and Lafond, 2001.

Example:

The width of these panels (wide enough to clearly present links and navigation information, but narrow enough so that they do not dominate the page) allow the user to recognize them as navigation and content panels.

5:6 Announce Changes to a Website

Relative Importance: 1 2 3 4 O

Strength of Evidence: 1 2 O O O

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

Comments: Introducing users to a redesigned website 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 relevant places on the website. For example, if shipping policies have changed, a notification of such on the order page should be provided.

Sources: Levine, 1996; Nall, Koyani and Lafond, 2001.

Example:

Creating Web pages that introduce a new look or changes in the navigation structure is one way of re-orienting users after a site redesign.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 O

5:7 Communicate the Website's Purpose

Relative Importance: 1 2 3 O O

Strength of Evidence: 1 2 O O O

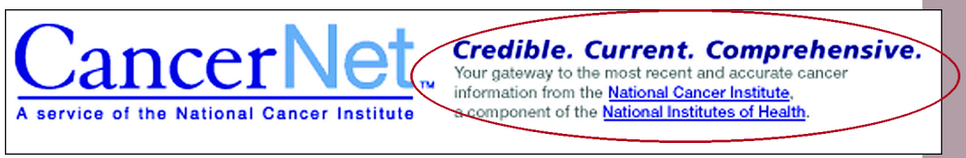
Guideline: Communicate the purpose of the website on the homepage.

Comments: Many users waste time because they misunderstand the purpose of a website. 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 website 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 to determine a site's purpose.

Sources: Coney and Steehouder, 2000; Nall, Koyani and Lafond, 2001.

Example:



5:8 Limit Prose Text on the Homepage

Relative Importance: 1 2 ○ ○ ○

Strength of Evidence: 1 2 3 ○ ○

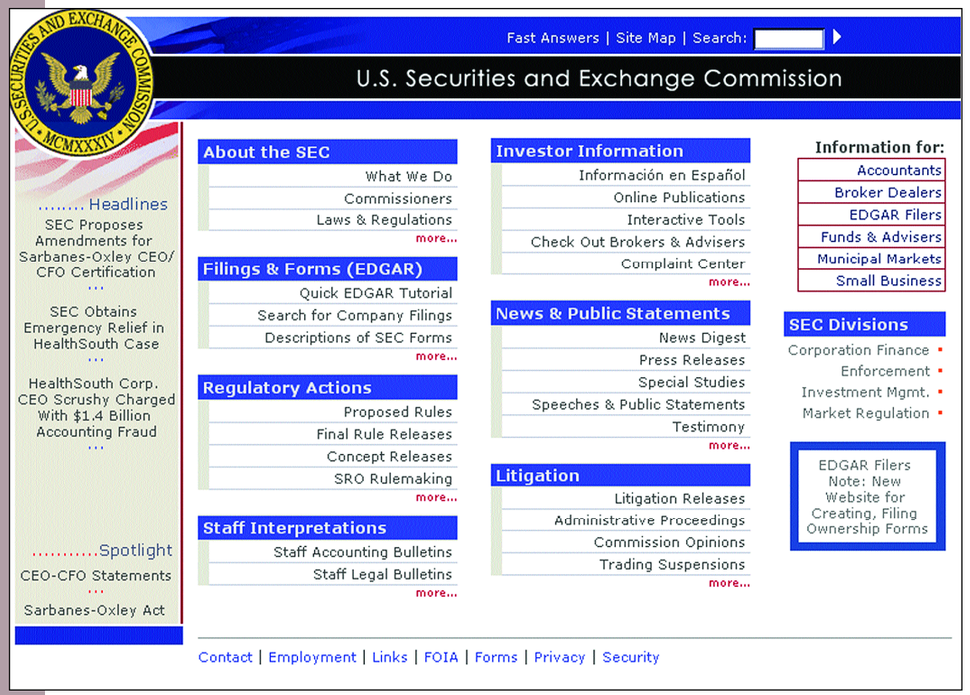
Guideline: Limit the amount of prose text on the homepage.

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.

Sources: Bailey, Koyani and Nall, 2000; Farkas and Farkas, 2000; Morkes and Nielsen, 1998.

Example:

Clean, prose-free design allows users to quickly discern the primary headings and sub-headings without the distraction of paragraphs of text.



See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

5:9 Limit Homepage Length

Relative Importance: 1 ○ ○ ○ ○

Strength of Evidence: 1 2 ○ ○ ○

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 website. 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.

The dimensions for one screenful of information are based primarily on screen resolution. The following assume that users have selected an 800 x 600 pixel resolution: Maximum width = 780 pixels; Maximum height = 430 pixels.

Sources: Badre, 2002; IBM, 1999; Lynch and Horton, 2002; Nielsen and Tahir, 2002; Spyridakis, 2000.

Example:

Users can view all of the information on this homepage without scrolling.

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 also are 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 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.

6:1 Set Appropriate Page Lengths

Relative Importance: 1 2 3 4 O

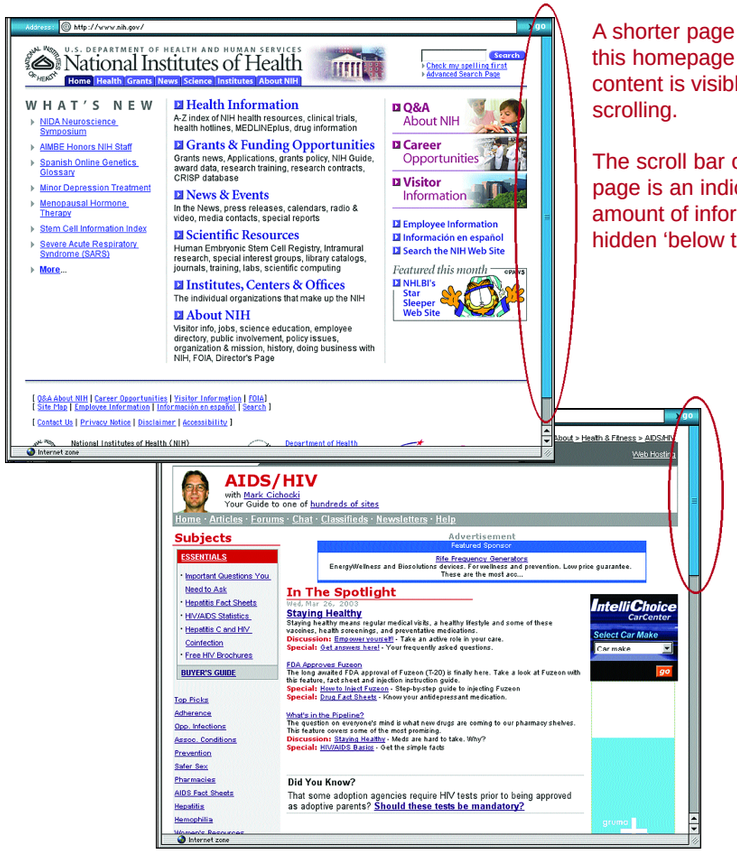
Strength of Evidence: 1 2 3 O O

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.

Sources: Bernard, Baker and Fernandez, 2002; Evans, 1998; Lynch and Horton, 2002.

Example:



A shorter page is used for this homepage so that most content is visible without scrolling.

The scroll bar on each page is an indication of the amount of information hidden 'below the fold.'

Research-Based Web Design & Usability Guidelines

6:2 Use Frames When Functions Must Remain Accessible

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 ○

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

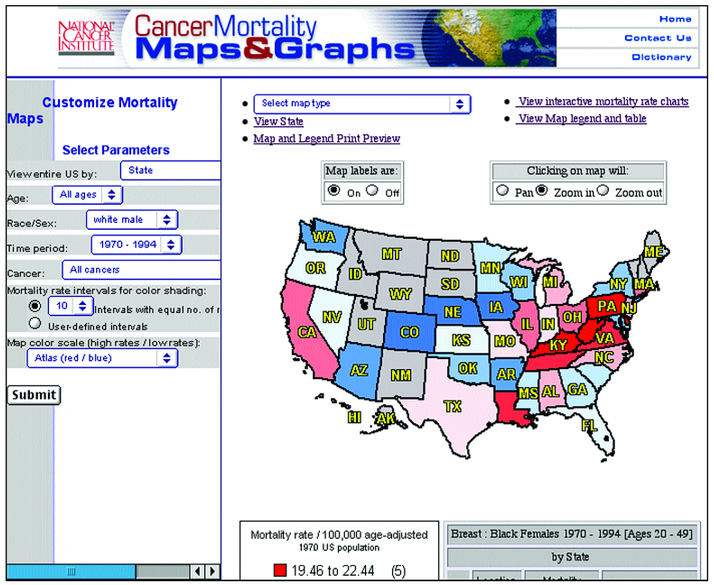
Comments: It works well to have the functional items in one frame and the items that are being acted upon in another frame. This is sometimes referred to as a 'simultaneous menu' because making changes in one frame causes the information to change in another frame. Side-by-side frames seem to work best, 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 searching pages.

Sources: Ashworth and Hamilton, 1997; Bernard and Hull, 2002; Bernard, Hull and Drake, 2001; Detweiler and Omanson, 1996; Kosslyn, 1994; Koyani, 2001a; Lynch and Horton, 2002; Nielsen, 1996a; Nielsen, 1999b; Powers, et al., 1961; Spool, et al., 1997.

Example:

Multi-variable charting applications are one example of an acceptable use of frames. The map of the United States in the right frame is controlled by the menu selections in the left frame. As such, the left frame remains fixed while the right frame regenerates based upon the user-defined selections in the left frame. Such use of frames allows users to continually view the menu selections, avoiding use of the Back button when changing selections and eliminating the need for users to maintain this information in their working memory.



6:3 Establish Level of Importance

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 ○

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

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.

Sources: Detweiler and Omanson, 1996; Evans, 1998; Kim and Yoo, 2000; Marshall, Drapeau and DiSciullo, 2001; Nall, Koyani and Lafond, 2001; Nielsen and Tahir, 2002; Nygren and Allard, 1996; Spyridakis, 2000.

Example:

Priority information and links appear in order based on users' needs. The order was determined by surveys, log analyses, and interviews.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

6:4 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.

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 ○

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.

Sources: Byrne, Anderson, et al., 1999; Detweiler and Omanson, 1996; Faraday, 2000; Faraday, 2001; Lewenstein, et al., 2000; Mahajan and Shneiderman, 1997; Nielsen, 1996a; Nielsen, 1999b; Nielsen, 1999c; Spyridakis, 2000.

Example: Eye-tracking studies indicate this is the area of the screen where most new users first look when a website page loads.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

6:5 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.

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 ○

Comments: Users will try to anticipate where common items will appear on their screen. 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 the top items much better than those farther down the page.

Sources: Badre, 2002; Bernard, 2001; Bernard, 2002; Byrne, Anderson, et al., 1999.

Example: Important items—in this case primary navigation tabs—are consistently placed at the top of each page.

6:6 Structure for Easy Comparison

Relative Importance: 1 2 3 ○ ○

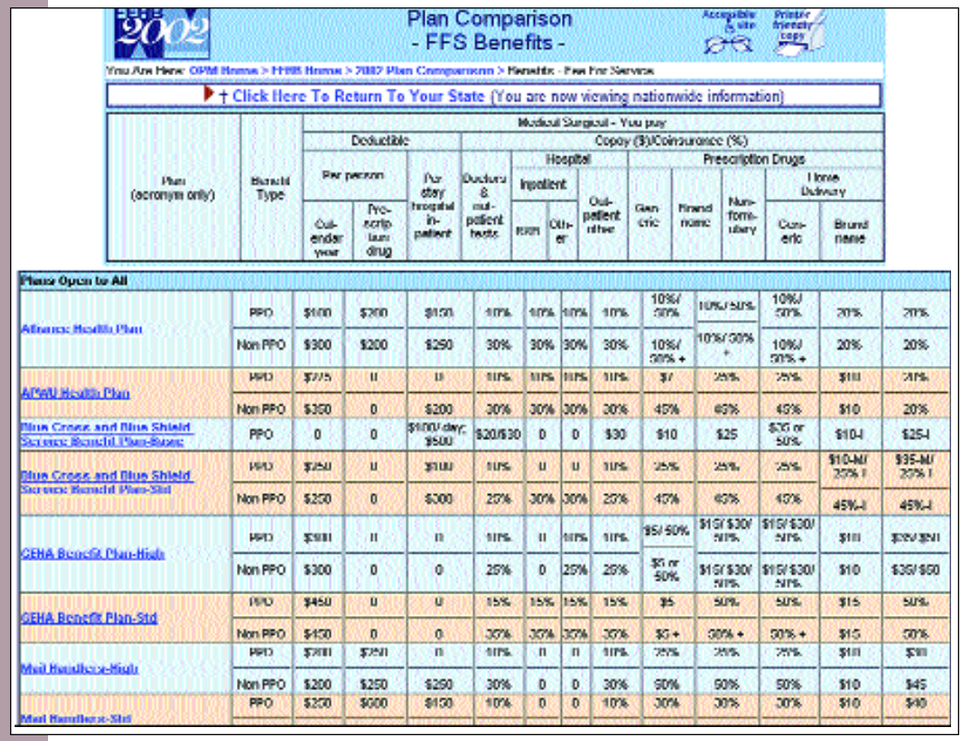
Strength of Evidence: 1 2 3 4 ○

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.

Sources: Spool, et al., 1997; Tullis, 1981; Williams, 2000.

Example: This page layout is structured to easily allow users to quickly scan and compare data.



2002

Plan Comparison
- FFS Benefits -

† Click Here To Return To Your State (You are now viewing nationwide information)

Plan (acronym only)	Benefit Type	Medical Surgical - You pay											
		Deductible			Copay ($)/Coinsurance (%)								
		Per person		Per stay hospital in-patient	Doctors & out-patient visits	Hospital			Prescription Drugs			Home Delivery	
						Inpatient		Out-patient other	Generic	Brand name	Non-formulary	Generic	Brand name
		Calendar year	Prescription drug			Rem	Other						
Plans Open to All													
Alliance Health Plan	PPO	$100	$200	$150	10%	10%	10%	10%	10%/ 50%	10%/ 50%	10%/ 50%	20%	20%
	Non PPO	$300	$200	$250	30%	30%	30%	30%	10%/ 50% +	10%/ 50% +	10%/ 50% +	20%	20%
APWU Health Plan	PPO	$275	0	0	10%	10%	10%	10%	$7	25%	25%	$10	20%
	Non PPO	$350	0	$200	30%	30%	30%	30%	45%	45%	45%	$10	20%
Blue Cross and Blue Shield Service Benefit Plan-Basic	PPO	0	0	$100/ day; $500	$20/$30	0	0	$30	$10	$25	$35 or 50%	$10-I	$25-I
Blue Cross and Blue Shield Service Benefit Plan-Std	PPO	$250	0	$100	10%	0	0	10%	25%	25%	25%	$10-M/ 25% I	$35-M/ 25% I
	Non PPO	$250	0	$300	25%	30%	30%	25%	40%	40%	40%	45%-I	45%-I
CEHA Benefit Plan-High	PPO	$100	0	0	10%	0	10%	10%	$5/ 50%	$15/ $30/ 50%	$15/ $30/ 50%	$10	$35/ $50
	Non PPO	$300	0	0	25%	0	25%	25%	$5 or 50%	$15/ $30/ 50%	$15/ $30/ 50%	$10	$35/ $50
CEHA Benefit Plan-Std	PPO	$450	0	0	15%	15%	15%	15%	$5	50%	50%	$15	50%
	Non PPO	$450	0	0	30%	30%	30%	30%	$5 +	50% +	50% +	$15	50%
Mail Handlers-High	PPO	$100	$250	0	10%	0	0	10%	25%	25%	25%	$10	$30
	Non PPO	$200	$250	$250	30%	0	0	30%	50%	50%	50%	$10	$45
Mail Handlers-Std	PPO	$250	$500	$150	10%	0	0	10%	30%	30%	30%	$10	$40

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

6:7 Use Moderate White Space

Relative Importance: 1 2 3 ○ ○

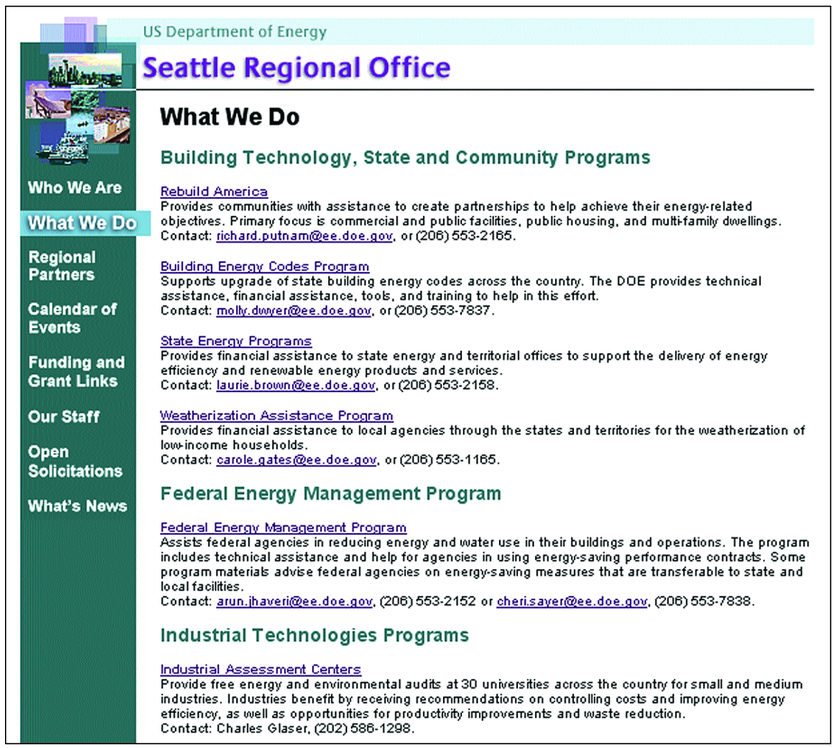
Strength of Evidence: 1 2 3 4 ○

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.

Sources: Chaparro and Bernard, 2001; Parush, Nadir and Shtub, 1998; Spool, et al., 1997; Staggers, 1993; Tullis, 1984.

Example: This page facilitates user's ability to scan for information by limiting the amount of white space.



US Department of Energy

Seattle Regional Office

Who We Are
What We Do
Regional Partners
Calendar of Events
Funding and Grant Links
Our Staff
Open Solicitations
What's News

What We Do

Building Technology, State and Community Programs

Rebuild America
Provides communities with assistance to create partnerships to help achieve their energy-related objectives. Primary focus is commercial and public facilities, public housing, and multi-family dwellings.
Contact: richard.putnam@ee.doe.gov, or (206) 553-2165.

Building Energy Codes Program
Supports upgrade of state building energy codes across the country. The DOE provides technical assistance, financial assistance, tools, and training to help in this effort.
Contact: molly.dwyer@ee.doe.gov, or (206) 553-7837.

State Energy Programs
Provides financial assistance to state energy and territorial offices to support the delivery of energy efficiency and renewable energy products and services.
Contact: laurie.brown@ee.doe.gov, or (206) 553-2158.

Weatherization Assistance Program
Provides financial assistance to local agencies through the states and territories for the weatherization of low-income households.
Contact: carole.gates@ee.doe.gov, or (206) 553-1165.

Federal Energy Management Program

Federal Energy Management Program
Assists federal agencies in reducing energy and water use in their buildings and operations. The program includes technical assistance and help for agencies in using energy-saving performance contracts. Some program materials advise federal agencies on energy-saving measures that are transferable to state and local facilities.
Contact: arun.jhaveri@ee.doe.gov, (206) 553-2152 or cheri.sayer@ee.doe.gov, (206) 553-7838.

Industrial Technologies Programs

Industrial Assessment Centers
Provide free energy and environmental audits at 30 universities across the country for small and medium industries. Industries benefit by receiving recommendations on controlling costs and improving energy efficiency, as well as opportunities for productivity improvements and waste reduction.
Contact: Charles Glaser, (202) 586-1298.

6:8 Align Items on a Page

Relative Importance: 1 2 3 ○ ○

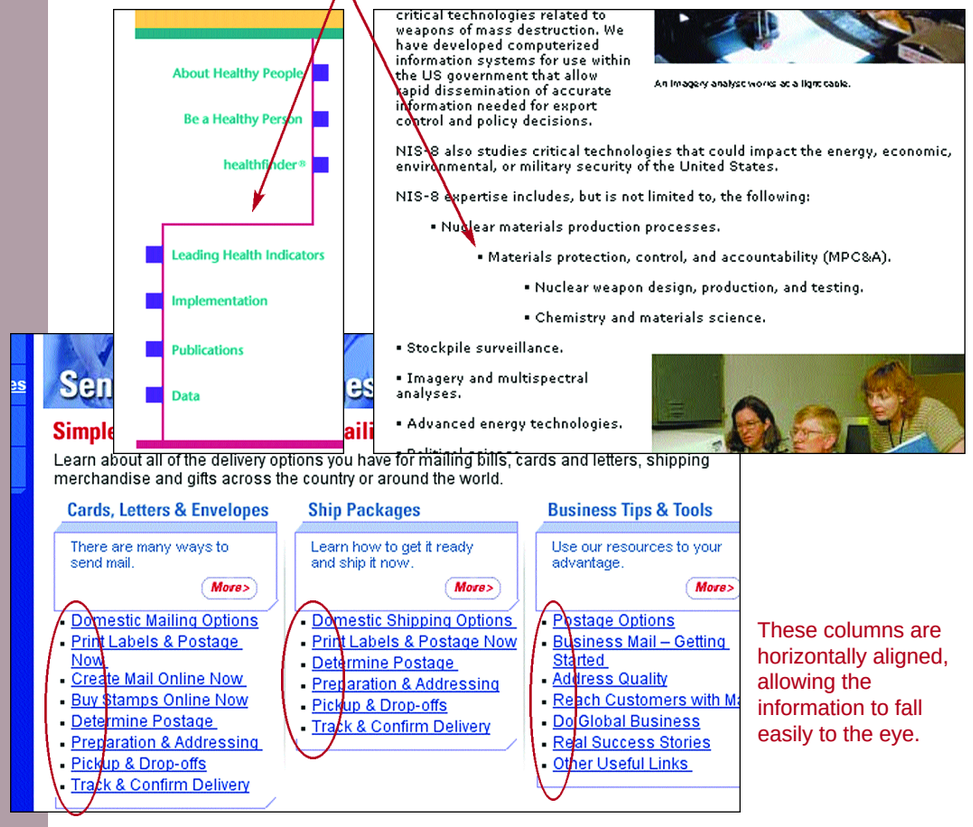
Strength of Evidence: 1 2 3 4 5

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

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

Sources: Ausubel, 1968; Bailey, 1996; Esperet, 1996; Fowler, 1998; Lawless and Kulikowich, 1996; Marcus, Smilonich and Thompson, 1995; Mayer, Dyck and Cook, 1984; Parush, Nadir and Shtub, 1998; Spyridakis, 2000; Trollip and Sales, 1986; Voss, et al., 1986; Williams, 1994; Williams, 2000.

Example: The design of these list columns makes them extremely difficult to scan, and thus will slow users' attempts to find information.



These columns are horizontally aligned, allowing the information to fall easily to the eye.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

6:9 Choose Appropriate Line Lengths

Relative Importance: 1 2 ○ ○ ○

Strength of Evidence: 1 2 3 4 5

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

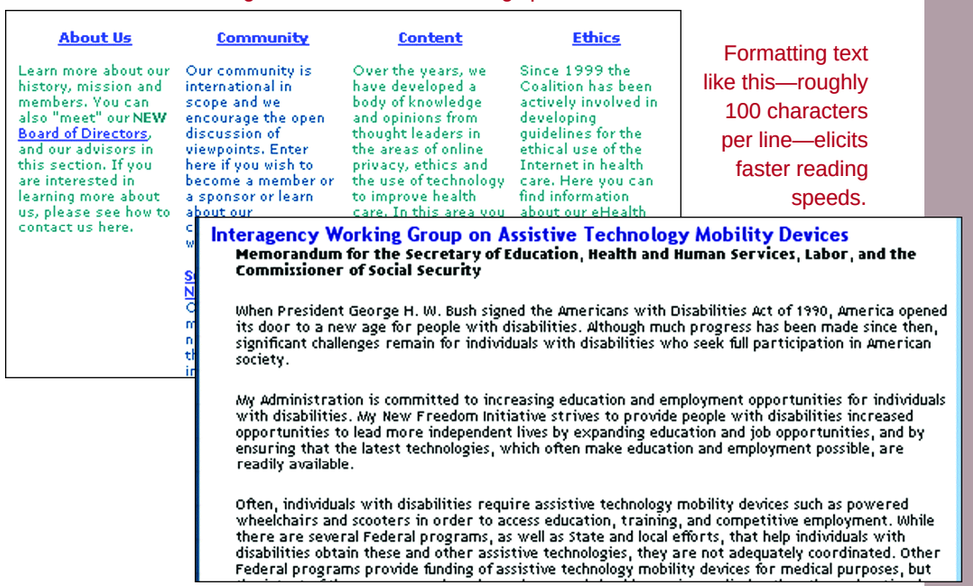
Comments: When designing, first determine if performance or preference is most important. Users read faster when line lengths are long. However, they tend to prefer shorter line lengths, even though reading shorter lines generally slows overall reading speed. One study found that line lengths of about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

Sources: Duchnicky and Kolers, 1983; Dyson and Haselgrove, 2000; Dyson and Haselgrove, 2001; Dyson and Kipping, 1998; Evans, 1998; Paterson and Tinker, 1940b; Rehe, 1979; Smith and Mosier, 1986; Tinker and Paterson, 1929; Tullis, 1988; Youngman and Scharff, 1999.

Example: Formatting text into narrow columns with very short line lengths will slow users' reading speeds.



Formatting text like this—roughly 100 characters per line—elicits faster reading speeds.

6:10 Avoid Scroll Stoppers

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

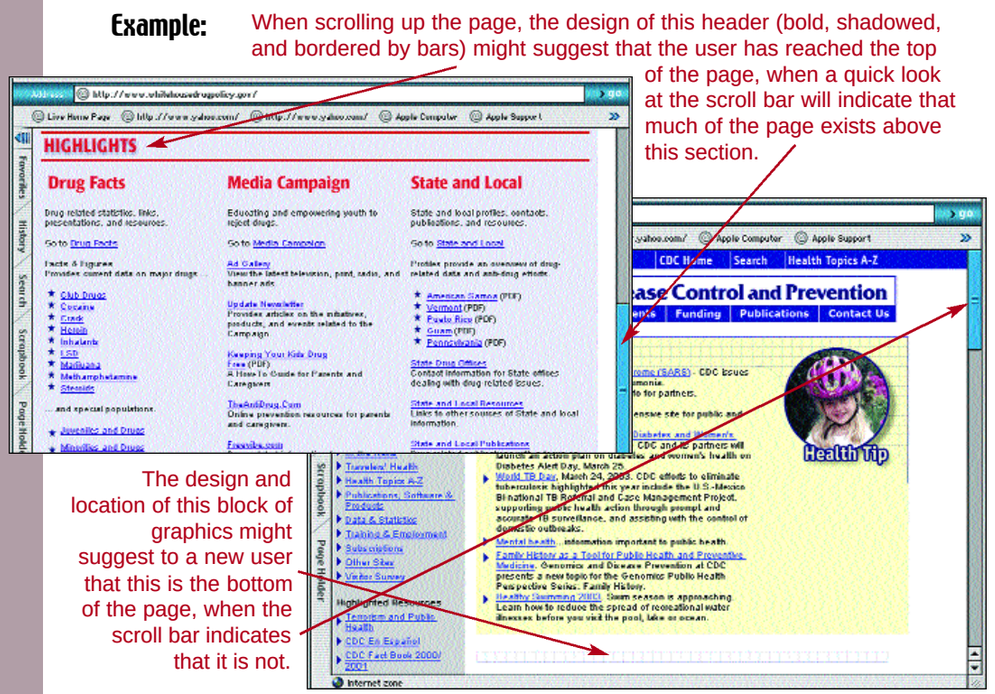
Guideline: Ensure that the location of headings and other page elements does not create the illusion that users have reached the top or bottom of a page when they have not.

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.

Sources: Bailey, Koyani and Nall, 2000; Ivory, Sinha and Hearst, 2000; Marshall, Drapeau and DiSciullo, 2001; Nygren and Allard, 1996; Spool, Klee and Schroeder, 2000; Spool, et al., 1997.

Example:



Navigation

Navigation refers to the method used to find

information within a website. A navigation page is used primarily to help users locate and link to destination pages. A website'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.

Research-Based Web Design & Usability Guidelines

7:1 Provide Feedback on Users' Location

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

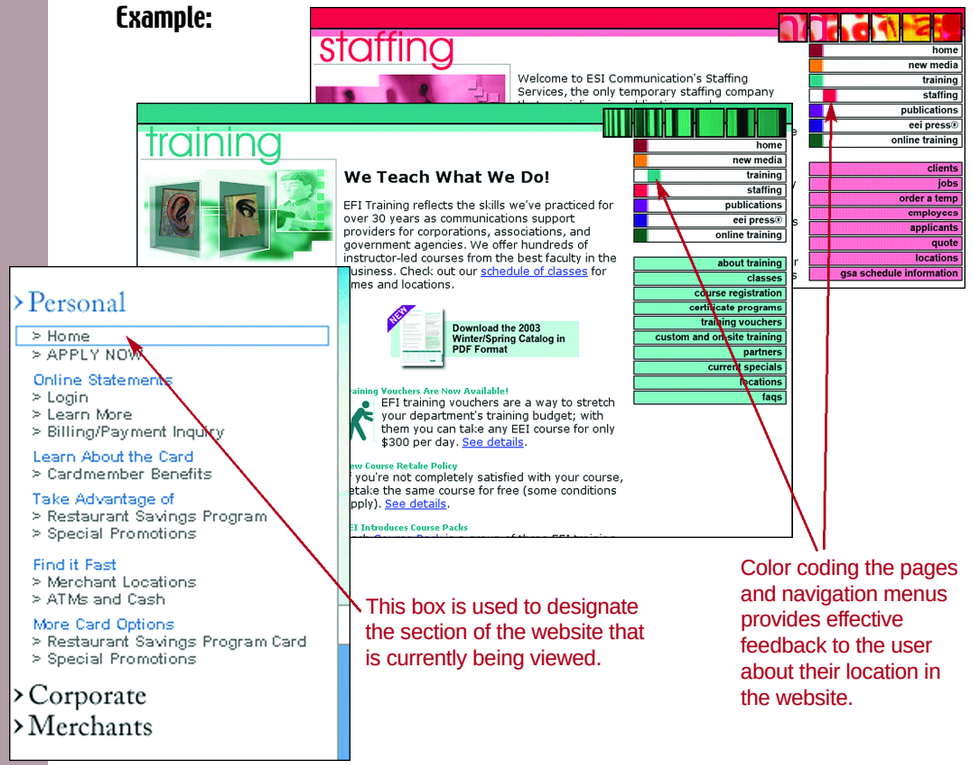
Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 ○ ○ ○

Comments: Feedback provides users with the information they need to understand where they are within the website, 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.

Sources: Evans, 1998; Farkas and Farkas, 2000; IBM, 1999; Lynch and Horton, 2002; Marchionini, 1995; Nielsen and Tahir, 2002; Spool, et al., 1997.

Example:



7:2 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.

Relative Importance: 1 2 3 4 ○

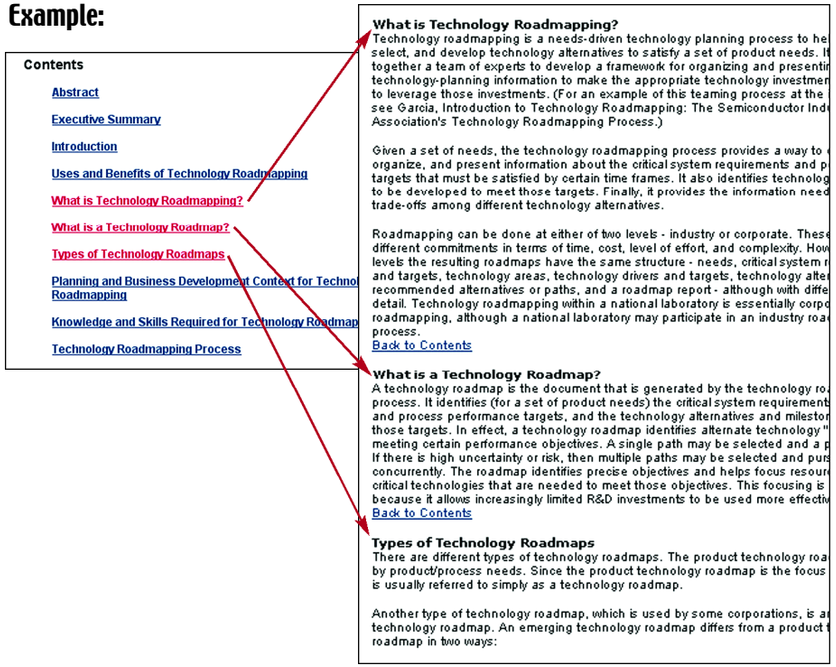
Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Bieber, 1997; Farkas and Farkas, 2000; Haas and Grams, 1998; Levine, 1996; Nall, Koyani and Lafond, 2001; Spool, et al., 1997; Spyridakis, 2000; Williams, 2000; Zimmerman, Slater and Kendall, 2001.

Example:



See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

7:3 Do Not Create Pages with No Navigational Options

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

Relative Importance: 1 2 3 4 5

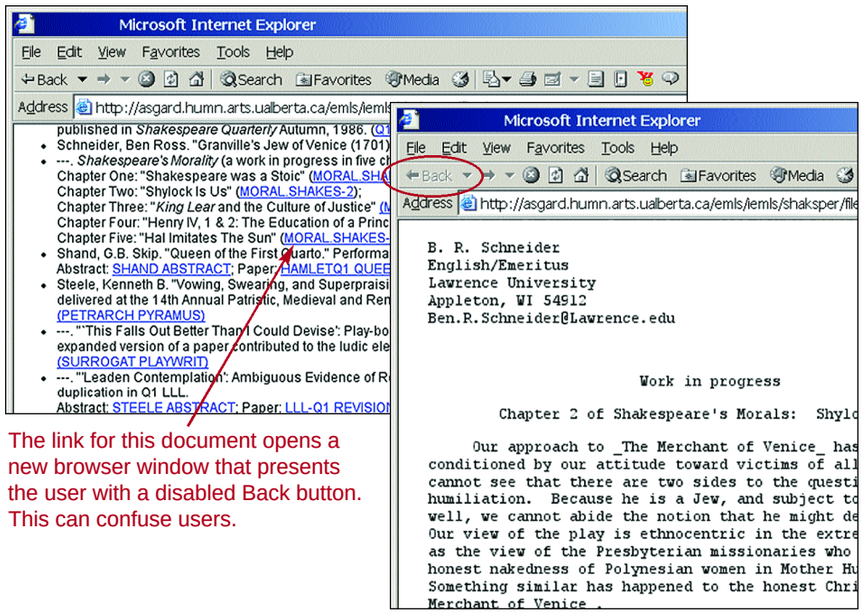
Strength of Evidence: 1 2 5 5 5

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 website, 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.

Sources: Detweiler and Omanson, 1996; Lynch and Horton, 2002; Spool, et al., 1997; Tullis, 2001; Zimmerman, Slater and Kendall, 2001.

Example:



The link for this document opens a new browser window that presents the user with a disabled Back button. This can confuse users.

7:4 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.

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

Comments: Create a common, website-wide navigational scheme to help users learn and understand the structure of your website. 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.

Sources: Bailey, 2000b; Detweiler and Omanson, 1996; Evans, 1998; Farkas and Farkas, 2000; Koyani and Nall, 1999; Lynch and Horton, 2002; Nielsen and Tahir, 2002; Niemela and Saarinen, 2000.

Example:

Navigation elements are grouped (high-level topic areas across the top of the page) and consistently placed across the website.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 5

7:5 Use Descriptive Tab Labels

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 ○ ○

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

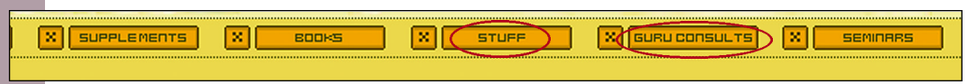
Comments: Users like tabs when they have labels that are descriptive enough to allow error-free selections. When tab labels cannot be made clear because of the lack of space, do not use tabs.

Sources: Allinson and Hammond, 1999; Badre, 2002; Koyani, 2001b.

Example:

These tab labels clearly describe the types of information a user can expect to find on the destination pages.

These tab labels are not as descriptive which leaves the user in doubt about the type of information available on the destination pages.



See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

7:6 Present Tabs Effectively

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 ○ ○

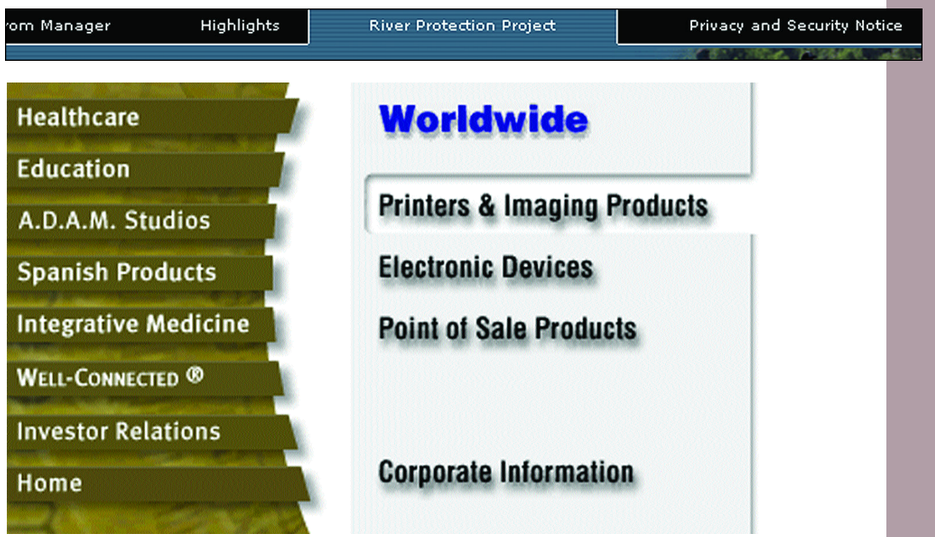
Guideline: Ensure that navigation tabs are located at the top of the page, and look like clickable versions of real-world tabs.

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.

Sources: Bailey, Koyani and Nall, 2000; Kim, 1998.

Example: These clickable tabs look just like tabs found in office filing cabinets.

The design of these navigation tabs provides few clues to suggest that they are clickable until a user mouses-over them. Mousing-over is a slow and inefficient way for users to discover navigation elements.



7:7 Use Site Maps

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 ○

Guideline: Use site maps for websites that have many pages.

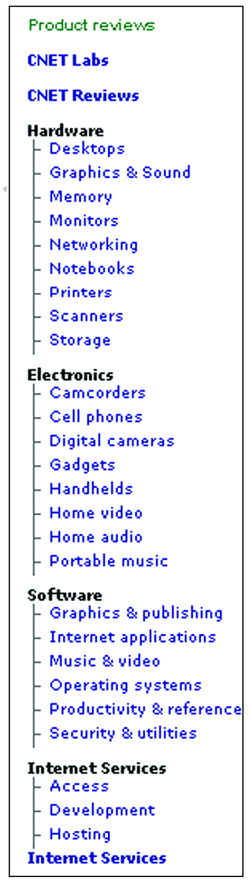
Comments: Site maps provide an overview of the website. They may display the hierarchy of the website, may be designed to resemble a traditional table of contents, or may be a simple index.

Some studies suggest that site maps do not necessarily improve users' mental representations of a website. 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.

Sources: Ashworth and Hamilton, 1997; Billingsley, 1982; Detweiler and Omanson, 1996; Dias and Sousa, 1997; Farkas and Farkas, 2000; Farris, Jones and Elgin, 2001; Kandogan and Shneiderman, 1997; Kim and Hirtle, 1995; McDonald and Stevenson, 1998; McEneaney, 2001; Nielsen, 1996a; Nielsen, 1997a; Nielsen, 1999b; Nielsen, 1999c; Nielsen, 1999d; Stanton, Taylor and Tweedie, 1992; Tullis, 2001; Utting and Yankelovich, 1989.

Example:

This site map effectively presents the site's information hierarchy.



The use of headers, subcategories, and alphabetization make this site map easy to scan.

7:8 Use Appropriate Menu Types

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 ○

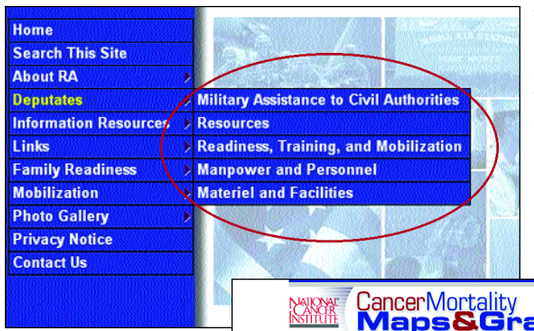
Guideline: Use 'sequential' menus for simple forward-moving tasks, and use 'simultaneous' menus for tasks that would otherwise require numerous uses of the Back button.

Comments: Most websites 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.

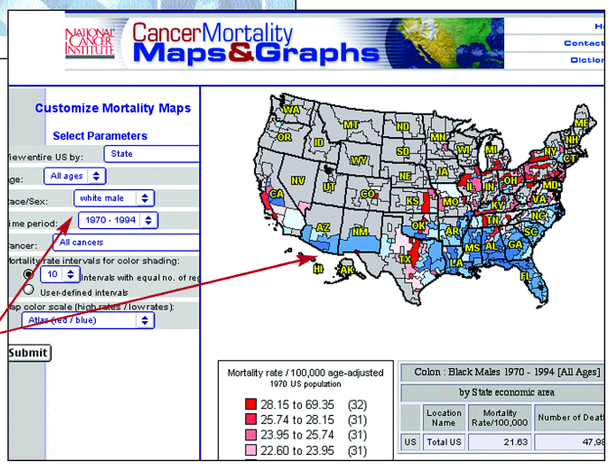
Sources: Card, Moran and Newell, 1980a; Hochheiser and Shneiderman, 2000.

Example:



This is an example of a 'sequential' menu. In this case, mousing-over "Deputates" invokes the circled sub-menu.

This is a good example of when to use 'simultaneous' menus. The user can repetitively manipulate the many variables shown in the left panel and view the results on the map in the right panel without having to use the Back button.



See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

7:9 Keep Navigation-only Pages Short

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

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.

Sources: Piolat, Roussey and Thunin, 1998; Schwarz, Beldie and Pastoor, 1983; Zaphiris, 2000.

Example: Users can view all of the information on this navigation page without scrolling.

7:10 Use 'Glosses' to Assist Navigation

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

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

Comments: 'Glosses' are short phrases of information that pop-up 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.

Sources: Evans, 1998; Farkas and Farkas, 2000; Zellweger, et al., 2000.

Example:

When a user places his or her mouse pointer over one of these links ("News," "Information," etc.), a 'gloss' appears to the right that provides information about the content contained under that particular link.

When a user mouses-over the "Office of Trust Records (OTR)" link, the circled text appears.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 5

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 website 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.

8:1 Eliminate Horizontal Scrolling

Relative Importance: 1 2 3 4 5

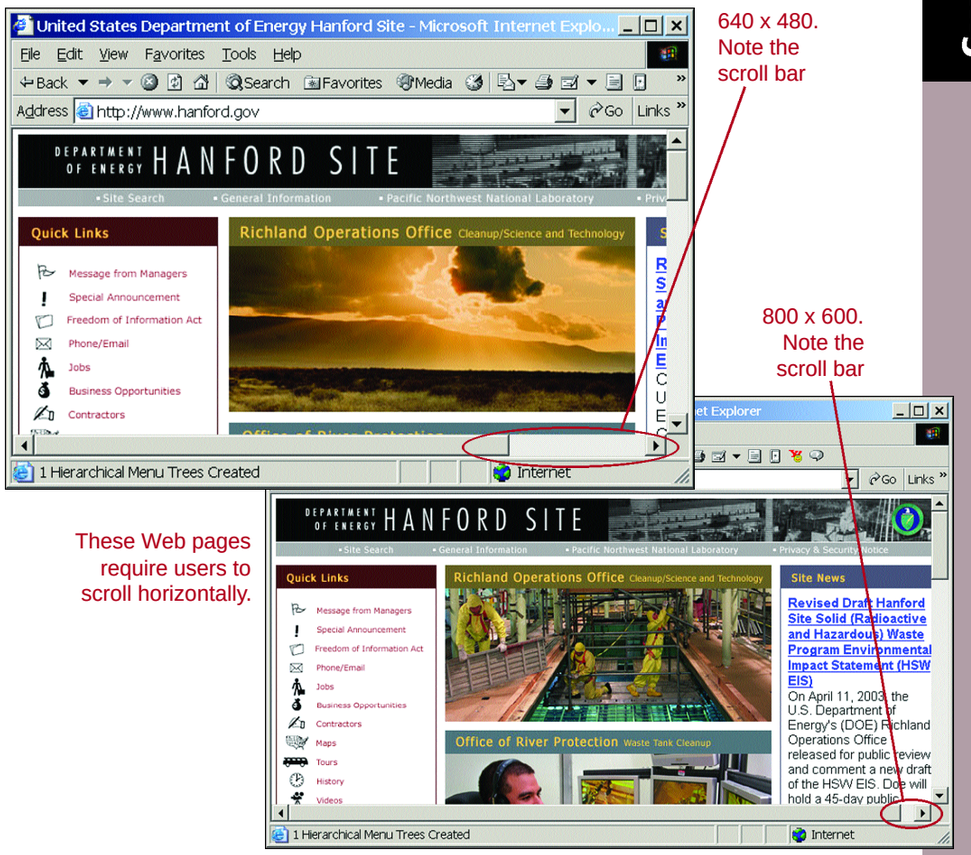
Strength of Evidence: 1 2 3 4

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.

Sources: Bernard and Larsen, 2001; Lynch and Horton, 2002; Nielsen and Tahir, 2002; Spyridakis, 2000; Williams, 2000.

Example:



See page xxi for detailed descriptions of the rating scales
1 2 3 4

8:2 Use Scrolling Pages For Reading Comprehension

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 ○

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.

Sources: Byrne, John, et al., 1999; Campbell and Maglio, 1999; Piolat, Roussey and Thunin, 1998; Schwarz, Beldie and Pastoor, 1983; Spool, et al., 1997; Spyridakis, 2000.

8:3 Use Paging Rather Than Scrolling

Relative Importance: 1 2 ○ ○ ○

Strength of Evidence: 1 2 3 4 ○

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.

Sources: Nielsen, 1997e; Piolat, Roussey and Thunin, 1998; Schwarz, Beldie and Pastoor, 1983.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

8:4 Scroll Fewer Screenfuls

Relative Importance: 1 2 ○ ○ ○

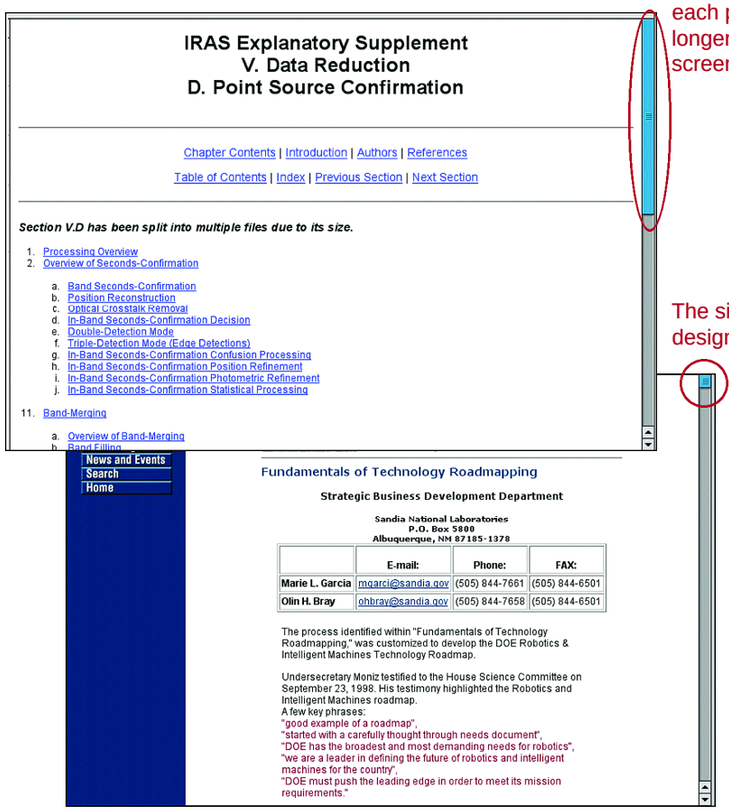
Strength of Evidence: 1 2 ○ ○ ○

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

Comments: For many websites, 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.

Sources: Detweiler and Omanson, 1996; Lynch and Horton, 2002; Nielsen, 1996a; Spool, et al., 1997; Spyridakis, 2000.

Example: Good design of a long, content-rich document. This single document is divided into numerous sections, resulting in each page being no longer than four screenfuls.



The single-page design of this document requires users to scroll more than twenty-seven screenfuls.

8:5 Facilitate Rapid Scrolling

Relative Importance: 1 ○ ○ ○ ○

Strength of Evidence: 1 2 3 ○ ○

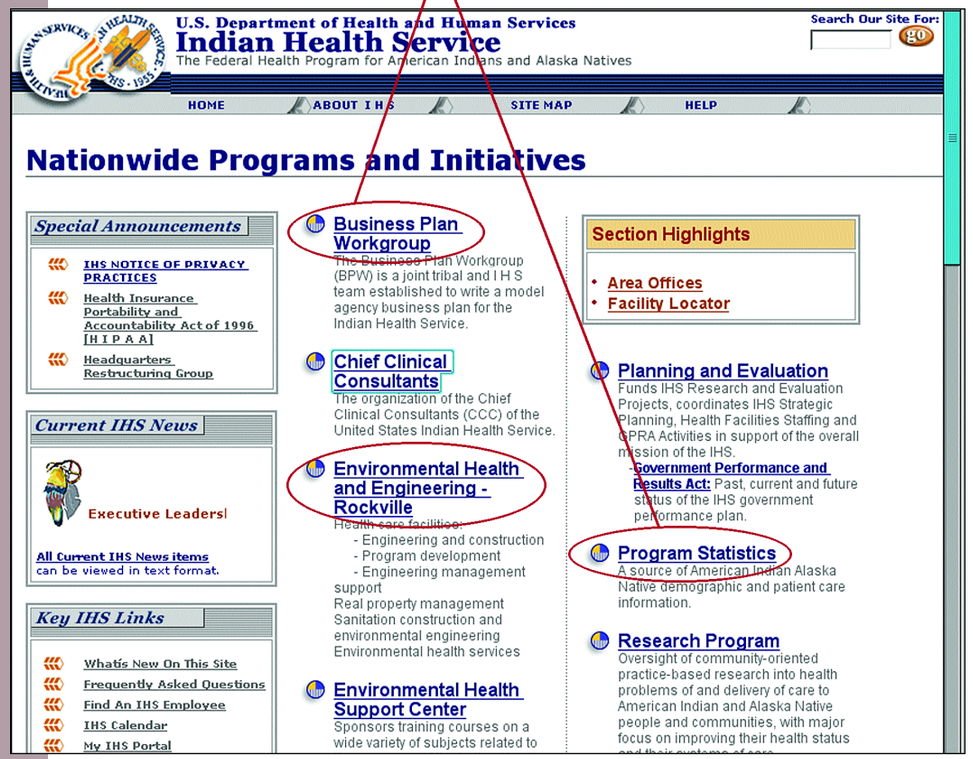
Guideline: Facilitate fast scrolling by highlighting major items.

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.

Sources: Bailey, Koyani and Nall, 2000.

Example:

Bold, large text and an accompanying graphic are effectively used to draw the user's attention during fast scrolling.



See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

Headings, Titles, and Labels

Most users spend a considerable amount of time scanning rather than reading information on websites. 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.

9:1 Use Clear Category Labels

Relative Importance: 1 2 3 4 5

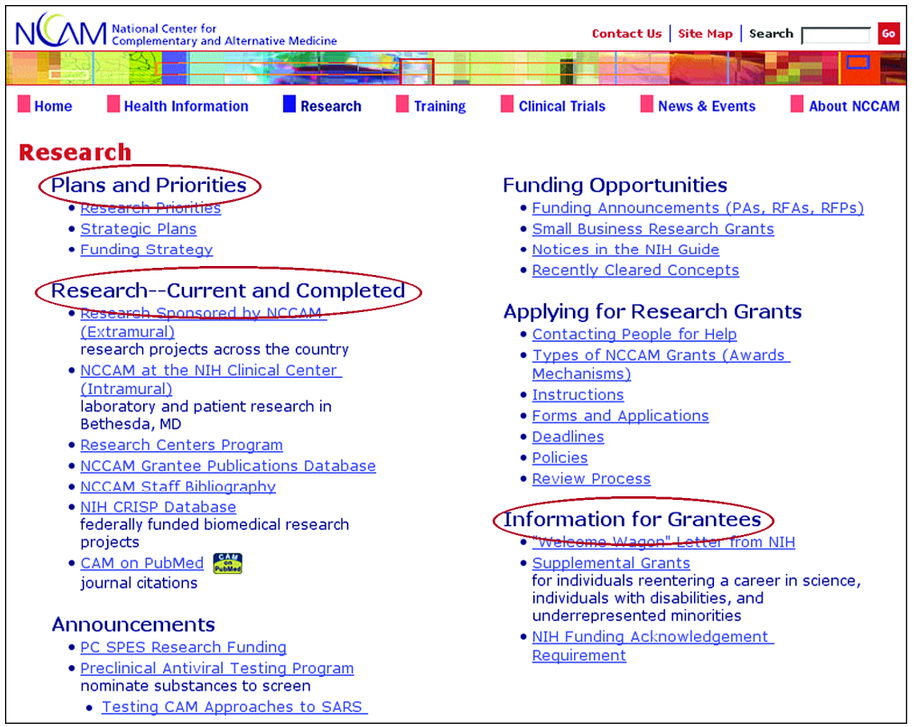
Strength of Evidence: 1 2 3 4 ○

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.

Sources: Evans, 1998; Landesman and Schroeder, 2000; Mahajan and Shneiderman, 1997; Marshall, Drapeau and DiSciullo, 2001; Nall, Koyani and Lafond, 2001; Spyridakis, 2000; Zimmerman, et al., 2002.

Example: These labels are clear and distinct, allowing users to distinguish paths quickly.



See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

9:2 Use Unique and Descriptive Headings

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 ○ ○

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 websites. 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 extensive usability testing and other methods.

Sources: Bailey, Koyani and Nall, 2000; Gerhardt-Powals, 1996; Morkes and Nielsen, 1998; Williams, 2000.

Example: These headings are well-designed—they are unique from one another and descriptive of the information to which they link.

Alphabetical List of all Topics

Air
Acid Rain, Global Warming, Emissions...

Cleanup
Brownfields, Superfund, Corrective Action...

Compliance & Enforcement
Complaints, Compliance Assistance...

Economics
Cost Benefit Analysis, Grants, Financing...

Ecosystems
Wetland, Watersheds, Endangered Species...

Emergencies
Reporting, Oil Spills, Accidents...

Environmental Management
Smart Growth, Risk Mgmt, Environmental Indicators...

Human Health
Children's Health, Exposure, Risk Assessment, Healthy School Environments ...

Industry
Small Business, Permits, Reporting...

International Cooperation
Border Issues, Technical Assistance...

Pesticides
Insecticides, Registration, Food Safety...

Pollutants/Toxics
Lead, Dioxins, Chemicals, Radiation...

Pollution Prevention
Recycling, Conservation, Energy...

Research
Publications, Laboratories, Models...

Treatment & Control
Treatment Technologies, Pretreatment..

Wastes
Hazardous Wastes, Landfills, Treatment...

Water
Wastewater, Drinking Water, Ground Water...

9:3 Use Descriptive Row and Column Headings

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

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Bransford and Johnson, 1972; Chisholm, Vanderheiden and Jacobs, 1999d; Detweiler and Omanson, 1996; Lynch and Horton, 2002; United States Government, 1998; Wright, 1980.

Example: An example of good table heading design. The non-expert user will have no problem understanding these descriptive row and column headers.

Connecticut Business Starts Index 2002

Click on the 2002 Month/Year Column Header for a Monthly Detailed Report of Starts

	Jan-2002	Feb-2002	Mar-2002	Apr-2002	May-2002	Jun-2002	Jul-2002	Aug-2002	Sep-2002	Oct-2002	Nov-2002	Dec-2
# New Starts	2398	2176	2384	2374	2412	2147	2016	2042	1987	2188	1959	2
% Change (MM)	12.3	-10.2	8.7	-.42	1.6	-11.3	-6.5	1.3	-2.8	9.6	-12.2	1
% Change (Y/Y)	10.2	16.7	12.3	12.3	12.7	7.3	10.5	2.7	21.6	31.8	8.8	
Year to Date	2398	4574	6958	9332	11744	13891	15907	17949	19936	22134	24093	26
Prior Year	2154	3968	6059	8140	10247	12238	14043	16029	17585	19083	20995	23
% Change	10.2	13.2	12.9	12.0	12.7	11.9	11.7	10.7	11.0	13.0	12.9	1

An example of poor table heading design. The non-expert user will have little idea what is meant by "R.", "J.", and "Pt." Unless space constraints dictate otherwise, always use row and column headers that are descriptive enough to be understood by non-expert users.

2002 TERM OPINIONS OF THE COURT

R-	Date	Docket	Name	J.	Pt.
35	03/26	01-1325	Brown v. Legal Foundation of Wash.	JS	538/1
34	03/25	01-1862	Woodford v. Garceau	T	538/1
33	03/25	01-1269	Cuyahoga Falls v. Buckeye Community Hope Foundation	O	538/1
32	03/10	01-963	Norfolk & Western R. Co. v. Ayers	G	538/1
31	03/10	01-1572	Cook County v. United States ex rel. Chandler	DS	538/1
30	03/05	01-729	Smith v. Doe	K	538/1

9:4 Use Descriptive Headings Liberally

Guideline: Use descriptive headings liberally throughout a website.

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 5

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.

Sources: Bailey, Koyani and Nall, 2000; Evans, 1998; Flower, Hayes and Swarts, 1983; Gerhardt-Powals, 1996; Hartley and Trueman, 1983; Ivory and Hearst, 2002; Ivory, Sinha and Hearst, 2000; Lorch and Lorch, 1995; Mayer, Dyck and Cook, 1984; Meyer, 1984; Morkes and Nielsen, 1998; Morrell, et al., 2002; Murphy and Mitchell, 1986; Nielsen, 1999c; Nielsen, 1999d; Schultz and Spyridakis, 2002; Spyridakis, 1989; Spyridakis, 2000; Zimmerman and Prickett, 2000.

Example:

Spending time during the design process to ensure that the site contains many carefully written headings and sub-headings will save users time as they rapidly locate the information for which they are searching.

- **Common Cancers**
  - Bladder Cancer
  - Breast Cancer
  - Colon Cancer
  - Endometrial Cancer
  - Head and Neck Cancer
  - Leukemia
- **Childhood/Pediatric Cancers**
  - Childhood Cancers Home Page
- **Cancers by Body Location/System**
  - AIDS-Related
  - Bone
  - Brain
  - Breast
  - Digestive/Gastrointestinal
  - Endocrine
  - Eye
  - Genitourinary
  - Germ Cell
  - Gynecologic
  - Head and Neck

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

9:5 Provide Descriptive Page Titles

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 ○ ○ ○

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

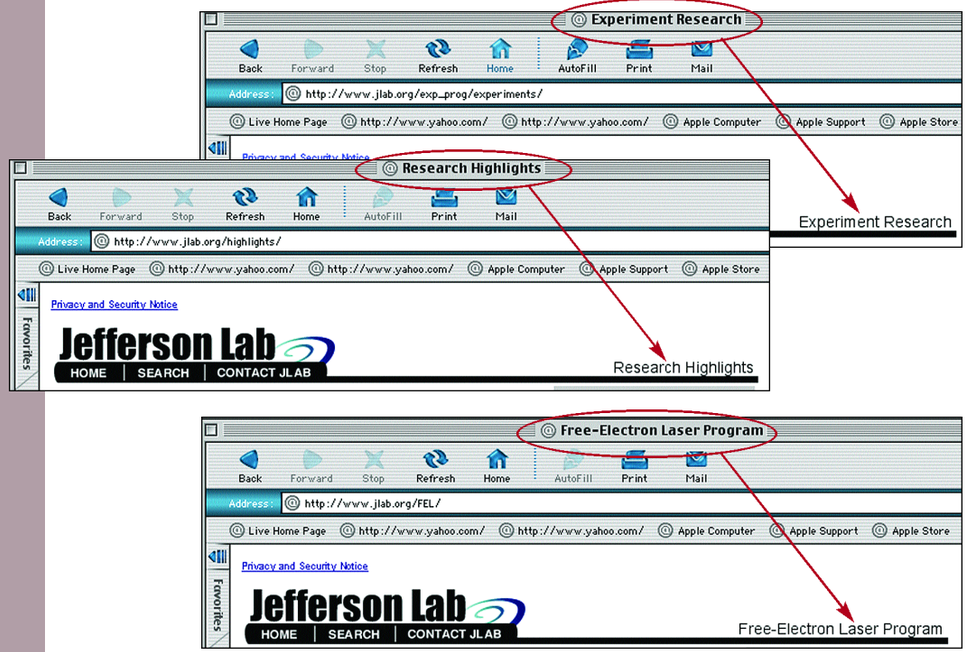
Comments: Title refers to the text that is in the browser title bar (this is the bar found at the very top of the browser screen). Titles are used by search engines to identify pages. If two or more pages have the same title, they cannot be differentiated by users or the Favorites capability of the browser.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

Sources: Evans, 1998; Levine, 1996; Nielsen and Tahir, 2002; Spyridakis, 2000; Williams, 2000.

Example: These titles are unique, concise, and consistent with the titles in the content area.



9:6 Highlight Critical Data

Relative Importance: 1 2 3 ○ ○

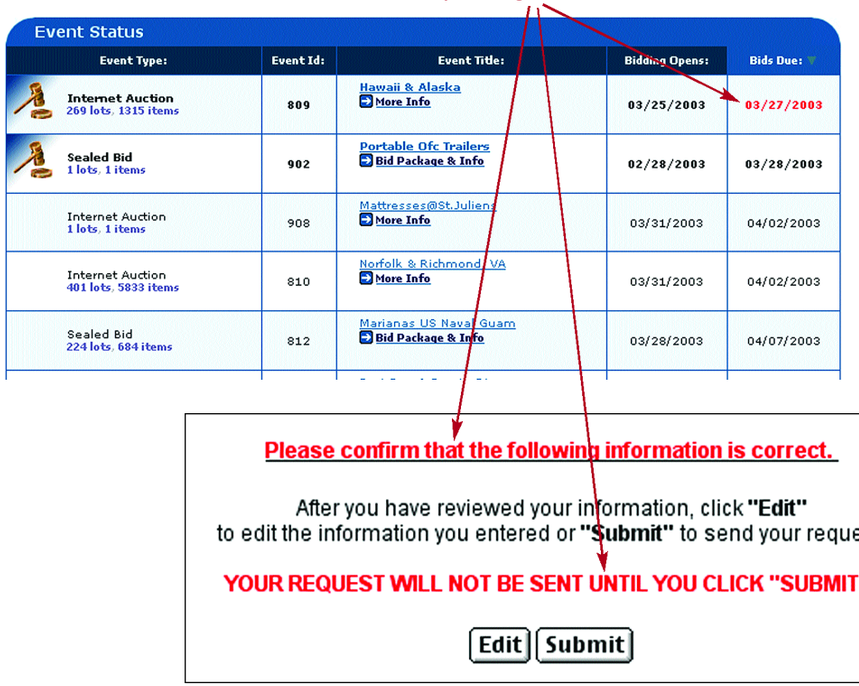
Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Ahlstrom and Longo, 2001; Engel and Granda, 1975; Levine, 1996; Myers, 1985.

Example: Formatting this text in underline, bold, and red draws attention to the most pressing deadline and instructions.



See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

9:7 Provide Users with Good Ways to Reduce Options

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

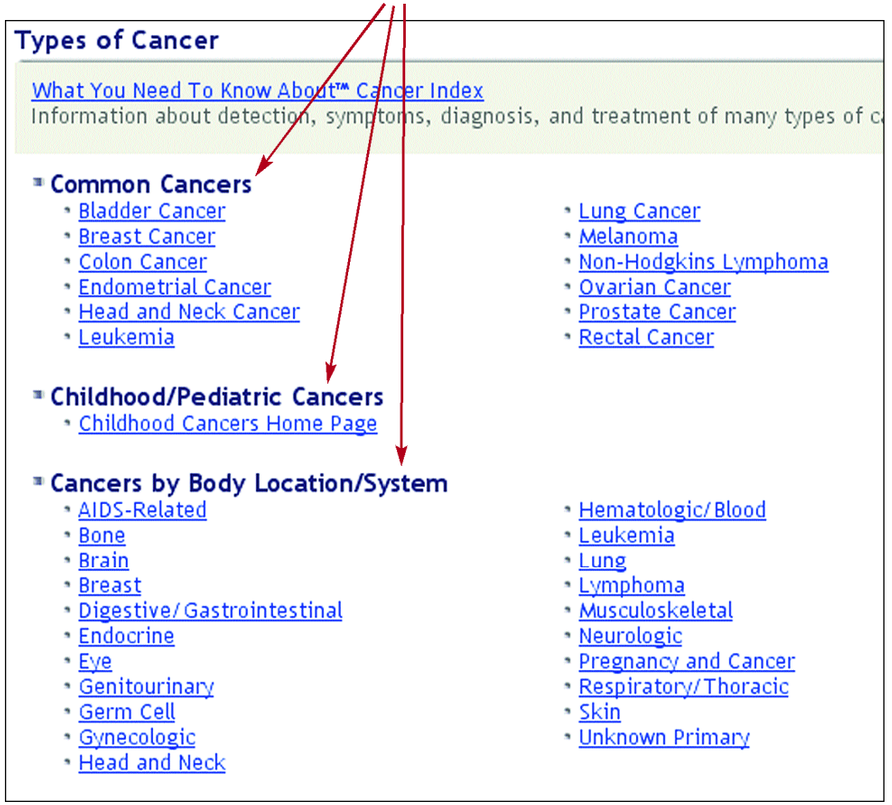
Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

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.

Sources: Bailey, Koyani and Nall, 2000.

Example: By providing three different options for selecting desired information, users can select the one most important to them.



See page xxi for detailed descriptions of the rating scales 1 2 3 4 5

9:8 Use Headings in the Appropriate HTML Order

Guideline: Use headings in the appropriate HTML order.

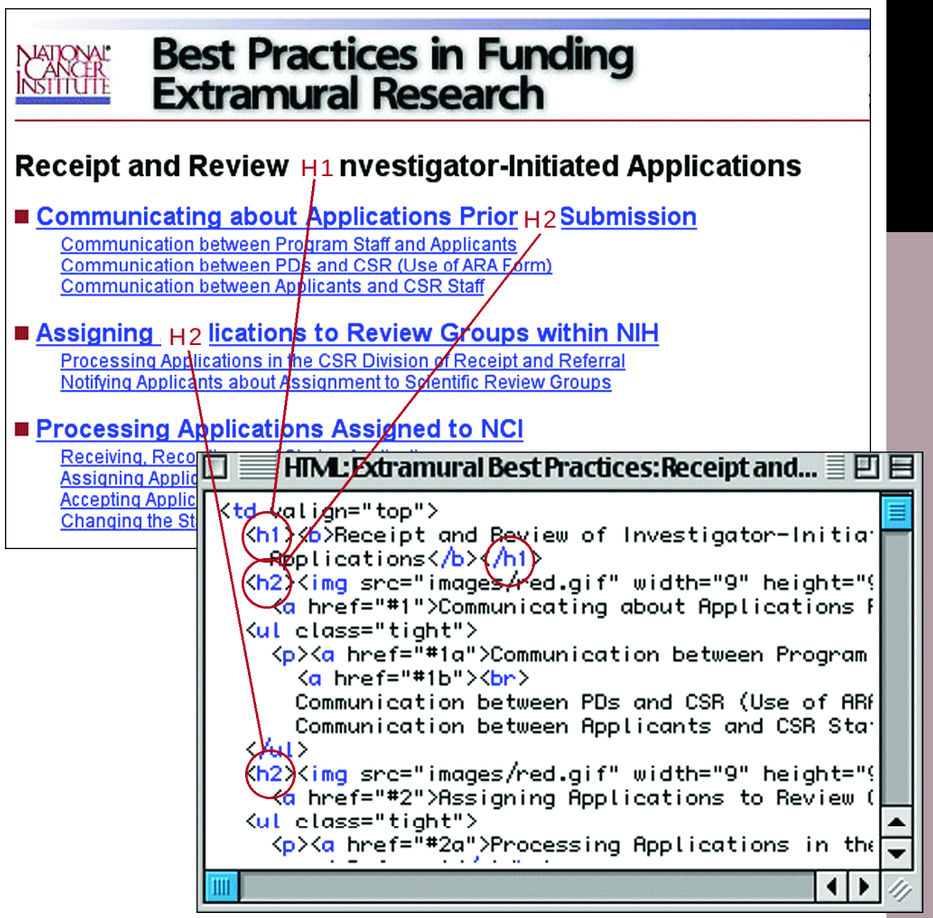
Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

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.

Sources: Detweiler and Omanson, 1996; Spool, et al., 1997.

Example:



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 clickability 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.

10:1 Provide Consistent Clickability Cues

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

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4

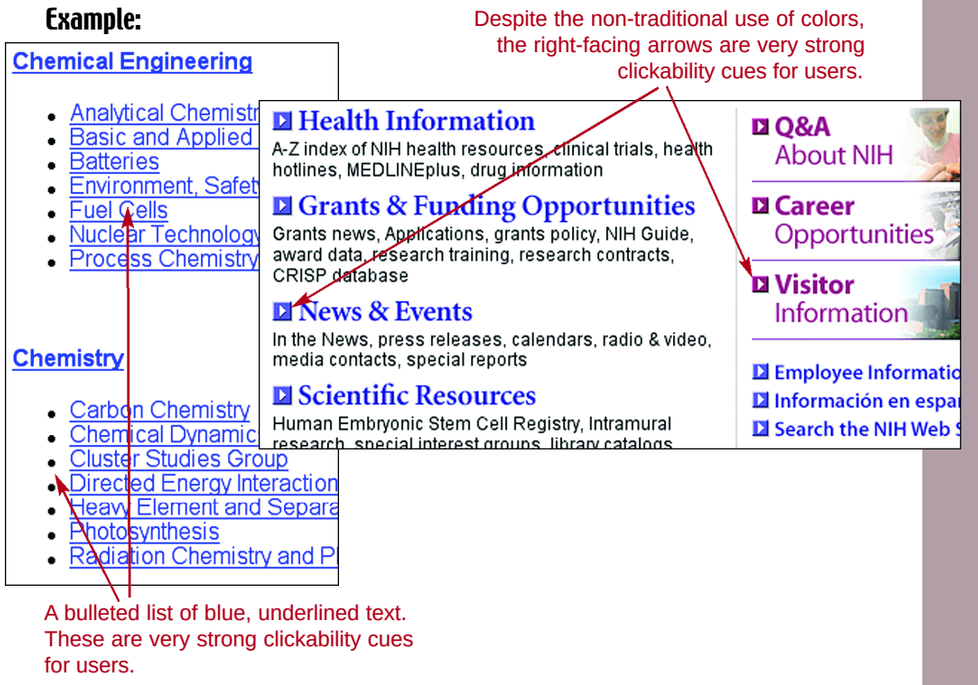
Comments: Users should not be expected to move the cursor around a website ('minesweeping') to determine what is clickable. Using the eyes to quickly survey the options is much faster than 'minesweeping.' Similarly, relying on mouseovers to designate links can confuse newer users, and slow all users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

Sources: Bailey, 2000b; Bailey, Koyani and Nall, 2000; Farkas and Farkas, 2000; Lynch and Horton, 2002; Tullis, 2001.

Example:



Research-Based Web Design & Usability Guidelines

10:2 Avoid Misleading Cues to Click

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 ○ ○ ○

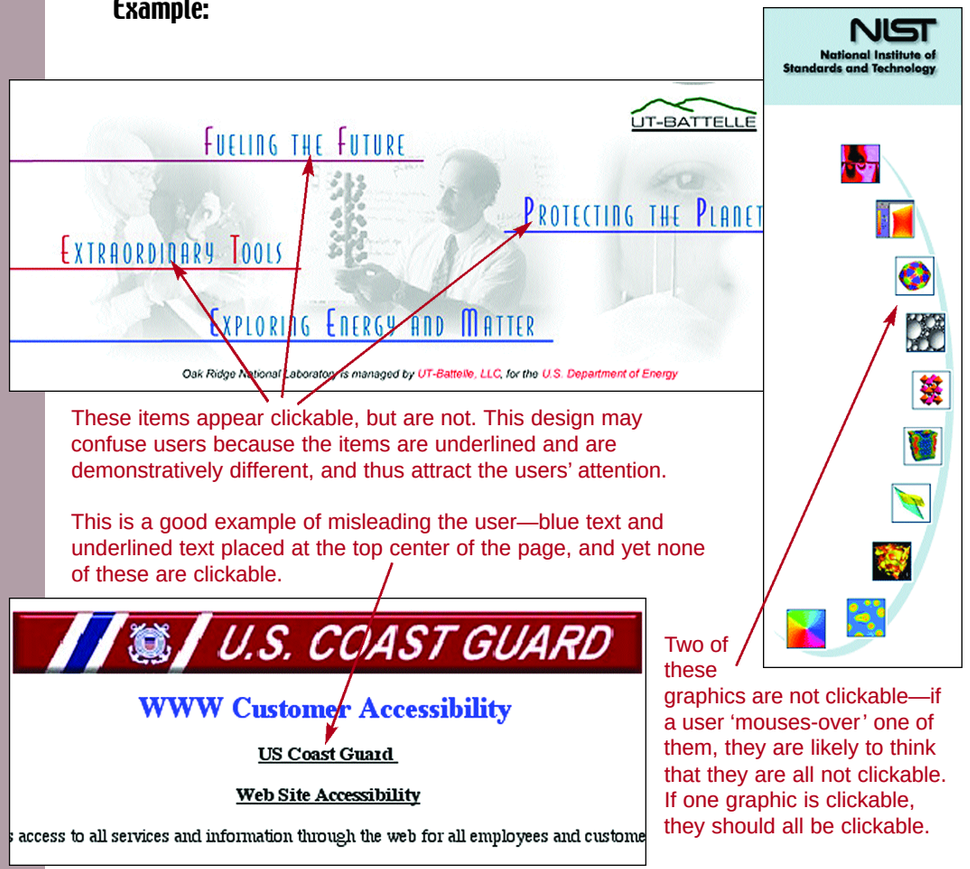
Guideline: Ensure that items that are not clickable do not have characteristics that suggest that they are clickable.

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.

Sources: Bailey, Koyani and Nall, 2000; Evans, 1998; Spool, et al., 1997.

Example:



These items appear clickable, but are not. This design may confuse users because the items are underlined and are demonstratively different, and thus attract the users' attention.

This is a good example of misleading the user—blue text and underlined text placed at the top center of the page, and yet none of these are clickable.

Two of these graphics are not clickable—if a user 'mouses-over' one of them, they are likely to think that they are all not clickable. If one graphic is clickable, they should all be clickable.

10:3 Use Text for Links

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 ○

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.

Sources: Farkas and Farkas, 2000; Mobrand and Spyridakis, 2002; Nielsen, 2000; Spool, et al., 1997.

Example:

The meaning of these three images are fairly clear, even if the accompanying text was not present.

The meanings of these two image links are not obvious at first glance.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

10:4 Use Meaningful Link Labels

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 ○

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

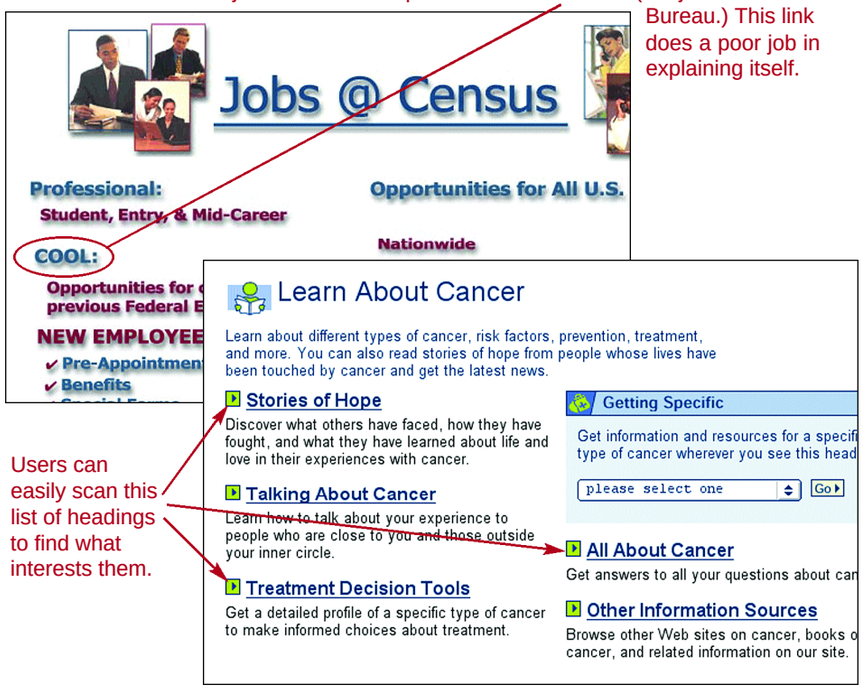
Comments: To avoid user confusion, use link labels that clearly differentiate one link from another. Users should be able to look at each link and learn something about the link's destination. Using terms like "Click Here" can be counterproductive.

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.

Sources: Bailey, Koyani and Nall, 2000; Coney and Steehouder, 2000; Evans, 1998; Farkas and Farkas, 2000; IEEE; Larson and Czerwinski, 1998; Miller and Remington, 2000; Mobrand and Spyridakis, 2002; Nielsen and Tahir, 2002; Spool, et al., 1997; Spyridakis, 2000.

Example:

'COOL' refers to an application that allows users to search for all jobs within the Department of Commerce (not just the Census Bureau.) This link does a poor job in explaining itself.



Users can easily scan this list of headings to find what interests them.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

10:5 Match Link Names with Their Destination Pages

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 ○

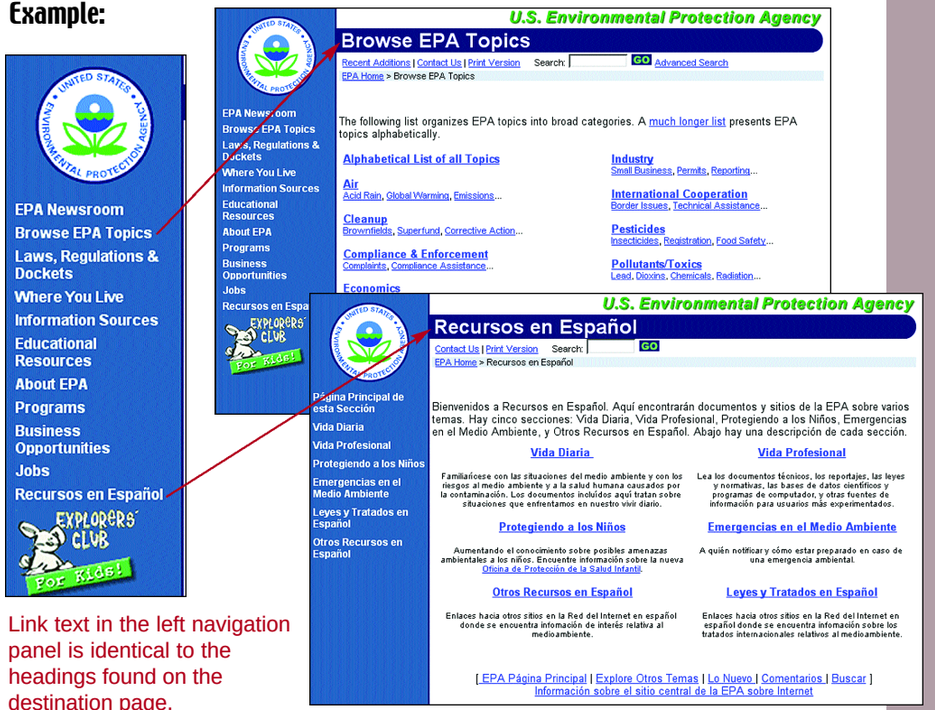
Guideline: Make the link text consistent with the title or headings on the destination (i.e., target) page.

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."

Sources: Bailey, Koyani and Nall, 2000; Levine, 1996; Mobrand and Spyridakis, 2002.

Example:



Link text in the left navigation panel is identical to the headings found on the destination page.

10:6 Ensure that Embedded Links are Descriptive

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

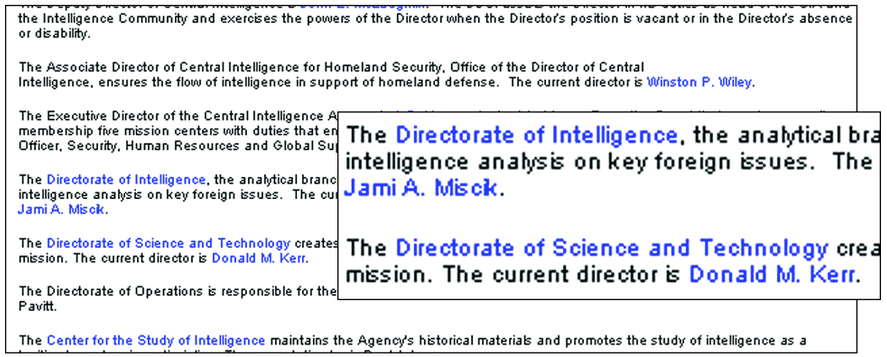
Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

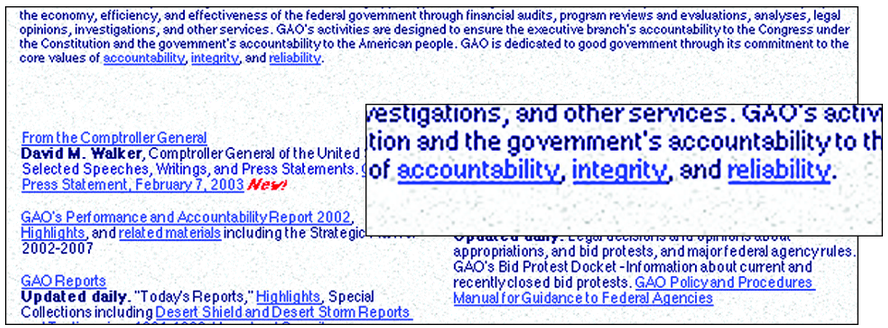
Comments: Users tend to ignore the text that surrounds each embedded link; therefore do not create embedded links that use the surrounding text to add clues about the link's destination.

Sources: Bailey, Koyani and Nall, 2000; Bernard and Hull, 2002; Card, et al., 2001; Chi, Pirolli and Pitkow, 2000; Evans, 1998; Farkas and Farkas, 2000; Mobrand and Spyridakis, 2002; Sawyer and Schroeder, 2000; Spool, et al., 1997.

Example: These embedded links are well designed—because the entire organization name is a link, the user does not have to read the surrounding text to understand the destination of the embedded link.



In this example, the user must read the surrounding text to gain clues as to the link's destination. In many cases, users will not read that text.



See page xxi for detailed descriptions of the rating scales
1 2 3 4 5

10:7 Repeat Important Links

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

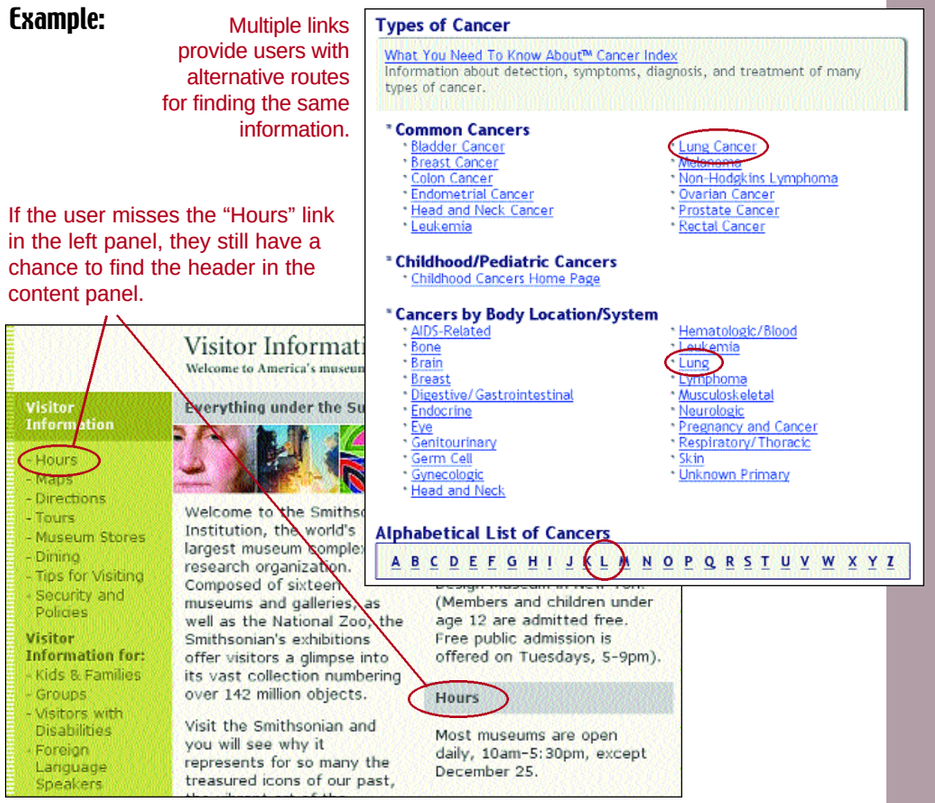
Guideline: Ensure that important content can be accessed from more than one link.

Comments: Establishing more than one way to access the exact same information can help some users find what they need. When certain information is critical to the success of the website, 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.

Sources: Bernard, Hull and Drake, 2001; Detweiler and Omanson, 1996; Ivory, Sinha and Hearst, 2000; Ivory, Sinha and Hearst, 2001; Levine, 1996; Nall, Koyani and Lafond, 2001; Nielsen and Tahir, 2002; Spain, 1999; Spool, Klee and Schroeder, 2000.

Example: Multiple links provide users with alternative routes for finding the same information.

If the user misses the "Hours" link in the left panel, they still have a chance to find the header in the content panel.



10:8 Designate Used Links

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 ○ ○ ○

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 website 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.

Sources: Evans, 1998; Nielsen and Tahir, 2002; Nielsen, 1996a; Nielsen, 1999b; Nielsen, 1999c; Spool, et al., 1997; Tullis, 2001.

Example:

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

10:9 Link to Related Content

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 ○ ○ ○

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

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

Sources: Koyani and Nall, 1999.

Example:

10:10 Link to Supportive Information

Relative Importance: 1 2 3 4 5

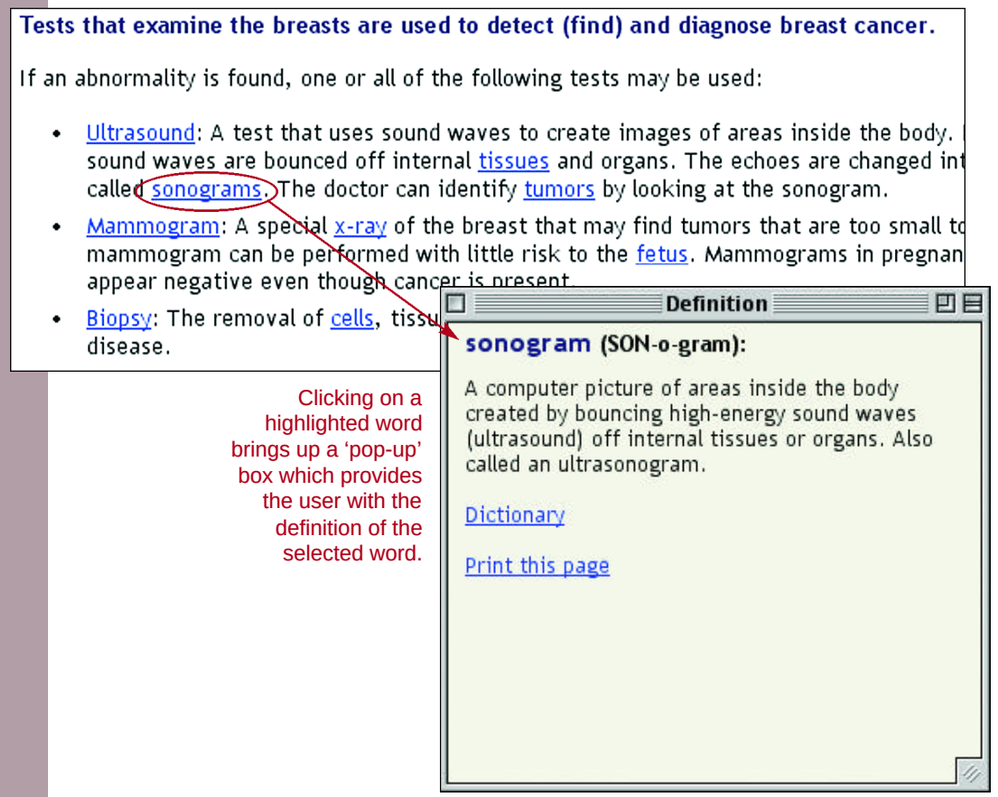
Strength of Evidence: 1 2 3 4 5

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 website. For example, provide links to a dictionary, glossary definitions, and sections dedicated to providing more information.

Sources: Farkas and Farkas, 2000; Levine, 1996; Morrell, et al., 2002; Zimmerman and Prickett, 2000.

Example:



Clicking on a highlighted word brings up a 'pop-up' box which provides the user with the definition of the selected word.

See page xxi for detailed descriptions of the rating scales 1 2 3 4

10:11 Use Appropriate Text Link Lengths

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

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.

Sources: Card, et al., 2001; Chi, Pirolli and Pitkow, 2000; Evans, 1998; Levine, 1996; Nielsen and Tahir, 2002; Nielsen, 2000; Sawyer and Schroeder, 2000; Spool, et al., 1997.

Example:

Text links should not wrap to a second line. They should be used to highlight a particular word or short phrase in a sentence, not an entire sentence.

Whenever possible, text links should only cover one line.

10:12 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 website.

Relative Importance: 1 2 3 4 5 — 3

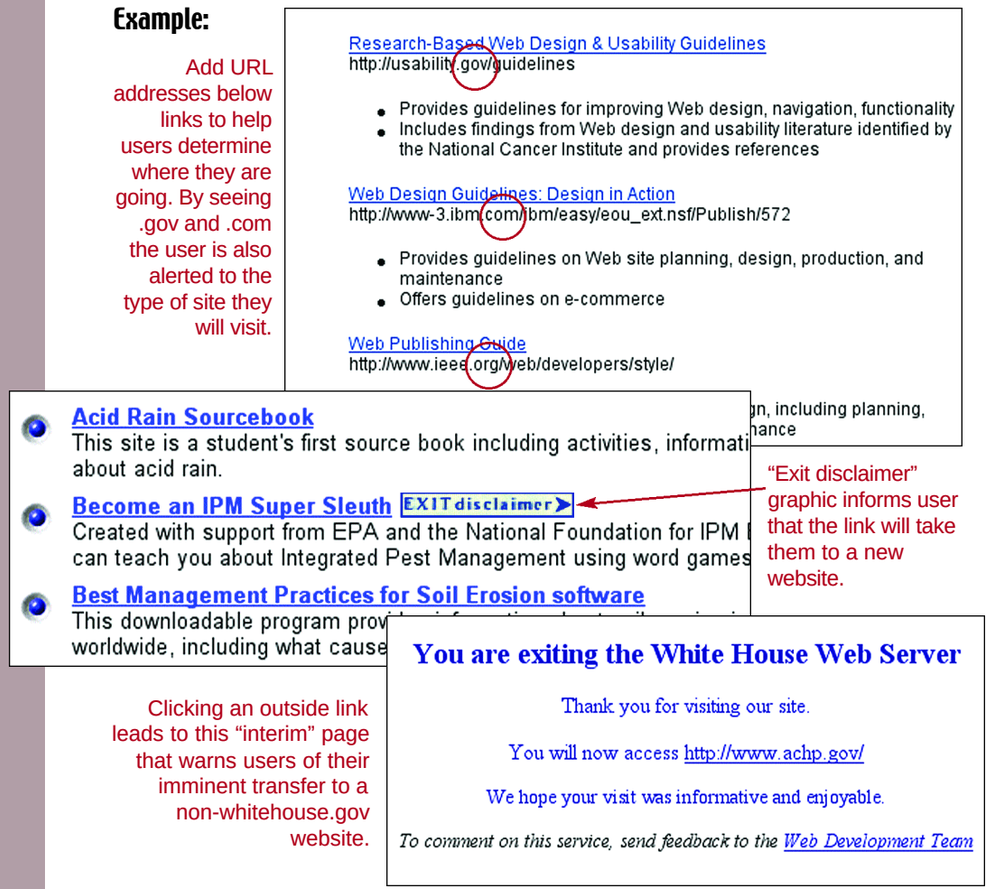
Strength of Evidence: 1 2 3 4 5 — 2

Comments: One study showed that users tend to assume that links will take them to another page within the same website. 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.

Sources: Nall, Koyani and Lafond, 2001; Nielsen and Tahir, 2002; Spool, et al., 1997.

Example:

Add URL addresses below links to help users determine where they are going. By seeing .gov and .com the user is also alerted to the type of site they will visit.



"Exit disclaimer" graphic informs user that the link will take them to a new website.

Clicking an outside link leads to this "interim" page that warns users of their imminent transfer to a non-whitehouse.gov website.

10:13 Use 'Pointing-and-Clicking'

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

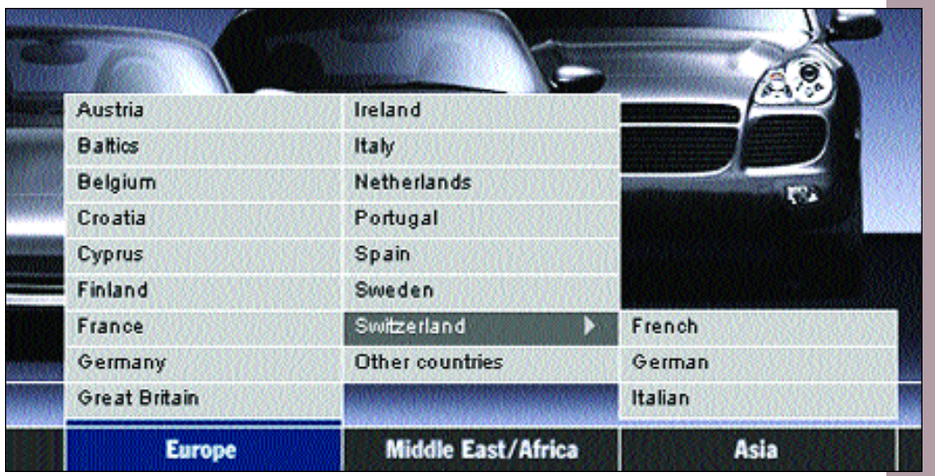
Relative Importance: 1 2 3 4 5 — 3

Strength of Evidence: 1 2 3 4 5 — 3

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.

Sources: Chaparro, Minnaert and Phipps, 2000.

Example:



This site relies on users to 'mouse-over' the main links (shown on the bottom of the page) to reveal the sub-menu links (shown extending to the right in gray). The use of this 'mouseover' method is slower than 'pointing-and-clicking.'

See page xxi for detailed descriptions of the rating scales
1 2 3 4 5

10:14 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.

Relative Importance: 1 2 3 ○ ○

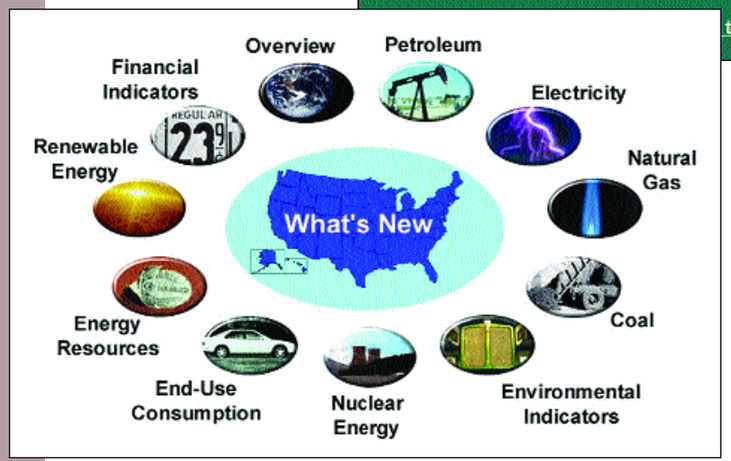
Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Detweiler and Omanson, 1996; Levine, 1996; Lim and Wogalter, 2000.

Example:

Dramatically different colors delineate clickable regions.



The use of white space between clickable regions in this image map define the boundaries of each individual "hot" area.

Text Appearance

There are several issues related to text

characteristics that can help ensure a website 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.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

Research-Based Web Design & Usability Guidelines

11:1 Use Black Text on Plain, High-Contrast Backgrounds

Relative Importance: 1 2 3 4 5

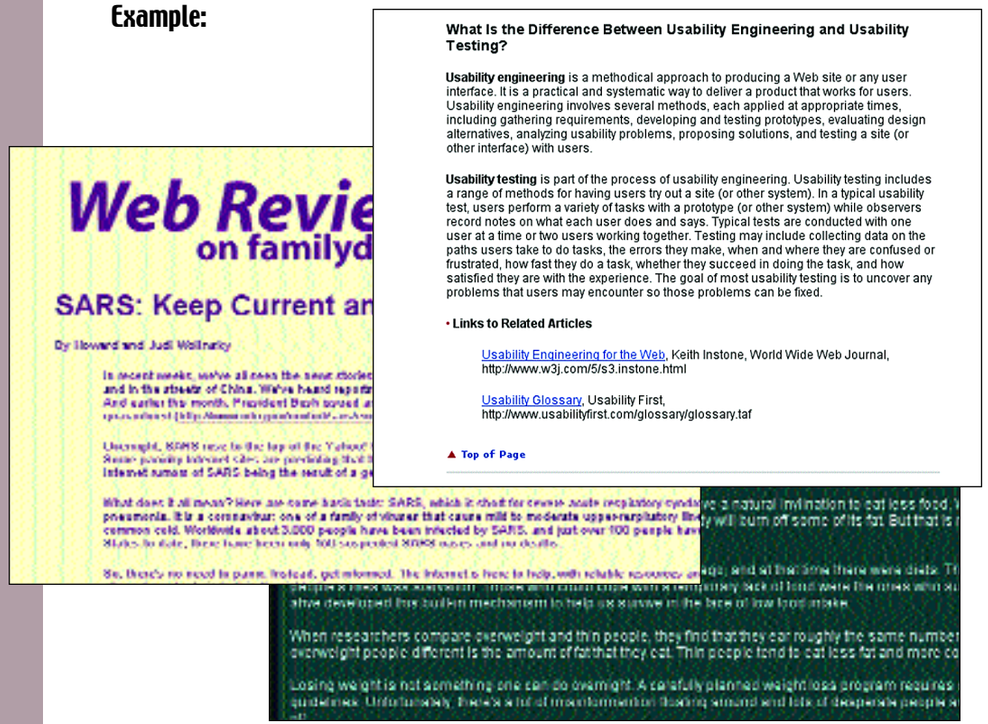
Strength of Evidence: 1 2 3 4 5

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.

Sources: Boyntoin and Bush, 1956; Bruce and Green, 1990; Cole and Jenkins, 1984; Evans, 1998; Goldsmith, 1987; Gould, et al., 1987a; Gould, et al., 1987b; Jenkins and Cole, 1982; Kosslyn, 1994; Muter and Maurutto, 1991; Muter, 1996; Scharff, Ahumada and Hill, 1999; Snyder, et al., 1990; Spencer, Reynolds and Coe, 1977a; Spencer, Reynolds and Coe, 1977b; Treisman, 1990; Williams, 2000.

Example:



See page xxi for detailed descriptions of the rating scales
1 2 3 4 O

11:2 Ensure Visual Consistency

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

Guideline: Ensure visual consistency of website 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.

Sources: Adamson and Wallace, 1997; Adkisson, 2002; Badre, 2002; Card, Moran and Newell, 1983; Cockburn and Jones, 1996; Eberts and Schneider, 1985; Grudin, 1989; Nielsen, 1999d; Osborn and Elliott, 2002; Ozok and Salvendy, 2000; Parush, Nadir and Shtub, 1998; Schneider and Shiffrin, 1977; Schneider, Dumais and Shiffrin, 1984; Tullis, 2001.

Example: An example of good visual consistency. Location and size of pictures, title bar, and font all contribute to visual consistency.

11:3 Format Common Items Consistently

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

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 ○ ○ ○

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).

Sources: Ahlstrom and Longo, 2001; Engel and Granda, 1975; Mayhew, 1992; Smith and Mosier, 1986; Tufte, 1983.

11:4 Use at Least 12-Point Font

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

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 5

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 14-point fonts. Never use less than 6-point font on a website.

Traditional paper-based font sizes do not translate well to website design. For instance, Windows Web browsers display type 2 to 3 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 that must specify large font settings.

Sources: Bailey, 2001; Bernard and Mills, 2000; Bernard, Liao and Mills, 2001a; Bernard, Liao and Mills, 2001b; Bernard, et al., 2002; Ellis and Kurniawan, 2000; Galitz, 2002; Tinker, 1963; Tullis, 2001; Tullis, Boynton and Hersh, 1995.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

11:5 Use Familiar Fonts

Relative Importance: 1 2 3 ○ ○

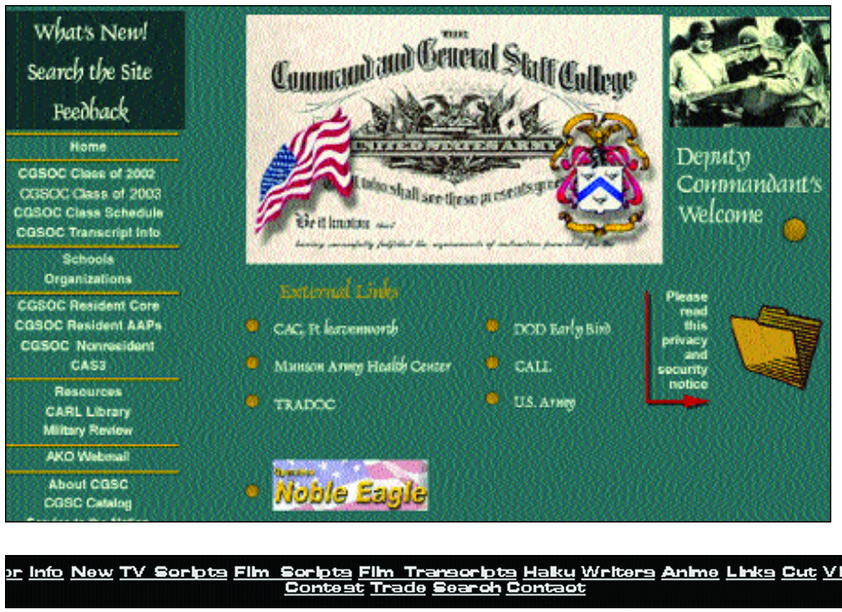
Strength of Evidence: 1 2 3 4 5

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 12-point Times New Roman or Georgia (serif fonts), or Arial, Helvetica or Verdana (sans serif fonts).

Sources: Bernard and Mills, 2000; Bernard, Liao and Mills, 2001a; Bernard, et al., 2002; Bernard, et al., 2001; Boyarski, et al., 1998; Evans, 1998; Tullis, Boynton and Hersh, 1995; Williams, 2000.

Example: Using unfamiliar fonts may slow reading speeds.



11:6 Emphasize Importance

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 5

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.

Sources: Bouma, 1980; Breland and Breland, 1944; DeRouvray and Couper, 2002; Evans, 1998; Faraday, 2000; Foster and Coles, 1977; Lichty, 1989; Marcus, 1992; Paterson and Tinker, 1940a; Poulton and Brown, 1968; Rehe, 1979; Spool, et al., 1997; Tinker and Paterson, 1928; Tinker, 1955; Tinker, 1963; Vartabedian, 1971; Williams, 2000.

Example: Limited use of bolding effectively emphasizes important topic categories.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

11:7 Use Attention-Attracting Features when Appropriate

Relative Importance: 1 2 ○ ○ ○

Strength of Evidence: 1 2 3 4 5

Guideline: 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.

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

Not all features of a website 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 website.
- 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.

Sources: Campbell and Maglio, 1999; Evans, 1998; Faraday and Sutcliffe, 1997; Faraday, 2000; Faraday, 2001; Galitz, 2002; Hillstrom and Yantis, 1994; Lewis and Walker, 1989; McConkie and Zola, 1982; Nygren and Allard, 1996; Treisman, 1988; Williams, 2000.

Example:

Lists

Lists are commonly found on websites. 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.

12:1 Order Elements to Maximize User Performance

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

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 5

Comments: Designers should determine if there is an order for items that will facilitate use of the website. 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.

Sources: Bransford and Johnson, 1972; Detweiler and Omanson, 1996; Engel and Granda, 1975; Evans, 1998; Flower, Hayes and Swarts, 1983; Halgren and Cooke, 1993; Morkes and Nielsen, 1998; Nygren and Allard, 1996; Ozok and Salvendy, 2000; Redish, Felker and Rose, 1981; Smith and Mosier, 1986; Spyridakis, 2000.

Example:

Ordering list by region and then alphabetically by country allows users to rapidly find desired information.

Region/Country
North America
Canada
Mexico
United States
Other
Total
Central & South America
Argentina
Bolivia
Brazil
Chile
Colombia
Costa Rica
Cuba
Dominican Republic
Ecuador
El Salvador
Guatemala
Honduras

If most of your users will be looking for the same item, then place it at the top of your list.

This list should be ordered to read down columns, not across rows.

Alabama	Alaska	Arizona	Arkansas
California	Colorado	Connecticut	Delaware
District of Columbia	Florida	Georgia	Hawaii
Idaho	Illinois	Indiana	Iowa
Kansas	Kentucky	Louisiana	Maine
Maryland	Massachusetts	Michigan	Minnesot
Mississippi	Missouri	Montana	Nebraska
Nevada	New Hampshire	New Jersey	New Mex
New York	North Carolina	North Dakota	Ohio

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12:2 Display Related Items in Lists

Relative Importance: 1 2 3 4 O

Strength of Evidence: 1 2 3 4 O

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.

Sources: Mayhew, 1992; Nygren and Allard, 1996; Smith and Mosier, 1986; Tullis, 1984; Wright, 1977.

Example:

The Office of Data makes available for download

- Annual Production Statistics
- Monthly Production Statistics
- Weekly Production Statistics and
- Quarterly Consumption Projections.

Bulleted lists are easier to scan and understand.

The Office of Data makes available for download Annual Production Statistics, Monthly Production Statistics, Weekly Production Statistics, and Quarterly Consumption Projections.

Horizontal lists are more difficult to scan and understand.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 O

12:3 Introduce Each List

Relative Importance: 1 2 3 4 O

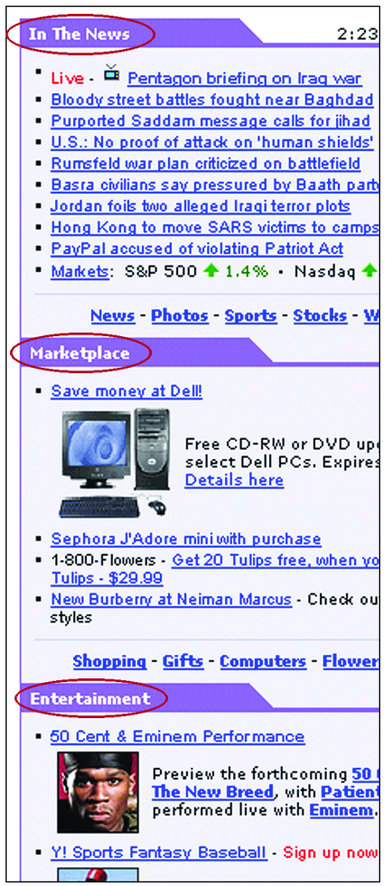
Strength of Evidence: 1 2 3 4 O

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.

Sources: Bransford and Johnson, 1972; Bransford and Johnson, 1973; Detweiler and Omanson, 1996; Engel and Granda, 1975; Levine, 1996; Redish, 1993; Smith and Goodman, 1984; Smith and Mosier, 1986.

Example:



12:4 Format Lists to Ease Scanning

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 3 4 ○

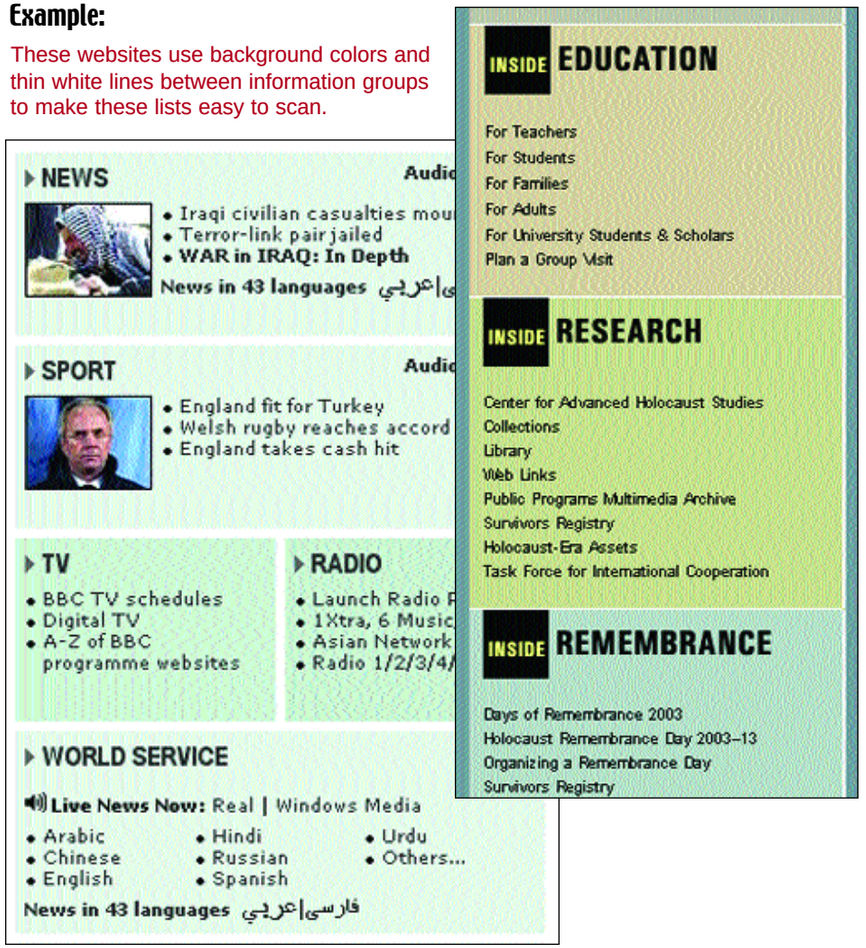
Guideline: Make lists easy to scan and understand.

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

Sources: Chaparro and Bernard, 2001; Detweiler and Omanson, 1996; Levine, 1996; Nielsen and Tahir, 2002; Nygren and Allard, 1996; Spyridakis, 2000; Treisman, 1982.

Example:

These websites use background colors and thin white lines between information groups to make these lists easy to scan.



See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

12:5 Start Numbered Items at One

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 ○ ○ ○

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."

Sources: Engel and Granda, 1975; Smith and Mosier, 1986.

12:6 Place Important Items at Top of the List

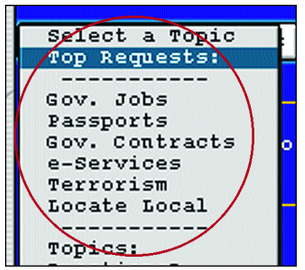
Relative Importance: 1 2 3 ○ ○
Strength of Evidence: 1 2 3 4 ○

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

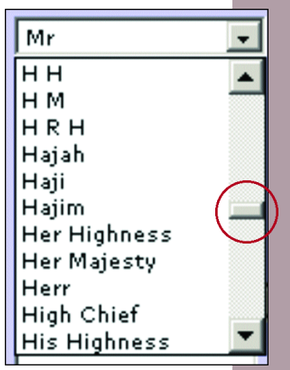
Comments: Experienced users usually look first at the top item in a menu or list, and almost always look at one of the top three items before looking at those farther down the list. Research indicates that users tend to stop scanning a list as soon as they see something relevant, thus illustrating the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

Sources: Byrne, Anderson, et al., 1999; Carroll, 1990; Evans, 1998; Faraday, 2001; Isakson and Spyridakis, 1999; Lewenstein, et al., 2000; Nielsen, 1996a; Nielsen, 1999b; Nielsen, 1999c; Spyridakis, 2000.

Example: On firstgov.gov, the "Topics" drop-down list presents the "Top Requests" in the first positions of the list, and then continues alphabetically by topic. This tactic can save users time when searching for popular items or topics.



This extensive list of titles contains the most commonly used titles at the top of the list and also in their alphabetically-correct position further down the list. This avoids the need for users to scroll through titles such as "His Highness."



12:7 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.

Relative Importance: 1○○○○

Strength of Evidence: 1 2 ○○○

Comments: Only the first letter of the first word should be capitalized unless the item contains another word that normally would be capitalized.

Sources: Bailey, 1996; Fowler, 1998; Marcus, Smilonich and Thompson, 1995; Microsoft, 1992.

Example:

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

12:8 Use Appropriate List Style

Relative Importance: 1○○○○

Strength of Evidence: 1 2 3 4 ○

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.

Sources: Coney and Steehouder, 2000; Detweiler and Omanson, 1996; Lorch and Chen, 1986; Narveson, 2001; Spyridakis, 2000.

Example:

Use bullets if your list items are of equal value, or if they have no discernable order.

Using numbered lists is appropriate when items are in a proscribed order, such as this list of "Top 10" queries.

Screen-based Controls (Widgets)

In order to interact with a website, 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 filling-out 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.

13:1 Distinguish Required and Optional Data Entry Fields

Guideline: Distinguish clearly and consistently between required and optional data entry fields.

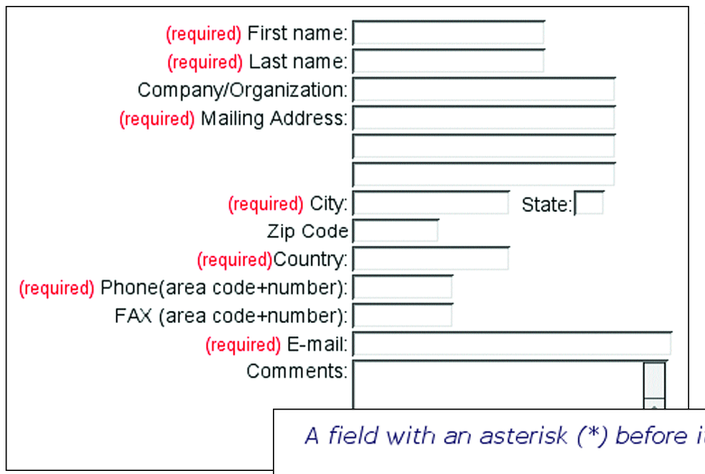
Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 ○ ○

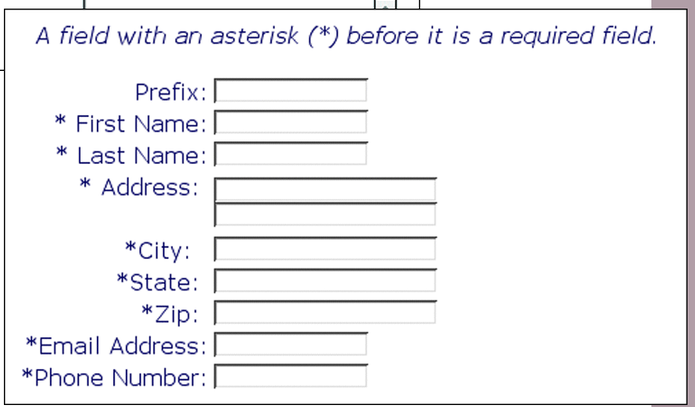
Comments: Users should be able to easily determine which data entry fields are required and which are optional. Many websites are currently using an asterisk in front of the label for required fields. Other sites are adding the word "required" near the label. One study found that bolded text is preferred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

Sources: Bailey, 1996; Fowler, 1998; Morrell, et al., 2002; Tullis and Pons, 1997.

Example:



Asterisks (*) and labeling data entry field names with "(required)" are two popular and effective methods of distinguishing between optional and required data entry fields.



13:2 Detect Errors Automatically

Relative Importance: 1 2 3 4 5

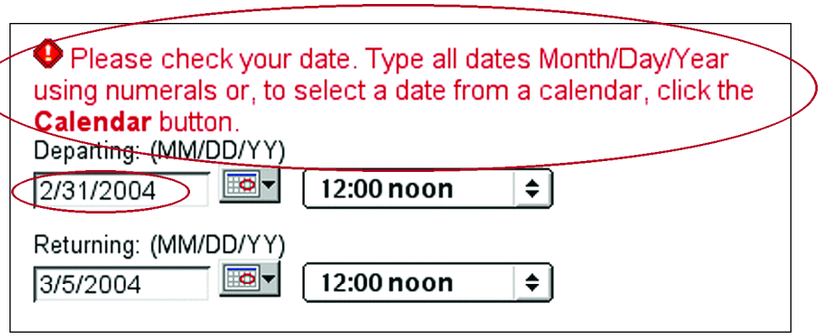
Strength of Evidence: 1 2 3 ○ ○

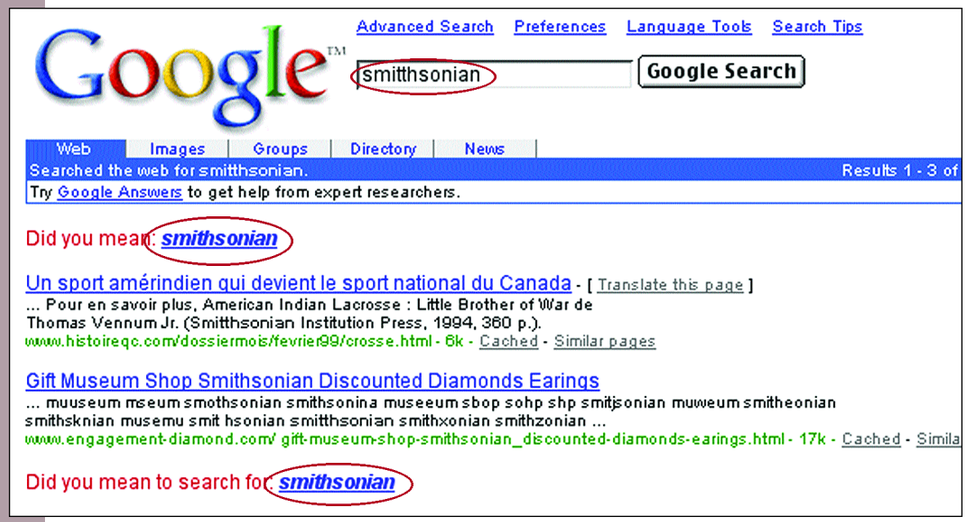
Guideline: Use the computer to detect errors made by users.

Comments: Do not expect users to make correct entries. Anticipate possible user errors and 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. Some user entries may not need checking, or may not be amenable to computer checking.

Sources: Bailey, 1983; Pew and Rollins, 1975; Smith and Mosier, 1986.

Example:





See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

13:3 Minimize User Data Entry

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 ○ ○

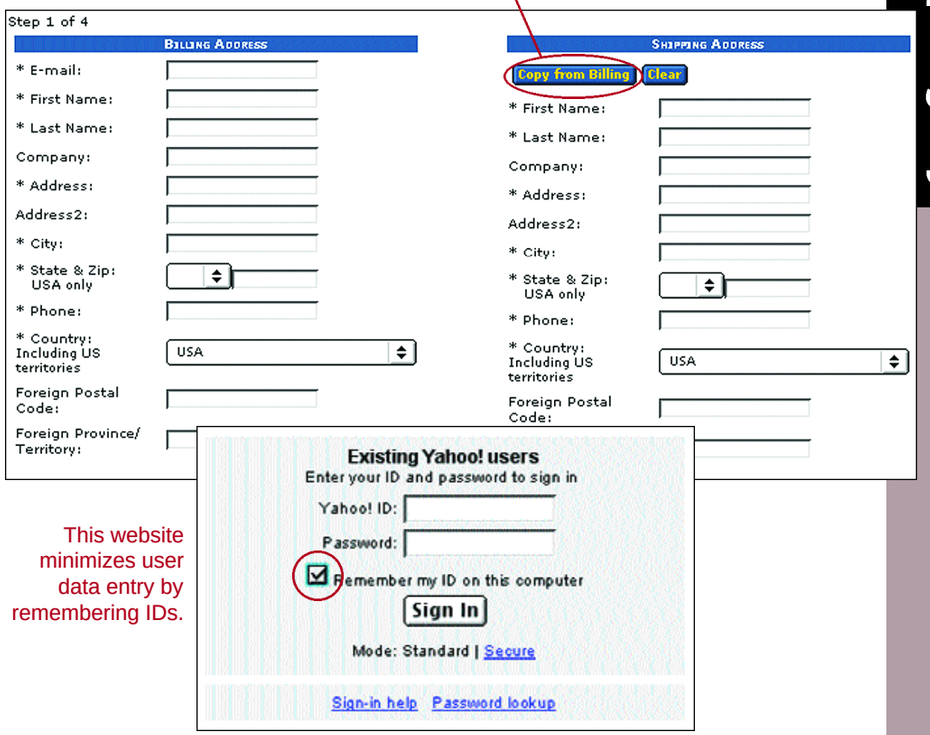
Guideline: Do not require users to enter the same information more than once.

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.

Sources: Czaja and Sharit, 1997; Smith and Mosier, 1986; Zimmerman, et al., 2002.

Example:

Clicking this button will prompt the server to copy information from the "Billing Address" column to the "Shipping Address" column, thus eliminating the need for users to re-input the data (if it is the same).



This website minimizes user data entry by remembering IDs.

13:4 Label Data Entry Fields Clearly

Relative Importance: 1 2 3 4 5
Strength of Evidence: 1 2 3 ○ ○

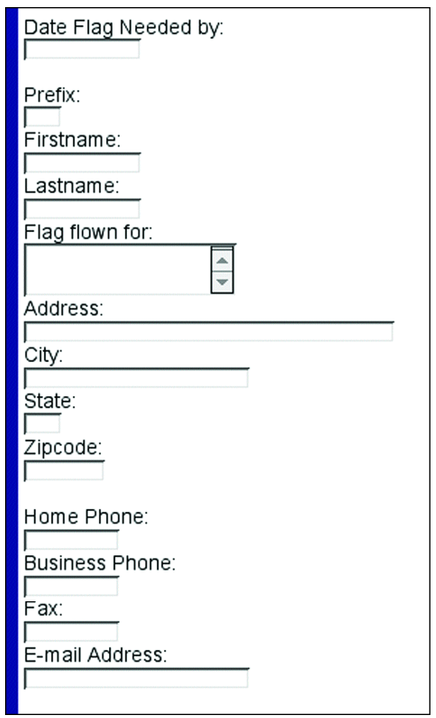
Guideline: Display an associated label for each data entry field to help users understand what entries are desired.

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.

Sources: Pew and Rollins, 1975; Smith and Mosier, 1986.

Example:



A good design—Each data entry field has an associated descriptive label.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

13:5 Put Labels Close to Data Entry Fields

Relative Importance: 1 2 3 4 5
Strength of Evidence: 1 2 ○ ○ ○

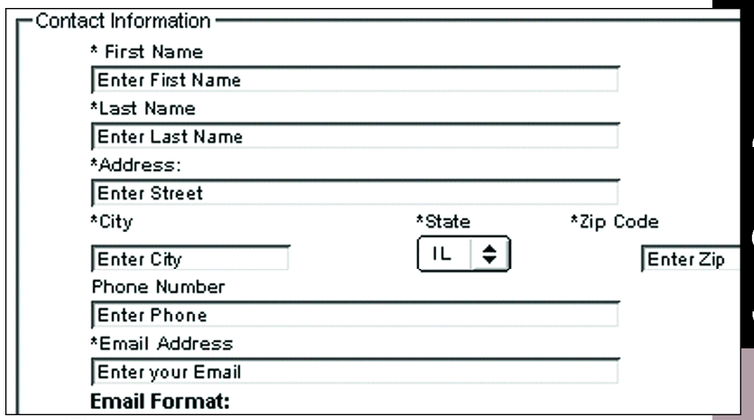
Guideline: Ensure that labels are close enough to their associated data entry fields so that users will recognize the label as describing the data entry field.

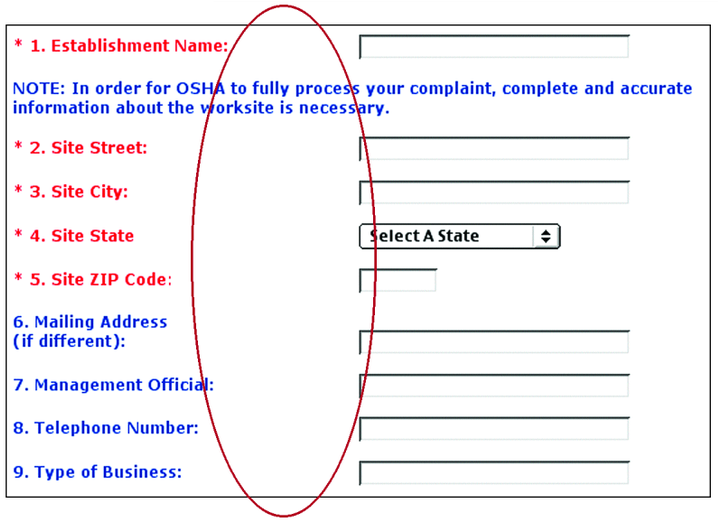
Comments: All labels and related information should be close to the data entry field to enable users to easily relate the label and entries required.

Sources: Engel and Granda, 1975; Evans, 1998; Galitz, 2002; Smith and Mosier, 1986.

Example:

Placing labels very close to the data entry fields allows users to rapidly relate the label and the required entries.





Placing labels away from the data entry field slows users' entry rates.

13:6 Label Pushbuttons Clearly

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 ○ ○ ○

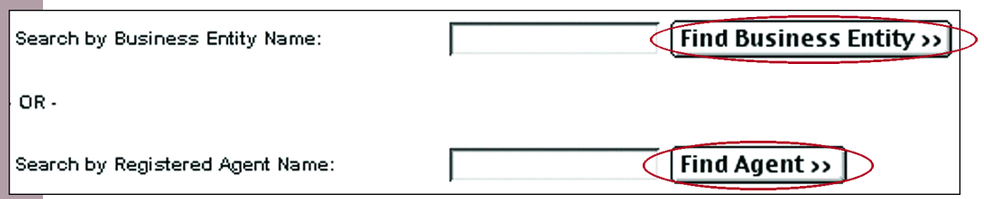
Guideline: Ensure that a pushbutton's label clearly indicates its action.

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," "Previous."

Sources: Bailey, 1996; Fowler, 1998; Marcus, Smilonich and Thompson, 1995.

Example:

Effective use of short phrases leaves no doubt in the user's mind as to what will happen when the pushbutton is clicked.



See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

13:7 Label Data Entry Fields Consistently

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Evans, 1998; Mahajan and Shneiderman, 1997; Smith and Mosier, 1986.

13:8 Allow Users to See Their Entered Data

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 3 ○ ○

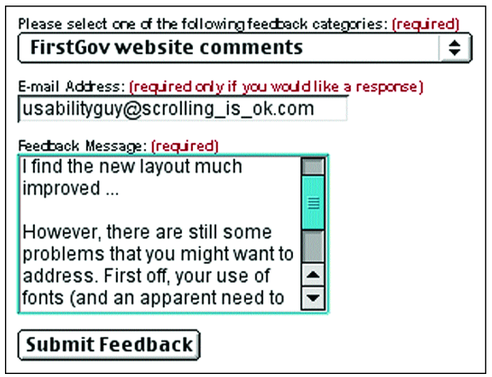
Guideline: Create data entry fields that are large enough to show all of the entered data without scrolling.

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.

Sources: Bailey, 1996; Czaja and Sharit, 1997; Fowler, 1998.

Example:

Text box expands vertically so that a user can see even very-long entries without having to scroll horizontally.



Data entry fields should be wide enough so that the user can see their entire entry without scrolling.

13:9 Display Default Values

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 ○ ○ ○

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

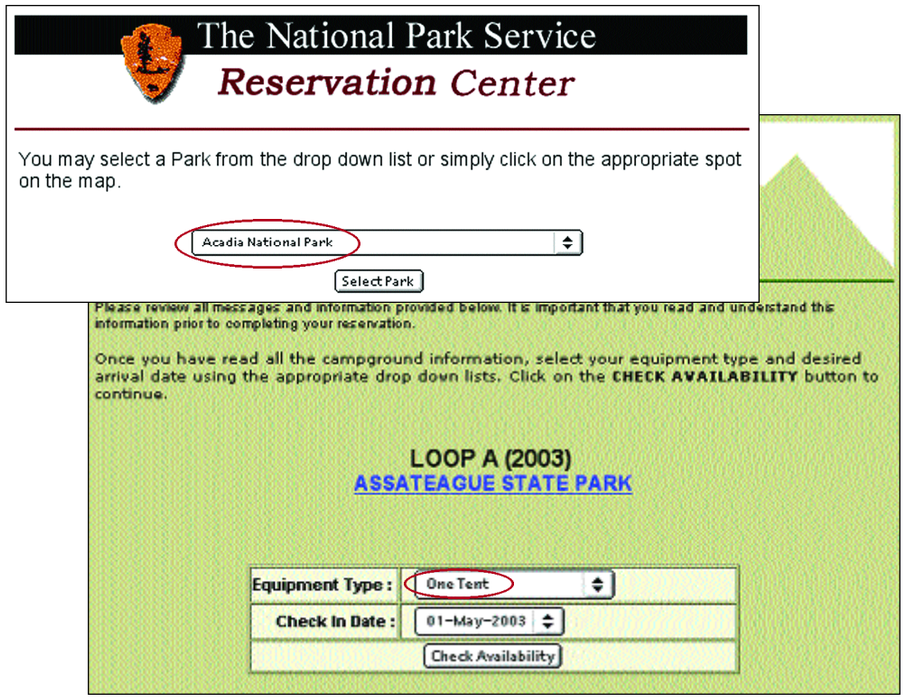
Comments: When likely default values can be defined, offer those values to speed data entry. The initial or default item could be the most frequently selected item or the last item selected by that user. In general, do not use the default position to display a heading or label for that widget.

Sources: Ahlstrom and Longo, 2001; Bailey, 1996; Fowler, 1998; Marcus, Smilonich and Thompson, 1995; Smith and Mosier, 1986.

Example:

Title	Item	Quantity	Unit Price	Delete?
2002 IRS Tax CD-ROM.	IRS2002PUB1796A*CD	1	$22.00	☐
		SubTotal:	$22.00	

Continue Shopping | Update Basket | Clear Basket



See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

13:10 Use a Minimum of Two Radio Buttons

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 ○ ○ ○

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."

Sources: Bailey, 1996; Fowler, 1998; Marcus, Smilonich and Thompson, 1995.

13:11 Use Radio Buttons for Mutually Exclusive Selections

Relative Importance: 1 2 3 ○ ○
Strength of Evidence: 1 2 3 4 ○

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.

Sources: Bailey, 1983; Bailey, 1996; Fowler, 1998; Galitz, 2002; Johnsgard, et al., 1995; Marcus, Smilonich and Thompson, 1995; Tullis and Kodimer, 1992.

Example:

If a user must be constrained to selecting one item in a list, employ radio buttons rather than check boxes.

When you use the U.S. Department of Education's (ED
(Please check only one)

- ○ Student
- ◉ Teacher
- ○ Education administrator or manager
- ○ Parent or family member
- ○ Researcher or analyst
- ○ Policy maker or legislator
- ○ Librarian
- ○ Writer or reporter
- ○ Other *(please specify)* _____

13:12 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.

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

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.

Sources: Bailey, 1996; Fowler, 1998; Galitz, 2002; Johnsgard, et al., 1995; Marcus, Smilonich and Thompson, 1995.

Example: Check boxes are most appropriately used in these examples because users may wish to order more than one product or select more than one file format—convention dictates that check boxes be used when more than one item in a list may be selected.

Media Type:
- [x] DVD
- [ ] CD-ROM 1
- [ ] CD-ROM 2
- [x] CD-ROM 3
- [ ] CD-ROM 4
- [x] CD-ROM 5
- [ ] 8mm high density tar tape

Total cost of selections: $

We want to provide information in for … us understand how you prefer to use information and in what formats.

a. Short documents

How do you prefer to use short documents? *(Please check all that apply)*
- [ ] View/read online
- [ ] Download to view offline
- [ ] Download to print
- [ ] Download to edit or manipulate

What file format(s) do you prefer? *(Please check all that apply)*
- [ ] Hypertext markup language (.html)
- [ ] Plain ASCII text (.txt)
- [ ] Adobe Acrobat (.pdf)
- [ ] Compressed file (.zip)
- [ ] Other *(please specify)*

See page xxi for detailed descriptions of the rating scales 1 2 3 4

13:13 Use Familiar Widgets

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

Relative Importance: 1 2 3 4 5

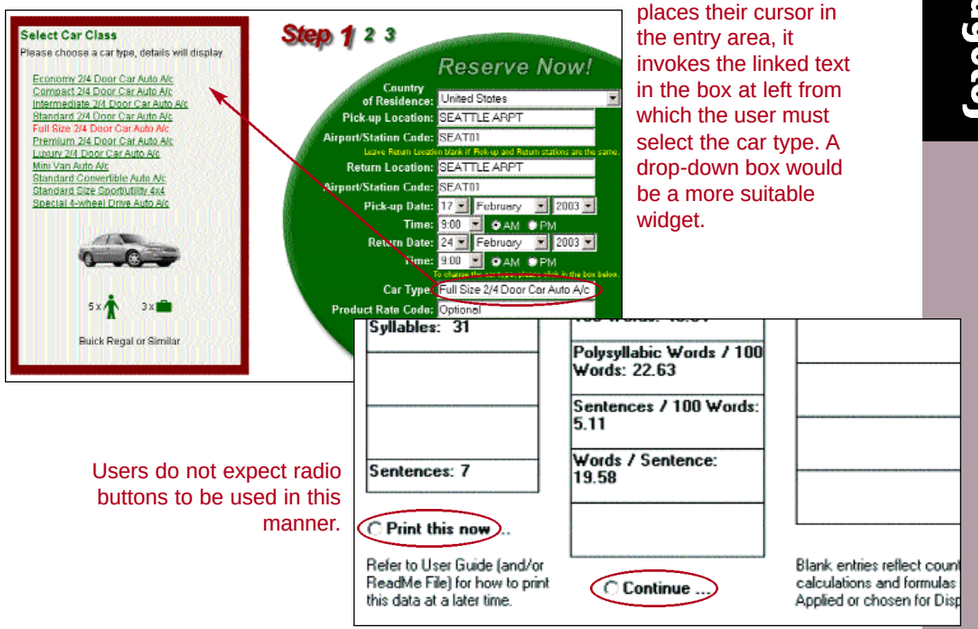
Strength of Evidence: 1 2 3 4 5

Comments: Do not assume that all users are familiar with all available widgets. Unfamiliar widgets will slow some users, and cause others to not 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 know how to use a drop-down list box.

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.

Sources: Bailey, Koyani and Nall, 2000; Nall, Koyani and Lafond, 2001.

Example: The circled widget is used in an unconventional manner. Users might expect this widget to be a text entry box. However, when a user places their cursor in the entry area, it invokes the linked text in the box at left from which the user must select the car type. A drop-down box would be a more suitable widget.



Users do not expect radio buttons to be used in this manner.

13:14 Use a Single Data Entry Method

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 ○

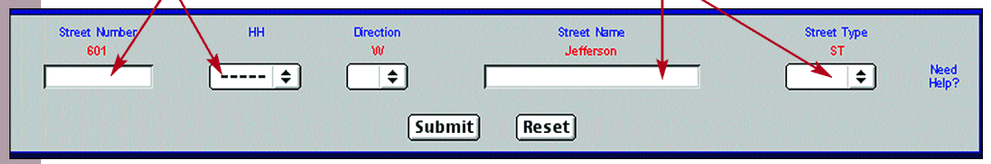
Guideline: Design data entry transactions so that users can stay with one entry method as long as possible.

Comments: Do not have users shift back and forth between data entry methods. Requiring users to make numerous shifts from keyboard to mouse to keyboard can substantially slow their entry speed.

Sources: Czaja and Sharit, 1997; Engel and Granda, 1975; Foley and Wallace, 1974; Smith and Mosier, 1986.

Example: In this example, data entry methods are used consistently so that users do not have to shift back and forth between mouse entry and keyboard entry.

This design forces users to switch between keyboard entry and mouse entry methods, and will slow the user's data entry task.



See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

13:15 Partition Long Data Items

Relative Importance: 1 2 3 ○ ○

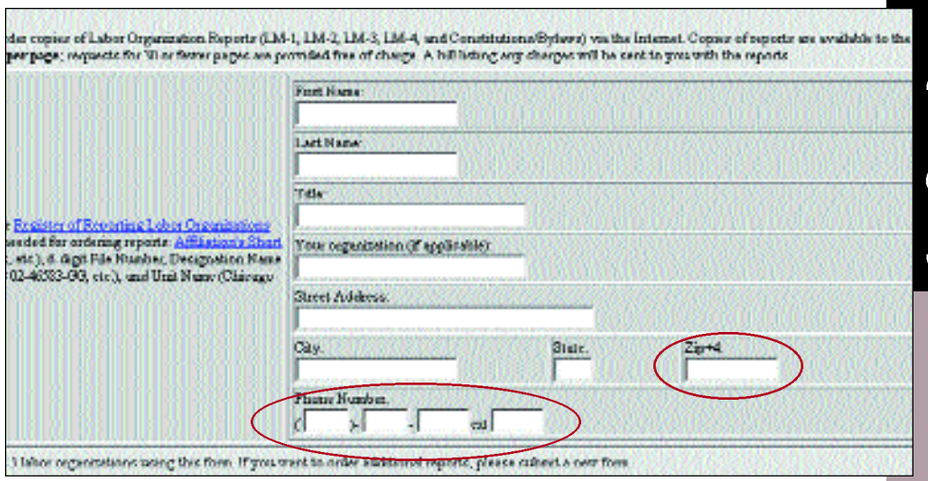
Strength of Evidence: 1 2 ○ ○ ○

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.

Sources: Mayhew, 1992; Smith and Mosier, 1986.

Example: The "Phone Number" entry field is partitioned correctly. However, the "ZIP+4" field should be broken out into two fields (one 5 digits long, and one 4 digits long, separated by a hyphen).



13:16 Do Not Make User-Entered Codes Case Sensitive

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

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 ○ ○ ○

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 entered by the user.

Sources: Ahlstrom and Longo, 2001; Smith and Mosier, 1986.

13:17 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.

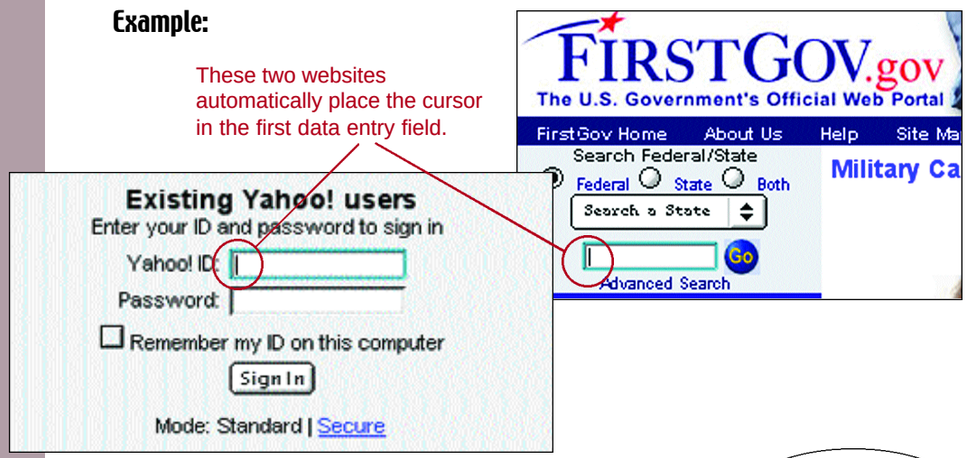
Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 ○ ○ ○

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.

Sources: Ahlstrom and Longo, 2001; Smith and Mosier, 1986.

Example:



See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

13:18 Provide Auto-tabbing Functionality

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

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 ○ ○

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

Sources: Ahlstrom and Longo, 2001; Pew and Rollins, 1975; Smith and Mosier, 1986.

13:19 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.

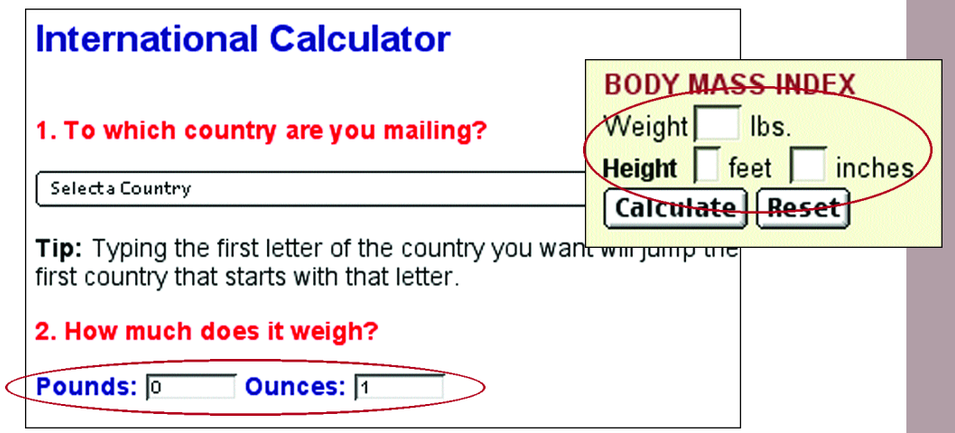
Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 ○ ○

Comments: Designers should include units such as minutes, ounces, or centimeters, etc. as part of the data entry field label. This will reduce the number of keystrokes required of users (speeding the data entry process), and reduce the chance of errors.

Sources: Pew and Rollins, 1975; Smith and Mosier, 1986.

Example:



13:20 Ensure that Double-Clicking Will Not Cause Problems

Guideline: Ensure that double-clicking on a link will not cause undesirable or confusing results.

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

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.

Sources: Bailey, Koyani and Nall, 2000; Fakun and Greenough, 2002.

13:21 Do Not Limit Viewable List Box Options

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

Relative Importance: 1 2 3 4 5

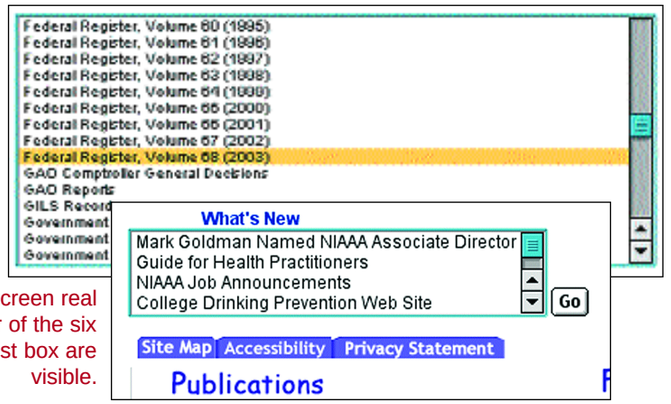
Strength of Evidence: 1 2 3 4 5

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.

Sources: Bailey, Koyani and Nall, 2000; Zimmerman, et al., 2002.

Example:

This open list shows as many options as possible given the amount of available screen real estate.



Despite plenty of screen real estate, only four of the six items in this list box are visible.

13:22 Use Open Lists to Select One from Many

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

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

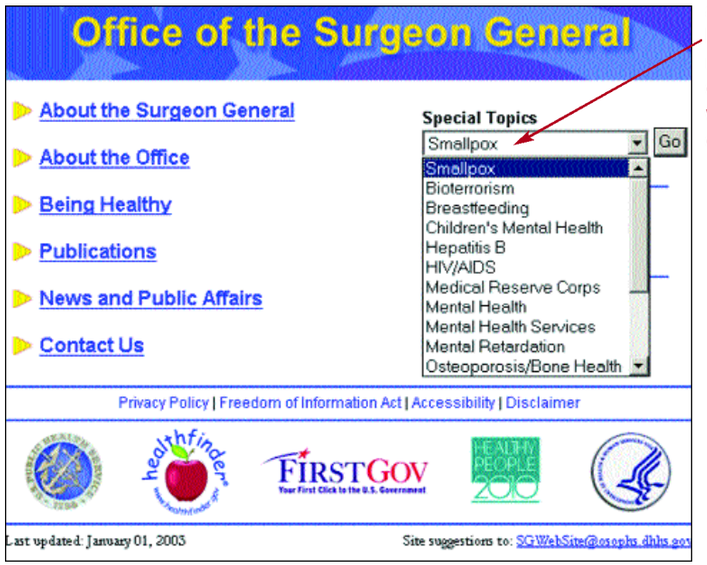
Comments: Generally, the more items users can see in a list (without scrolling), the faster their responses will be, and the fewer omission errors they will make. Ideally, users should be able to see all available items without scrolling.

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.

Sources: Bailey, 1996; Fowler, 1998; Marcus, Smilonich and Thompson, 1995.

Example:

In this example, the designers opted to use a drop-down list to conserve screen real estate. This is a trade-off, however, as a drop-down list will slow users when compared with an open list.



See page xxi for detailed descriptions of the rating scales 1 2 3 4 5

13:23 Prioritize Pushbuttons

Relative Importance: 1 2 3 4 5
Strength of Evidence: 1 2 3 4 5

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.

Sources: Bailey, 1996; Fowler, 1998; Marcus, Smilonich and Thompson, 1995.

Example:

The "Search" button is placed in the first position.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 5

13:24 Minimize Use of the Shift Key

Relative Importance: 1 2 3 4 5
Strength of Evidence: 1 2 3 4 5

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.

Sources: Card, Moran and Newell, 1980b; John, 1996; Smith and Mosier, 1986.

13:25 Use Data Entry Fields to Speed Performance

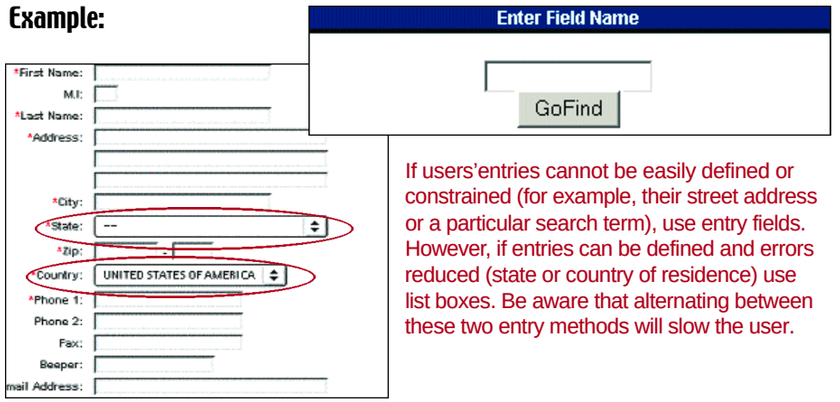
Relative Importance: 1 2 3 4 5
Strength of Evidence: 1 2 3 4 5

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.

Sources: Bailey, 1996; Czaja and Sharit, 1997; Fowler, 1998; Gould, et al., 1988; Gould, et al., 1989; Greene, et al., 1988; Greene, et al., 1992; Marcus, Smilonich and Thompson, 1995; Tullis and Kodimer, 1992.

Example:



If users'entries cannot be easily defined or constrained (for example, their street address or a particular search term), use entry fields. However, if entries can be defined and errors reduced (state or country of residence) use list boxes. Be aware that alternating between these two entry methods will slow the user.

Graphics, Images, and Multimedia

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 website. 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 website 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.

14:1 Use Video, Animation, and Audio Meaningfully

Guideline: Use video, animation, and audio only when they help to convey, or are supportive of, the website's message or other content.

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 5

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.

Sources: Campbell and Maglio, 1999; Chen and Yu, 2000; Faraday and Sutcliffe, 1997; Faraday, 2000; Faraday, 2001; Harrison, 1995; Nielsen, 2000; Park and Hannafin, 1993; Reeves and Rickenberg, 2000; Spinillo and Dyson, 2000/2001; Sundar, Edgar and Mayer, 2000.

14:2 Include Logos

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

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 ○

Comments: Users are frequently unaware when they click through to a different website. Having a logo on each page provides a frame of reference throughout a website 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.

Sources: Adkisson, 2002; Farkas and Farkas, 2000; Marchionini, 1995; Nall, Koyani and Lafond, 2001; Nielsen, 1999d; Omanson, Cline and Nordhielm, 2001; Omanson, et al., 1998; Osborn and Elliott, 2002; Spool, et al., 1997.

Example:

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14:3 Limit Large Images Above the Fold

Relative Importance: 1 2 3 4 ○

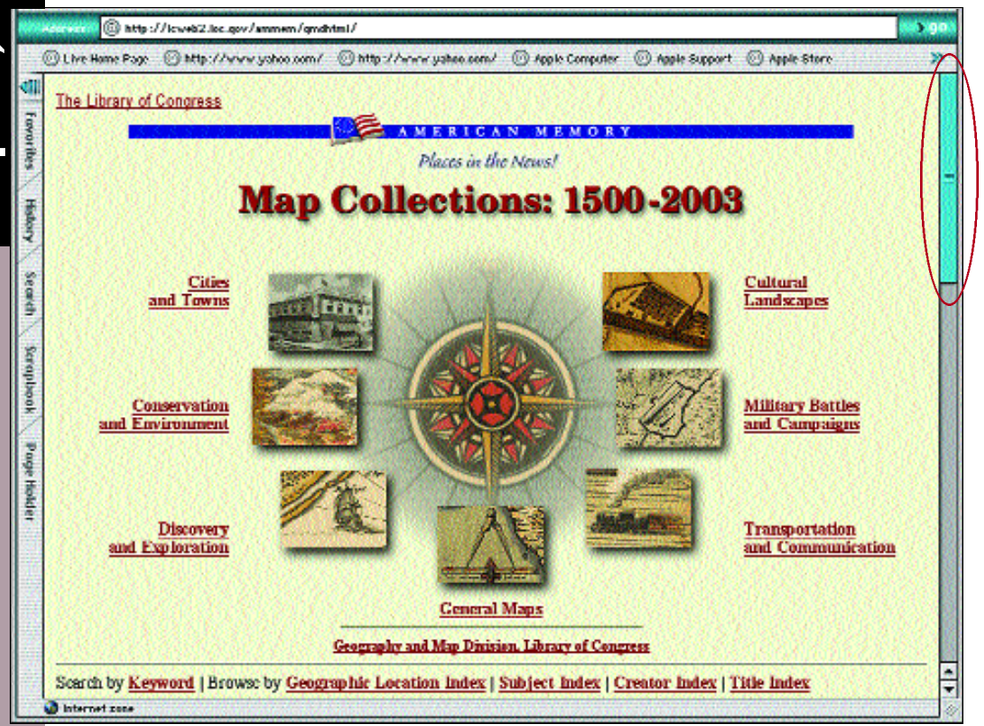
Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Bailey, Koyani and Nall, 2000; Chen and Yu, 2000; Golovchinsky and Chignell, 1993; Nielsen and Tahir, 2002.

Example: As the scroll bar shows, there are several additional screenfuls of information below this large navigation graphic—users may not look at the scroll bar, however, and thus may miss that information.



See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

14:4 Limit the Use of Images

Relative Importance: 1 2 3 ○ ○

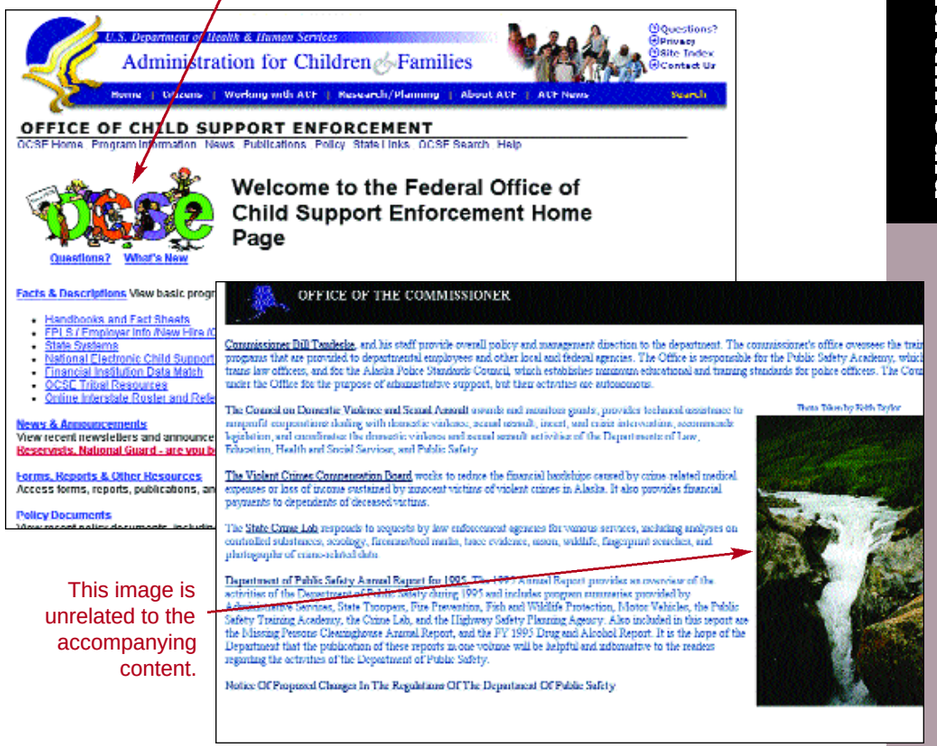
Strength of Evidence: 1 2 3 ○ ○

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

Comments: Ensure that a website's graphics add value and increase the clarity of the information on the site. Certain graphics can make some websites 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 not distract the user.

Sources: Badre, 2002; Evans, 1998; Nielsen, 1997e; Nielsen, 1999b; Nielsen, 2000; Spool, et al., 1997; Wen and Beaton, 1996; Williams, 2000.

Example: The placement of this image disrupts the left justification of the other page elements and it is visually distracting, drawing the user's attention from the site's content.



14:5 Label Clickable Images

Relative Importance: 1 2 3 ○ ○

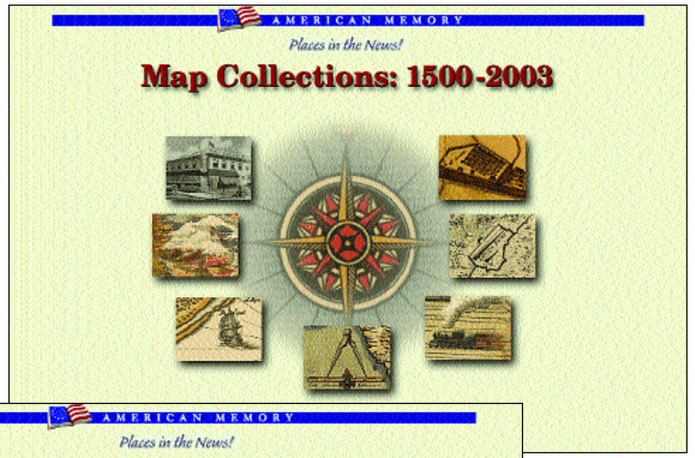
Strength of Evidence: 1 2 3 4 ○

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.

Sources: Booher, 1975; Evans, 1998; Hackman and Tinker, 1957; Spool, et al., 1997; Tinker and Paterson, 1931; Vaughan, 1998; Williams, 2000.

Example:



The addition of labels is essential for a user to understand the clickable image links.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

14:6 Ensure that Images Do Not Slow Downloads

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 5

Guideline: Take steps to ensure that images on the website 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.

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.

Sources: Bouch, Kuchinsky and Bhatti, 2000; Farkas and Farkas, 2000; Marchionini, 1995; Martin and Corl, 1986; Nielsen, 1996a; Nielsen, 1997a; Nielsen, 1999c; Nielsen, 2000; Perfetti and Landesman, 2001a; Ramsay, Barbesi and Preece, 1998; Sears, Jacko and Borella, 1997; Selvidge, Chaparro and Bender, 2001; Shneiderman, 1984; Tullis, 2001.

14:7 Use Thumbnail Images to Preview Larger Images

Relative Importance: 1 2 3 ○ ○

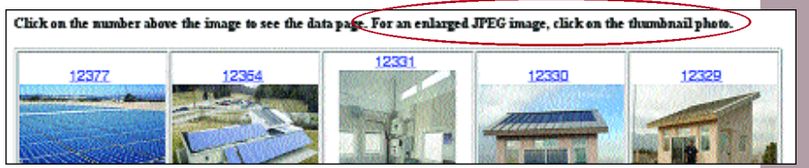
Strength of Evidence: 1 2 ○ ○ ○

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.

Sources: Levine, 1996; Nielsen and Tahir, 2002.

Example:



14:8 Graphics Should Not Look Like Banner Ads

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

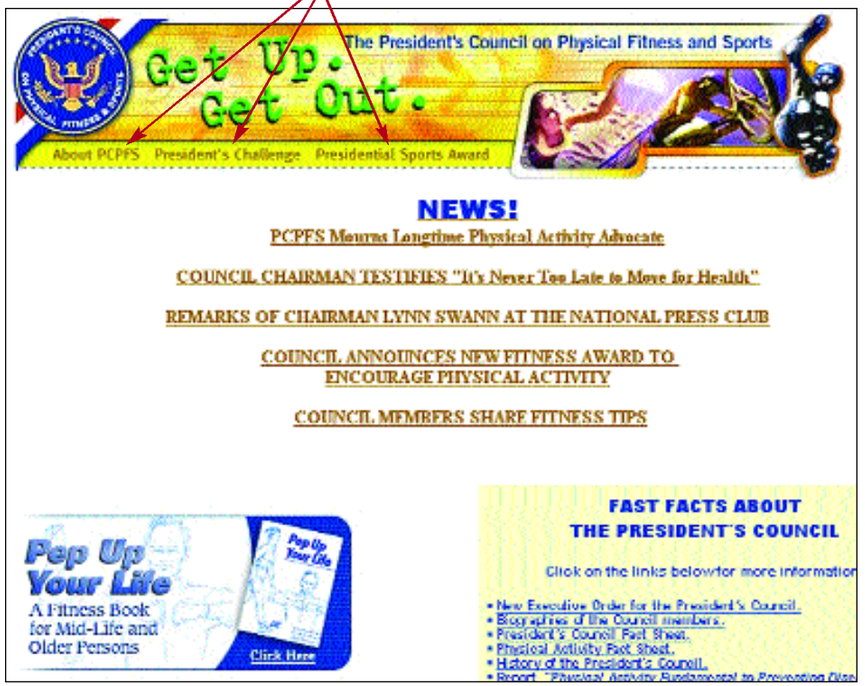
Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 ○

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.

Sources: Ahmadi, 2000; Badre, 2002; Bayles, 2002; Benway, 1998; Ellis and Kurniawan, 2000.

Example: This graphic, which contains three major, linked headers, looks like a banner advertisement. Consequently, users may skip over this design element, thus missing the headers.



14:9 Use Simple Background Images

Relative Importance: 1 2 3 ○ ○

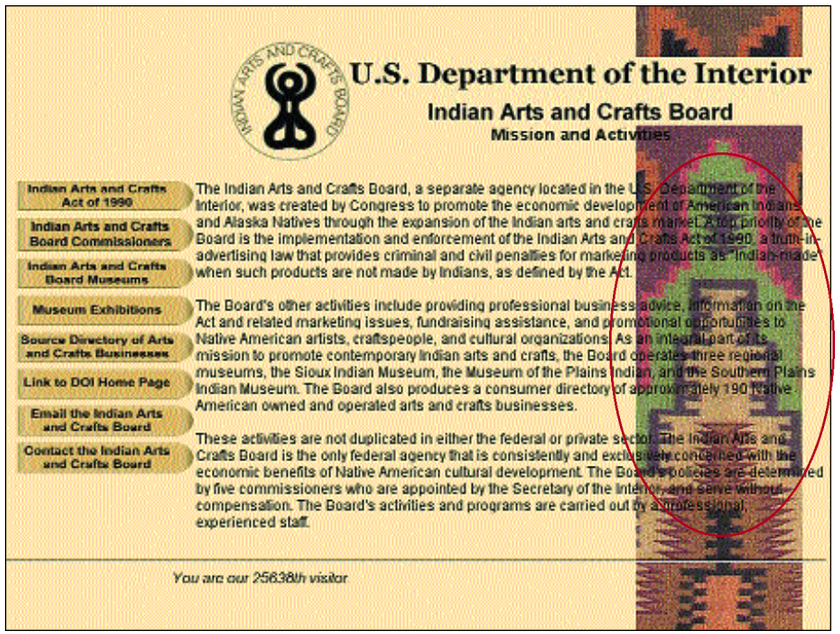
Strength of Evidence: 1 2 3 4 5

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

Sources: Boyntoin and Bush, 1956; Cole and Jenkins, 1984; Detweiler and Omanson, 1996; Hackman and Tinker, 1957; Jenkins and Cole, 1982; Levine, 1996; Levy, et al., 1996; Spencer, Reynolds and Coe, 1977a; Spencer, Reynolds and Coe, 1977b; Tinker and Paterson, 1931; Tinker, 1963.

Example: Complex graphics can obscure text, making it very difficult for users to read the site's content.



See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

14:10 Include Actual Data with Data Graphics

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

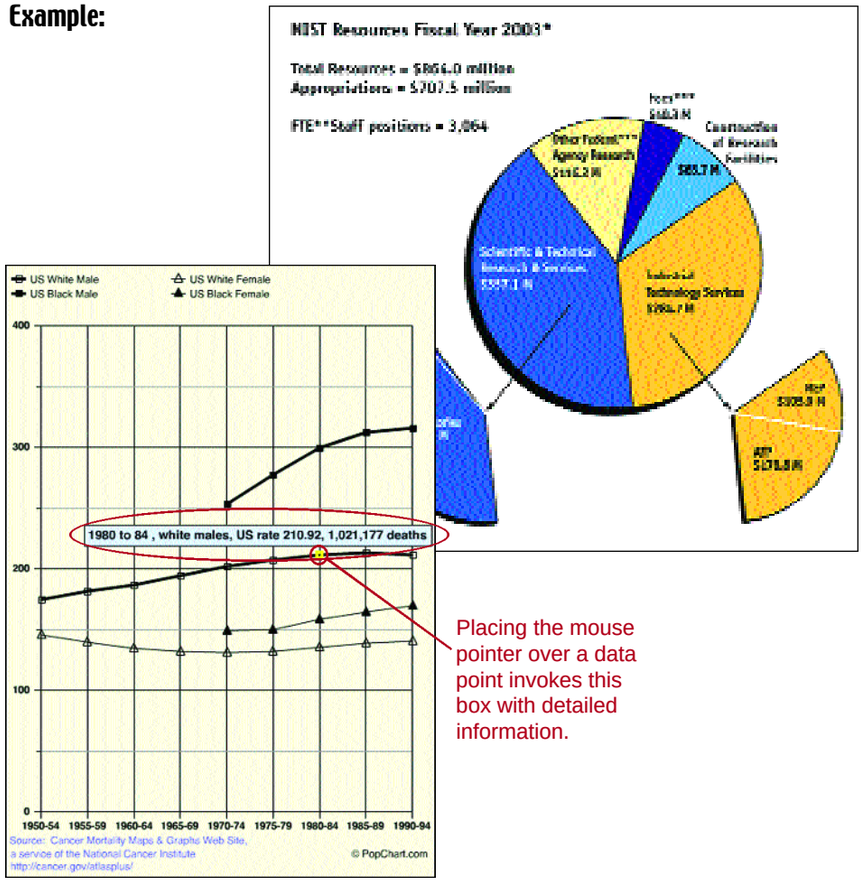
Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 ○

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.

Sources: Pagulayan and Stoffregen, 2000; Powers, et al., 1961; Smith and Mosier, 1986; Spool, et al., 1997; Tufte, 1983.

Example:



Placing the mouse pointer over a data point invokes this box with detailed information.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

14:11 Display Monitoring Information Graphically

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

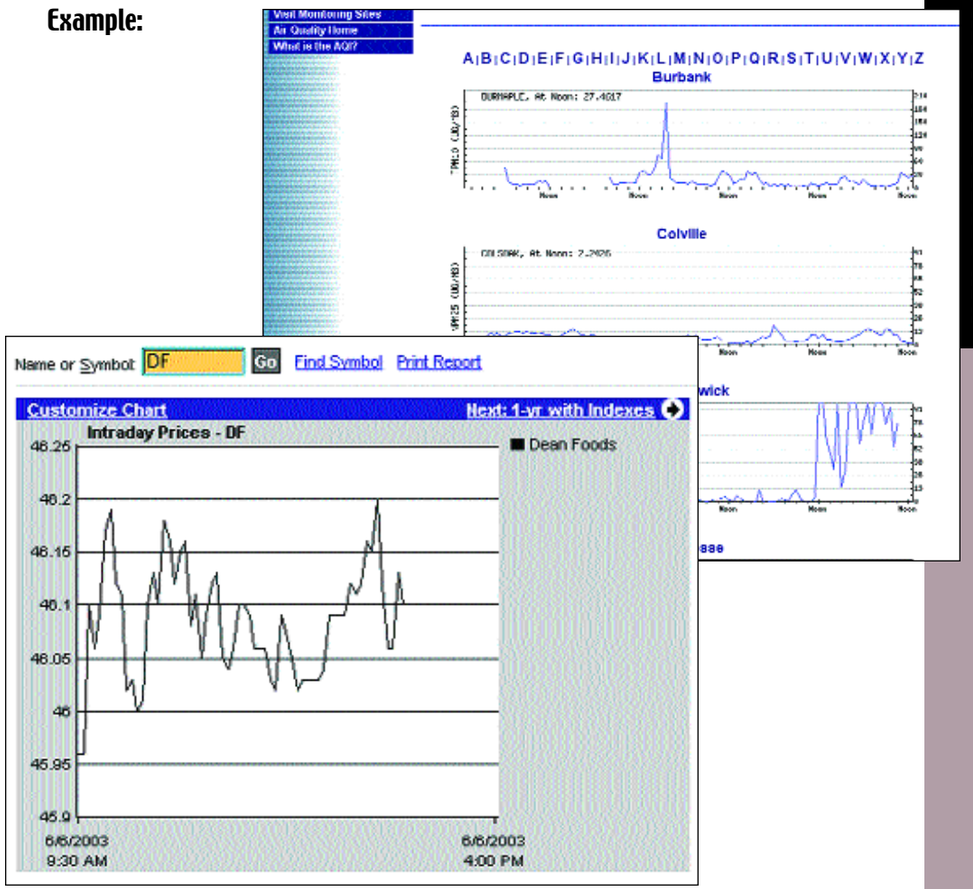
Relative Importance: 1 2 ○ ○ ○

Strength of Evidence: 1 2 3 4 ○

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.

Sources: Hanson, et al., 1981; Kosslyn, 1994; Powers, et al., 1961; Smith and Mosier, 1986; Tullis, 1981.

Example:



14:12 Introduce Animation

Relative Importance: 1 2 ○ ○ ○

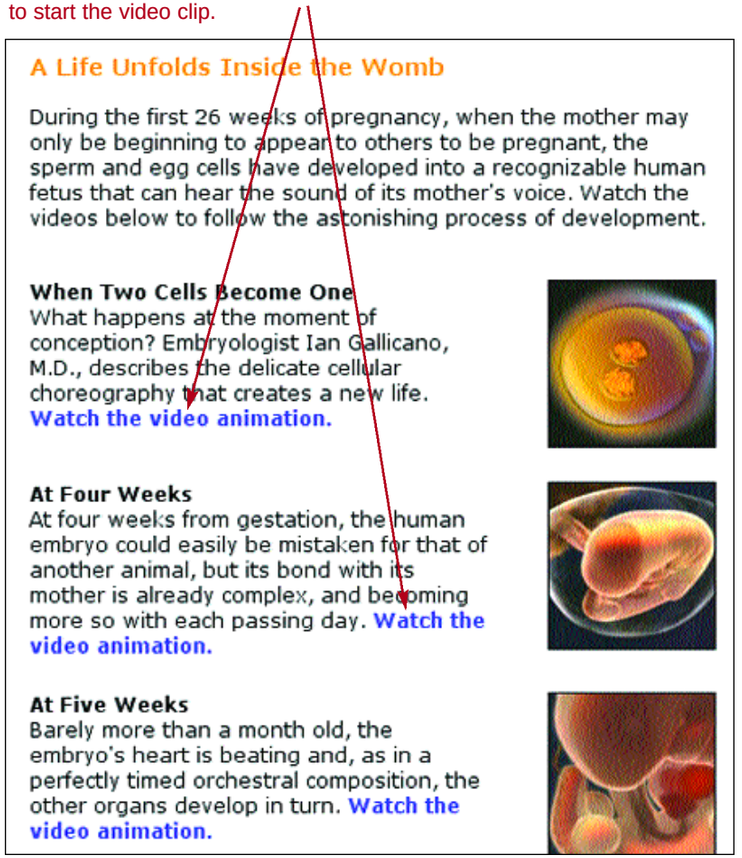
Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Evans, 1998; Faraday and Sutcliffe, 1999.

Example: Each video clip is accompanied by text that explains to the user what they are about to view. In addition, this website allows the user to control when to start the video clip.



See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

14:13 Ensure Website Images Convey Intended Messages

Relative Importance: 1 2 ○ ○ ○

Strength of Evidence: 1 2 3 ○ ○

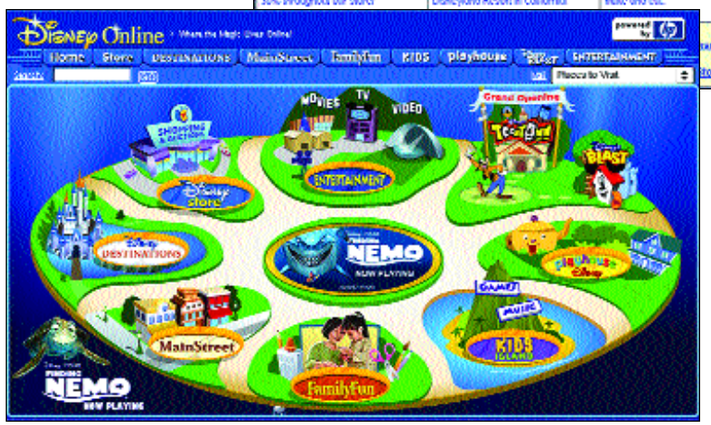
Guideline: Ensure that website images convey the intended message to users, not just to designers.

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.

Sources: Ahmadi, 2000; Evans, 1998; Nielsen and Tahir, 2002; Spool, et al., 1997.

Example:

One study found that seventy-five percent of users are able to find information on the "lite" site shown on the right, whereas only seventeen percent could find the same information on the graphics-intensive site below.



14:14 Use Images to Facilitate Learning

Relative Importance: 1 ○ ○ ○ ○

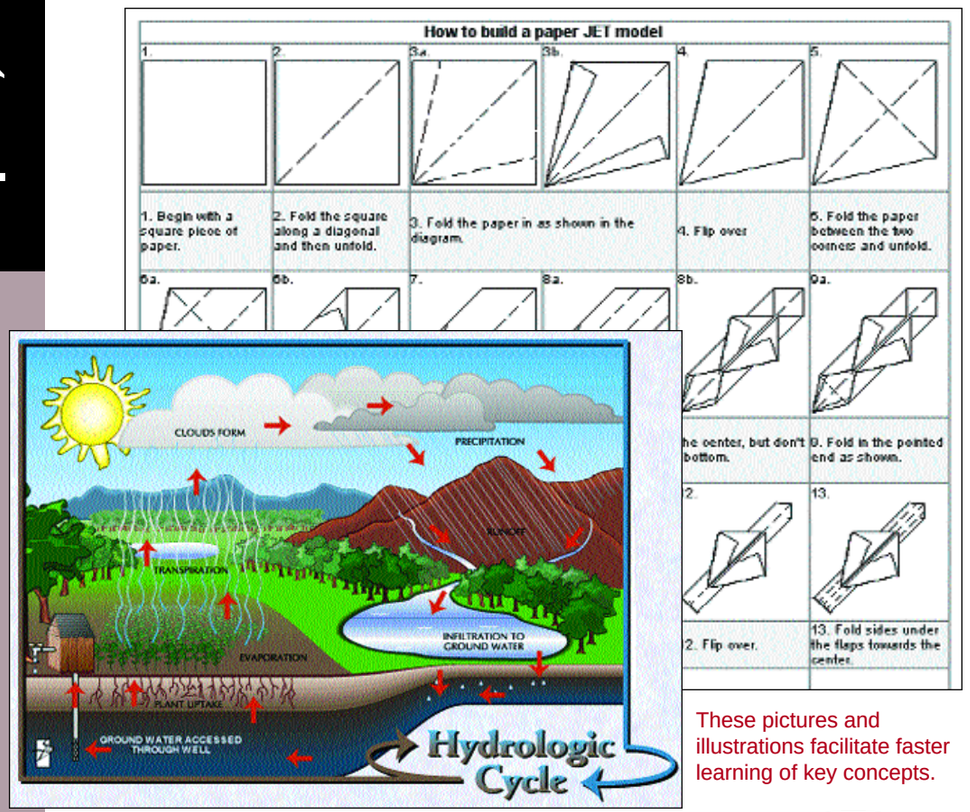
Strength of Evidence: 1 2 3 4 5

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.

Sources: Golovchinsky and Chignell, 1993; Krull and Watson, 2002; Levy, et al., 1996; Lieberman and Culpepper, 1965; Nelson, Reed and Walling, 1976; Paivio and Csapo, 1969; Paivio, Rogers and Smythe, 1968; Rodden, et al., 2001; Williams, 1993.

Example:



These pictures and illustrations facilitate faster learning of key concepts.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

14:15 Emulate Real-World Objects

Relative Importance: 1 ○ ○ ○ ○

Strength of Evidence: 1 2 3 4 ○

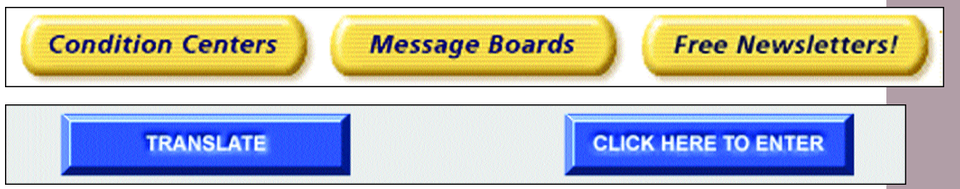
Guideline: Use images that look like real-world items when appropriate.

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.

Sources: Ahmadi, 2000; Bailey, 2000b; Galitz, 2002; Nolan, 1989.

Example:

These control items are designed to look like real-world items. The buttons below, for example, look like the buttons you might find on an Automated Teller Machine. The control item image to the right controls video on a website, and thus is designed to look like a control on a VCR or DVD player.



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 website.

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

When preparing prose content for a website, 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. State clearly 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.

15:1 Define Acronyms and Abbreviations

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

Relative Importance: 1 2 3 4 5

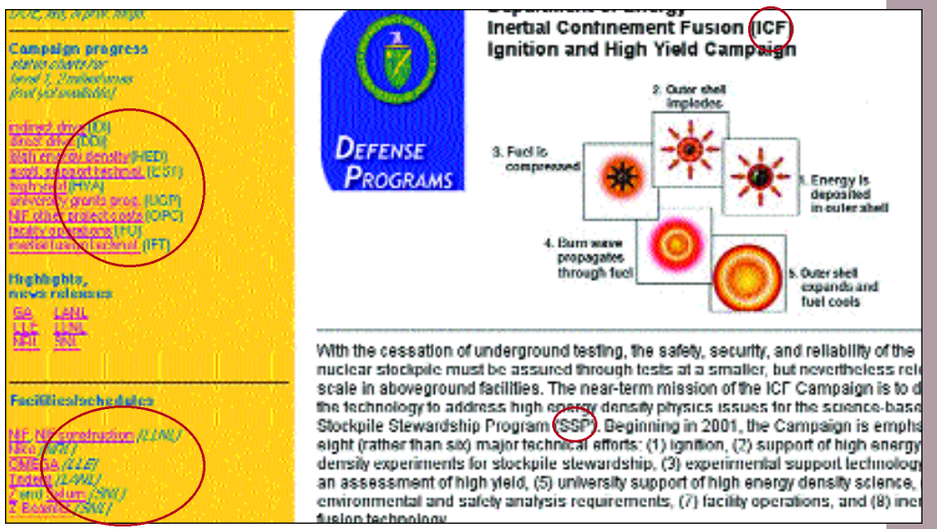
Strength of Evidence: 1 2 5 5 5

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.

Sources: Ahlstrom and Longo, 2001; Evans, 1998; Morrell, et al., 2002; Nall, Koyani and Lafond, 2001; Nielsen and Tahir, 2002; Tullis, 2001.

Example: Undefined acronyms on a homepage may leave users confused regarding the site's contents or purpose.

This detailed, highly-technical content page is designed for experts and not novice users. However, the designer has still defined each acronym and abbreviation on the page.



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15:2 Use Abbreviations Sparingly

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 ○ ○ ○

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.

Sources: Ahlstrom and Longo, 2001; Engel and Granda, 1975; Evans, 1998; Smith and Mosier, 1986.

Example:

If abbreviations are in common usage (FBI, DEA) then it is acceptable to use them. However, if an abbreviation is not in common usage (USPIS, USPP), the complete title should be used.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

15:3 Use Familiar Words

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Furnas, et al., 1987; Kucera and Francis, 1967; Leech, Rayson and Wilson, 2001; Spyridakis, 2000; Whissell, 1998.

15:4 Use Mixed Case with Prose

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 3 4 5

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.

Sources: Breland and Breland, 1944; Engel and Granda, 1975; Moskel, Erno and Shneiderman, 1984; Poulton and Brown, 1968; Smith and Mosier, 1986; Spyridakis, 2000; Tinker and Paterson, 1928; Tinker, 1955; Tinker, 1963; Vartabedian, 1971; Wright, 1977.

Example:

This block of text is an example of displaying continuous (prose) text using mixed upper- and lowercase letters. It's not difficult to read.

THIS BLOCK OF TEXT IS AN EXAMPLE OF DISPLAYING CONTINUOUS (PROSE) TEXT USING ALL UPPERCASE LETTERS. IT'S MORE DIFFICULT TO READ.

15:5 Avoid Jargon

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

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

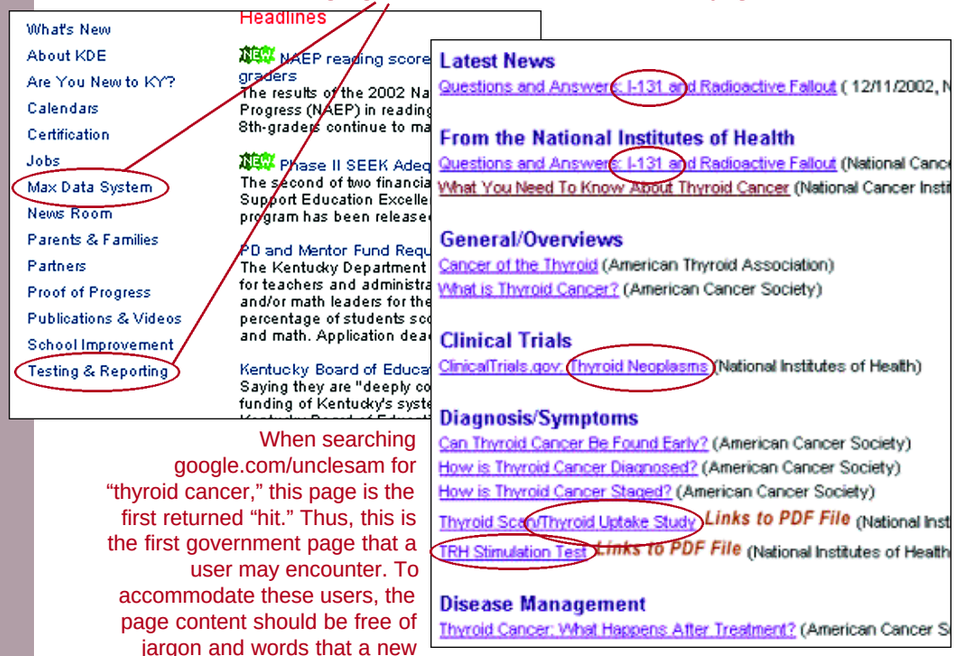
Comments: Terminology plays a large role in the user's ability to find and understand information. Many terms are familiar to designers and content writers, but not to users. In one study, some users did not understand the term "cancer screening." Changing the text to "testing for cancer" substantially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

Sources: Cockburn and Jones, 1996; Evans, 1998; Horton, 1990; Mayhew, 1992; Morkes and Nielsen, 1997; Morkes and Nielsen, 1998; Nall, Koyani and Lafond, 2001; Schramm, 1973; Spyridakis, 2000; Tullis, 2001; Zimmerman and Prickett, 2000; Zimmerman, et al., 2002.

Example:

This is a website often visited by the public. As such, the site language should be accessible and free of jargon.



When searching google.com/unclesam for "thyroid cancer," this page is the first returned "hit." Thus, this is the first government page that a user may encounter. To accommodate these users, the page content should be free of jargon and words that a new user might not understand.

See page xxi for detailed descriptions of the rating scales 1 2 3 4 5

15:6 Make First Sentences Descriptive

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

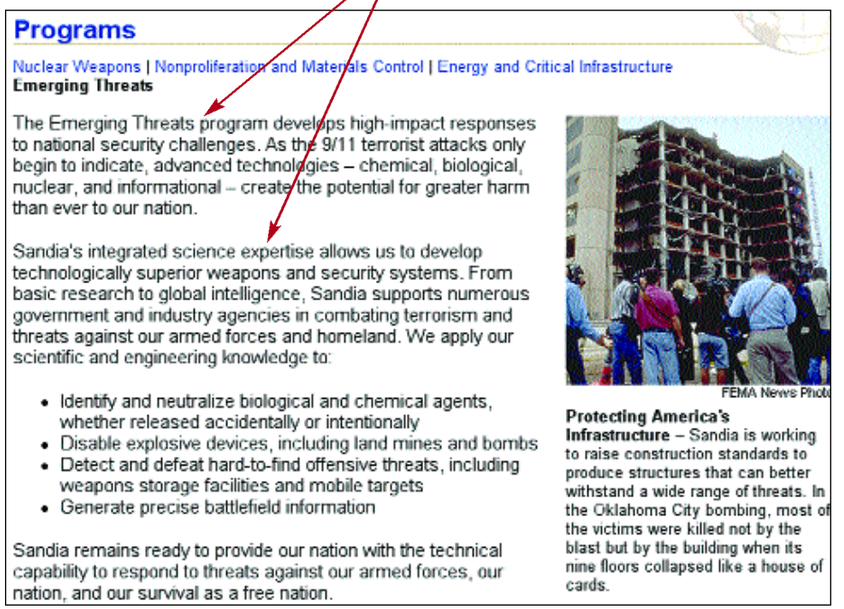
Guideline: Include the primary theme of a paragraph, and the scope of what it covers, in the first sentence of each paragraph.

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

Sources: Bailey, Koyani and Nall, 2000; Lynch and Horton, 2002; Morkes and Nielsen, 1997; Morkes and Nielsen, 1998; Spyridakis, 2000.

Example:

Descriptive first sentences set the tone for each of these paragraphs, and provide users with an understanding of the topic of each section of text.



15:7 Use Active Voice

Relative Importance: 1 2 3 ○ ○
Strength of Evidence: 1 2 3 4 ○

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.

Sources: Flower, Hayes and Swarts, 1983; Horton, 1990; Palermo and Bourne, 1978; Palmquist and Zimmerman, 1999; Redish, Felker and Rose, 1981; Smith and Mosier, 1986; Spinillo and Dyson, 2000/2001; Spyridakis, 2000; Wright, 1977; Zimmerman and Clark, 1987.

Example: Active Voice Example Passive Voice Example

"John hit the baseball." "The baseball was hit by John."

15:8 Write Instructions in the Affirmative

Relative Importance: 1 2 3 ○ ○
Strength of Evidence: 1 2 ○ ○ ○

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 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.

Sources: Greene, 1972; Herriot, 1970; Krull and Watson, 2002; Palmquist and Zimmerman, 1999; Smith and Mosier, 1986; Wright, 1977; Zimmerman and Clark, 1987.

Example: An example of negative voice pointing out consequences to the user.

Message successfully posted by: **156.40.129.142** (Logged!).

IMPORTANT: Do **NOT** press BACK - If you come back to this page, your message will be posted a second time!

See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

15:9 Limit the Number of Words and Sentences

Relative Importance: 1 2 3 ○ ○
Strength of Evidence: 1 2 3 4 ○

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.

Sources: Bailey, 1996; Bailey, Koyani and Nall, 2000; Bouma, 1980; Chervak, Drury and Ouellette, 1996; Evans, 1998; Kincaid, et al., 1990; Marcus, 1992; Mills and Caldwell, 1997; Nielsen, 1997c; Palmquist and Zimmerman, 1999; Rehe, 1979; Spyridakis, 2000; Zimmerman and Clark, 1987.

Example: This is an example of how to optimize reading comprehension. The number of words in a sentence is minimized, and there are few sentences in each paragraph.

Smallpox Vaccine: What you should know

There's been a lot in the news about the smallpox vaccine. What is it and how does it work?

The smallpox vaccine was used until the early 1970s to wipe out smallpox worldwide. Much like other vaccines, the smallpox vaccine protects against infection by helping your body develop immunity to the smallpox virus. The smallpox vaccine is made from a live virus that's very similar to the smallpox virus. The vaccine doesn't cause smallpox, but it can cause life-threatening problems in some people.

If smallpox was wiped out long ago, why am I hearing about the vaccine now?

A smallpox epidemic hasn't occurred for many years, but there are still stocks of the virus in laboratories throughout the world. It is possible that these stocks of the smallpox virus could be used as weapons in a bioterrorism attack. The United States government has developed a plan to help protect Americans against smallpox in the event of bioterrorism.

What is a Smallpox Response Team?

A Smallpox Response Team is a group of medical professionals who have received the smallpox vaccine. In the event of a smallpox attack, these people could continue to provide health care to others. The Department of Health and Human Services (DHHS) is now working with state and local governments to form these response teams.

Should everyone get the smallpox vaccine?

For most people, whether they are vaccinated against smallpox depends on whether there has been an outbreak of the disease. In most cases, the vaccine causes mild side effects, such as soreness around the vaccination site, fever and body aches. A small percent of people will suffer serious side effects and may even die. Thus, if there hasn't been an outbreak of smallpox, the risks associated with the vaccine don't outweigh the benefits for most people. The following groups of people are more likely to have severe reactions and should only be vaccinated if actually exposed to smallpox:

15:10 Limit Prose Text on Navigation Pages

Relative Importance: 1 2 3 ○ ○

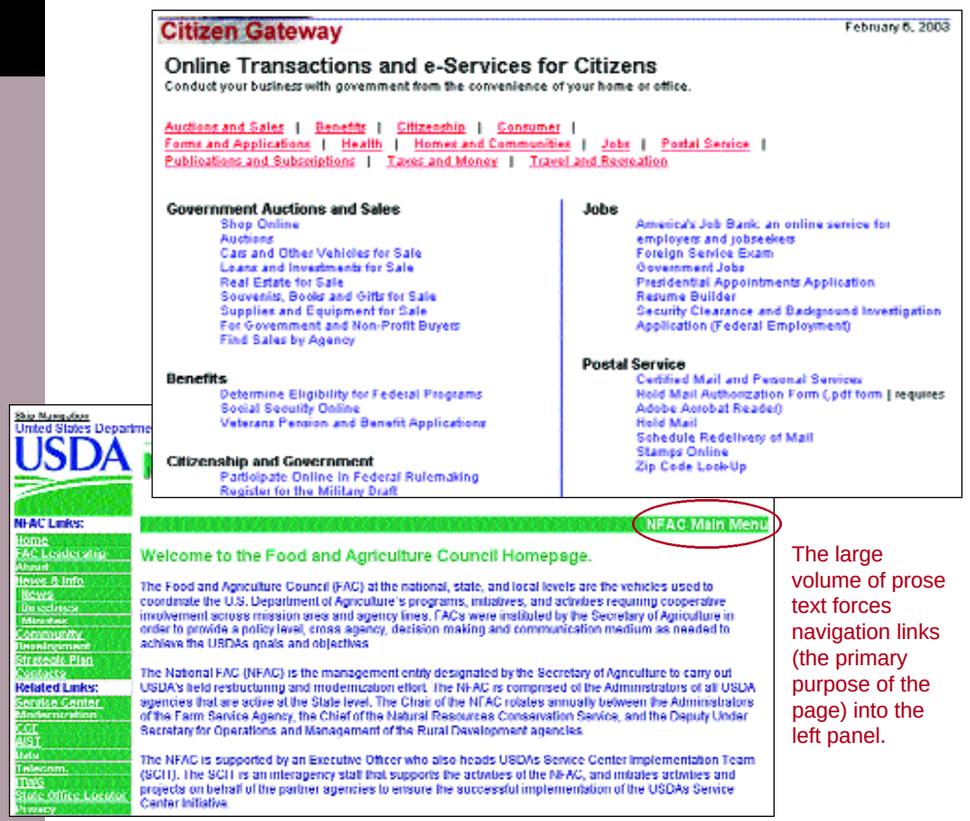
Strength of Evidence: 1 2 3 ○ ○

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.

Sources: Bailey, Koyani and Nall, 2000; Evans, 1998; Morkes and Nielsen, 1998; Nielsen, 2000; Spyridakis, 2000.

Example: The lack of prose text allows navigation elements to take center stage on this navigation page.



The large volume of prose text forces navigation links (the primary purpose of the page) into the left panel.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

15:11 Make Action Sequences Clear

Relative Importance: 1 2 ○ ○ ○

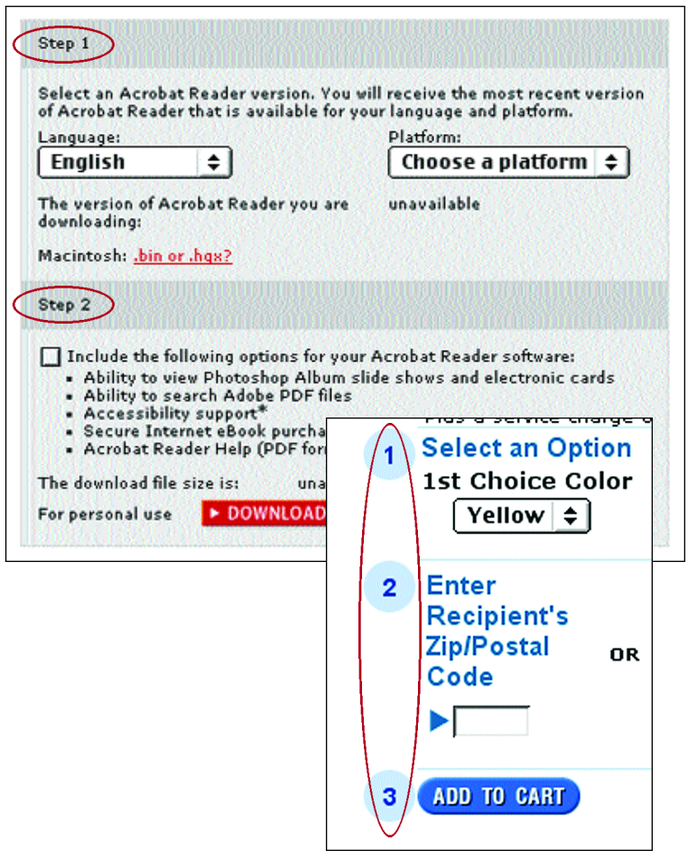
Strength of Evidence: 1 2 3 4 ○

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.

Sources: Czaja and Sharit, 1997; Farkas, 1999; Krull and Watson, 2002; Morkes and Nielsen, 1998; Nielsen, 2000; Smith and Mosier, 1986; Wright, 1977.

Example:



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.

16:1 Organize Information Clearly

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4

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

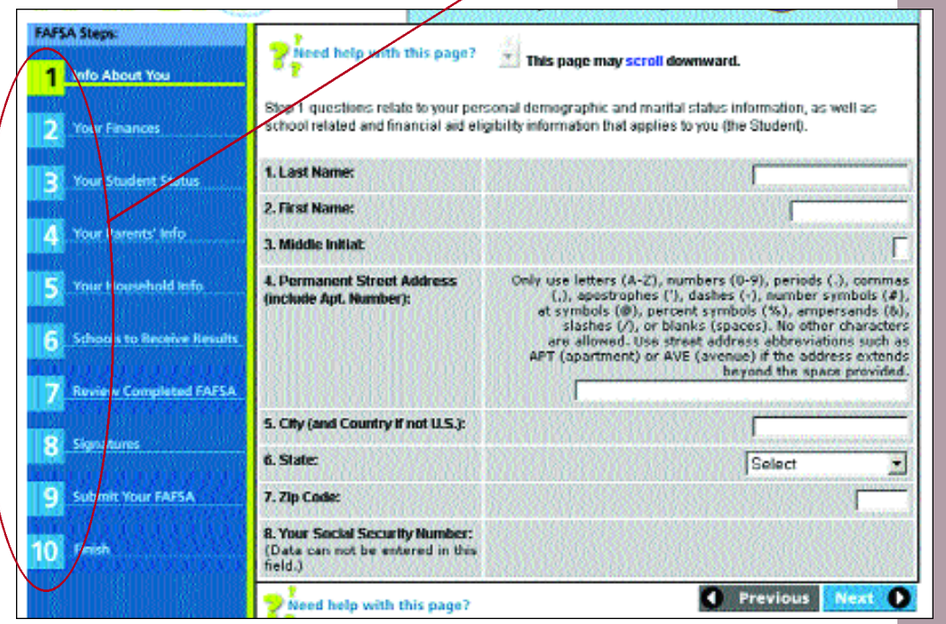
Comments: Designers should present information in a structure that reflects user needs and the site's goals. Information should be well-organized at the website level, page level, and paragraph or list level.

Good website 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.

Sources: Benson, 1985; Clark and Haviland, 1975; Detweiler and Omanson, 1996; Dixon, 1987; Evans, 1998; Farkas and Farkas, 2000; Keyes, 1993; Keyes, Sykes and Lewis, 1988; Lynch and Horton, 2002; Nielsen and Tahir, 2002; Redish, 1993; Redish, Felker and Rose, 1981; Schroeder, 1999; Spyridakis, 2000; Tiller and Green, 1999; Wright, 1987; Zimmerman and Akerelrea, 2002; Zimmerman, et al., 2002.

Example:

This design clearly illustrates to the user the logical structure of the website. The structure is built on the user's needs—namely, completing a form in ten steps.



Research-Based Web Design & Usability Guidelines

16:2 Put Critical Information Near the Top of the Website

Relative Importance: 1 2 3 4 5

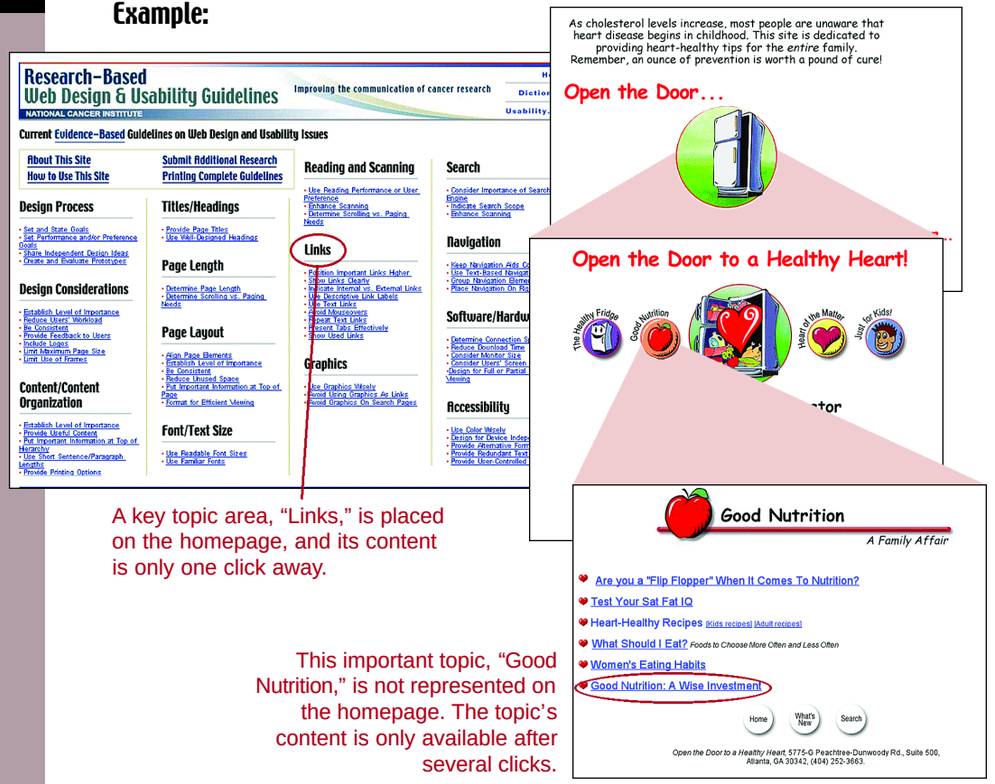
Strength of Evidence: 1 2 3 ○ ○

Guideline: Put critical information high in the hierarchy of a website.

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.

Sources: Evans, 1998; Levine, 1996; Nall, Koyani and Lafond, 2001; Nielsen and Tahir, 2002; Spyridakis, 2000; Zimmerman, et al., 1996; Zimmerman, et al., 2002.

Example:



A key topic area, "Links," is placed on the homepage, and its content is only one click away.

This important topic, "Good Nutrition," is not represented on the homepage. The topic's content is only available after several clicks.

16:3 Facilitate Scanning

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 5

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

Comments: Websites 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 dense text.

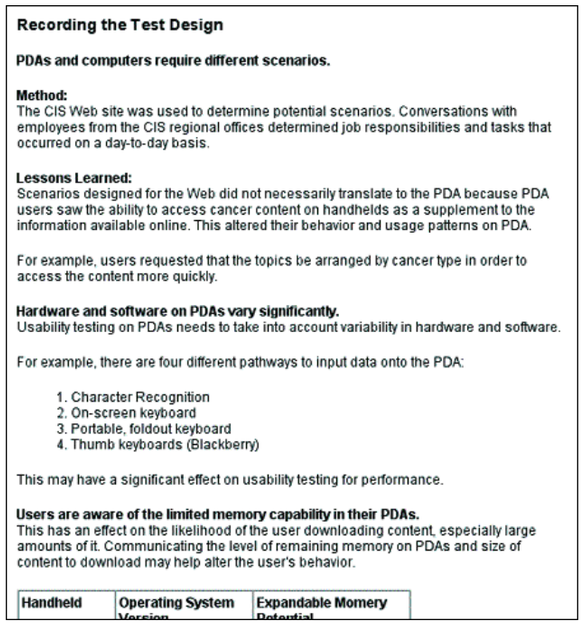
Studies report that about eighty percent of users scan any new page. Only sixteen percent read word-by-word. Users spend about twelve percent of their time trying to locate desired information on a page.

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.

Sources: Bailey, Koyani and Nall, 2000; Byrne, John, et al., 1999; Evans, 1998; Morkes and Nielsen, 1997; Morkes and Nielsen, 1998; Nielsen, 1997e; Nielsen, 2000; Schriver, 1997; Spool, et al., 1997; Spyridakis, 2000; Sticht, 1985; Sullivan and Flower, 1986; Toms, 2000; Zimmerman, et al., 1996.

Example:

This page facilitates scanning.



Recording the Test Design

PDAs and computers require different scenarios.

Method:
The CIS Web site was used to determine potential scenarios. Conversations with employees from the CIS regional offices determined job responsibilities and tasks that occurred on a day-to-day basis.

Lessons Learned:
Scenarios designed for the Web did not necessarily translate to the PDA because PDA users saw the ability to access cancer content on handhelds as a supplement to the information available online. This altered their behavior and usage patterns on PDA.

For example, users requested that the topics be arranged by cancer type in order to access the content more quickly.

Hardware and software on PDAs vary significantly.
Usability testing on PDAs needs to take into account variability in hardware and software.

For example, there are four different pathways to input data onto the PDA:

1. Character Recognition
2. On-screen keyboard
3. Portable, foldout keyboard
4. Thumb keyboards (Blackberry)

This may have a significant effect on usability testing for performance.

Users are aware of the limited memory capability in their PDAs.
This has an effect on the likelihood of the user downloading content, especially large amounts of it. Communicating the level of remaining memory on PDAs and size of content to download may help alter the user's behavior.

Handheld	Operating System Version	Expandable Memory Potential

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

16:4 Group Related Elements

Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 3 4 5

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.

Sources: Ahlstrom and Longo, 2001; Cakir, Hart and Stewart, 1980; Faraday, 2000; Gerhardt-Powals, 1996; Kahn, Tan and Beaton, 1990; Kim and Yoo, 2000; Nall, Koyani and Lafond, 2001; Niemela and Saarinen, 2000; Nygren and Allard, 1996; Spyridakis, 2000.

Example: This site organizes information well by grouping core navigation elements and key topic areas. These features allow users to search and scan for information faster.

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

16:5 Display Only Necessary Information

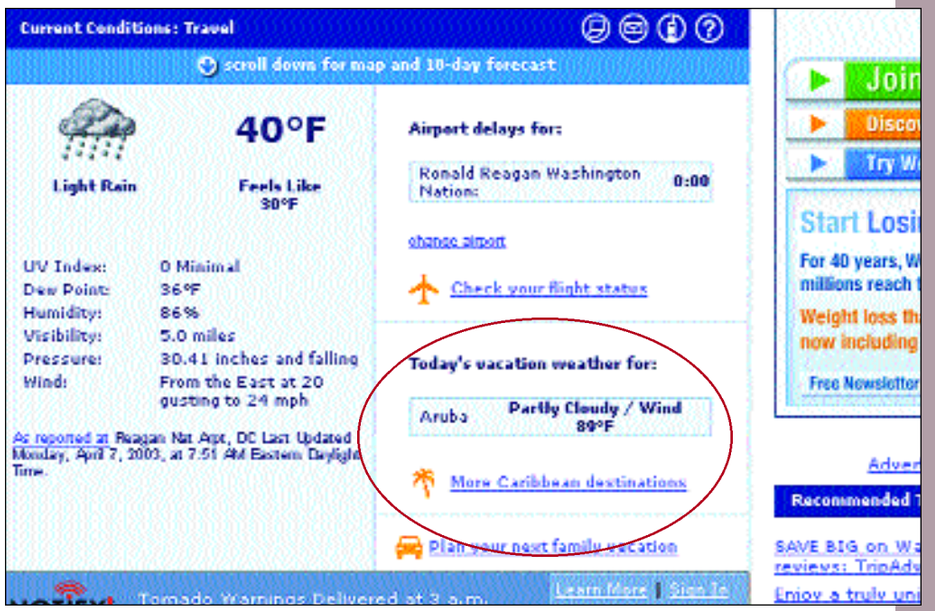
Relative Importance: 1 2 3 4 ○
Strength of Evidence: 1 2 3 4 ○

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 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.

Sources: Engel and Granda, 1975; Mayhew, 1992; Morkes and Nielsen, 1998; Powers, et al., 1961; Smith and Mosier, 1986; Spyridakis, 2000; Stewart, 1980; Tullis, 1981.

Example: An example of extraneous information. In this case, the user is looking for a weather forecast for Washington, D.C. The site provides this information, but also indicates today's vacation weather for Aruba—this information is extraneous to the user's original task.



16:6 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.

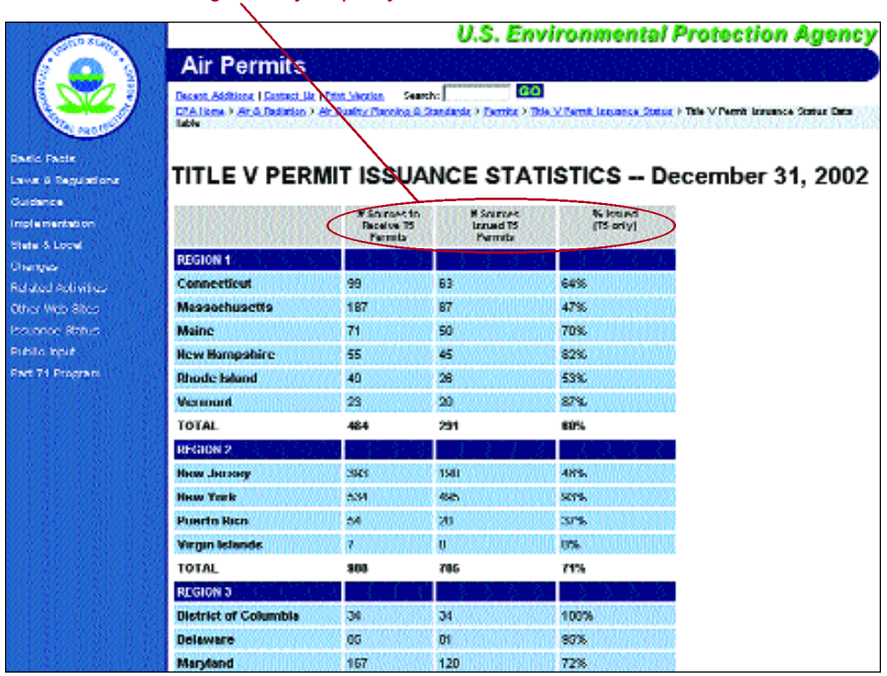
Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 ○ ○ ○

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.

Sources: Engel and Granda, 1975; Smith and Mosier, 1986; Spyridakis, 2000; Stewart, 1980; Tullis, 1983.

Example: This header row disappears as users scroll down the table. This can negatively effect users' performance on the site by exceeding their "working memory" capacity.



See page xxi for detailed descriptions of the rating scales 1 2 3 4 ○

16:7 Format Information for Multiple Audiences

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

Relative Importance: 1 2 3 4 ○

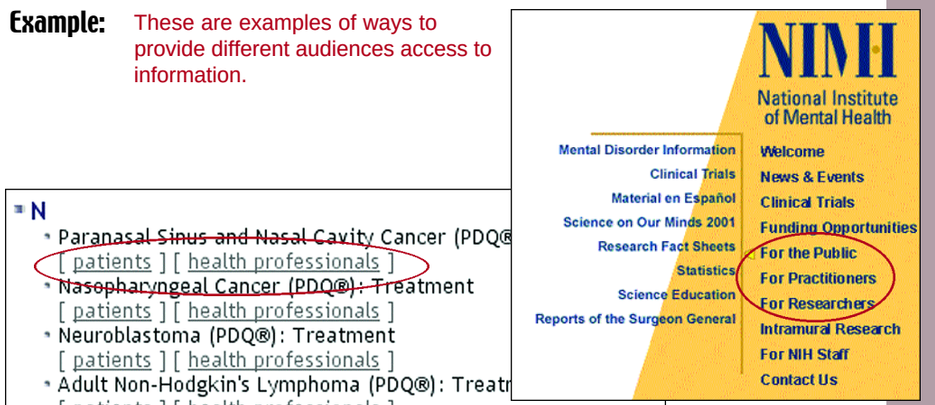
Strength of Evidence: 1 2 3 ○ ○

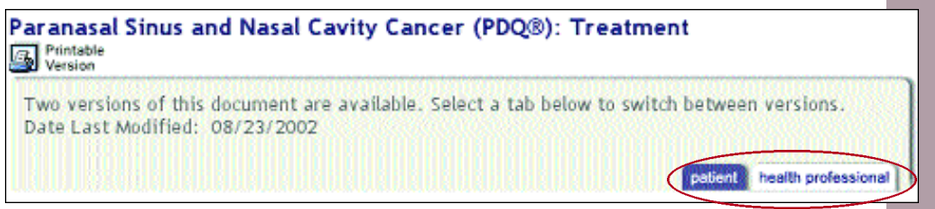
Comments: Information can be provided in varying formats and at different levels of detail on the same site. For example, information about cancer can be presented in differing ways for physicians and patients.

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.

Sources: Nall, Koyani and Lafond, 2001; Zimmerman and Prickett, 2000; Zimmerman, et al., 2002.

Example: These are examples of ways to provide different audiences access to information.





16:8 Design Quantitative Content for Quick Understanding

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

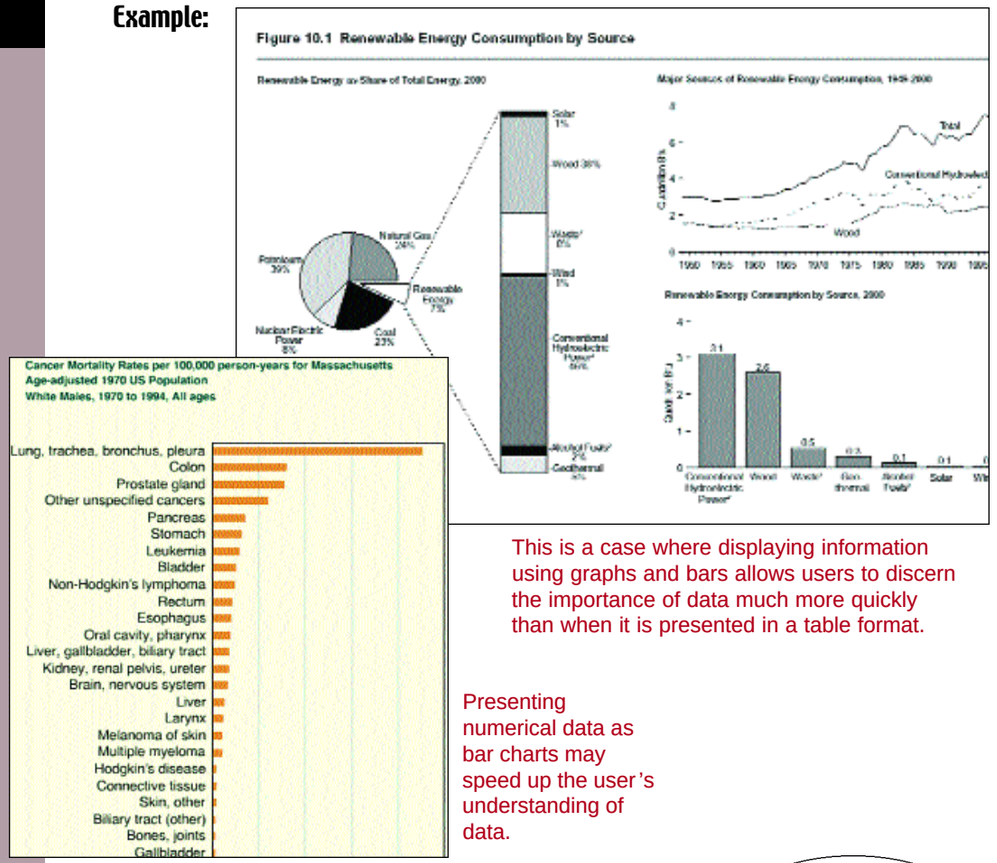
Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

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.

Sources: Galitz, 2002; Gerhardt-Powals, 1996; Kosslyn, 1994; Meyer, 1997; Meyer, Shamo and Gopher, 1999; Meyer, Shinar and Leiser, 1997; Tufte, 1983.

Example:



This is a case where displaying information using graphs and bars allows users to discern the importance of data much more quickly than when it is presented in a table format.

Presenting numerical data as bar charts may speed up the user's understanding of data.

See page xxi for detailed descriptions of the rating scales 1 2 3 4

16:9 Use Color for Grouping

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

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

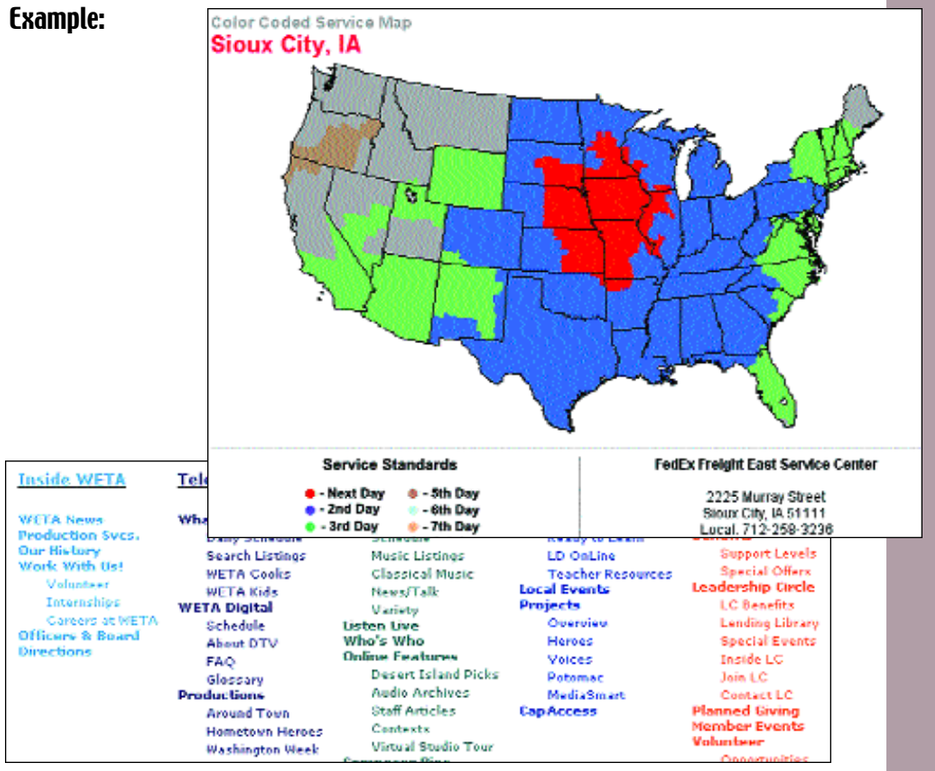
Comments: Color coding permits users to rapidly scan and quickly perceive patterns and relationships among items. Items that share the same color will be considered as being related to each other, while items with prominent color differences will seem to be different.

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 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.

Sources: Carter, 1982; Christ, 1975; Engel and Granda, 1975; Haubner and Neumann, 1986; Murch, 1985; Nygren and Allard, 1996; Smith, 1962; Smith, 1963; Smith, Farquhar and Thomas, 1965.

Example:



Search

Many websites 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 website that match the words entered by users, users are shown where in the website those words can be found.

Each page of a website 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.

17:1 Provide a Search Option on Each Page

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

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4 5

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

Sources: Detweiler and Omanson, 1996; Farkas and Farkas, 2000; Levine, 1996; Nielsen, 1996a; Nielsen, 1997e; Nielsen, 1999d; Spool, et al., 1997.

Example: As users delve deeper into the site's content, the search capability remains immediately available.

Research-Based Web Design & Usability Guidelines

17:2 Ensure Usable Search Results

Relative Importance: 1 2 3 4 5

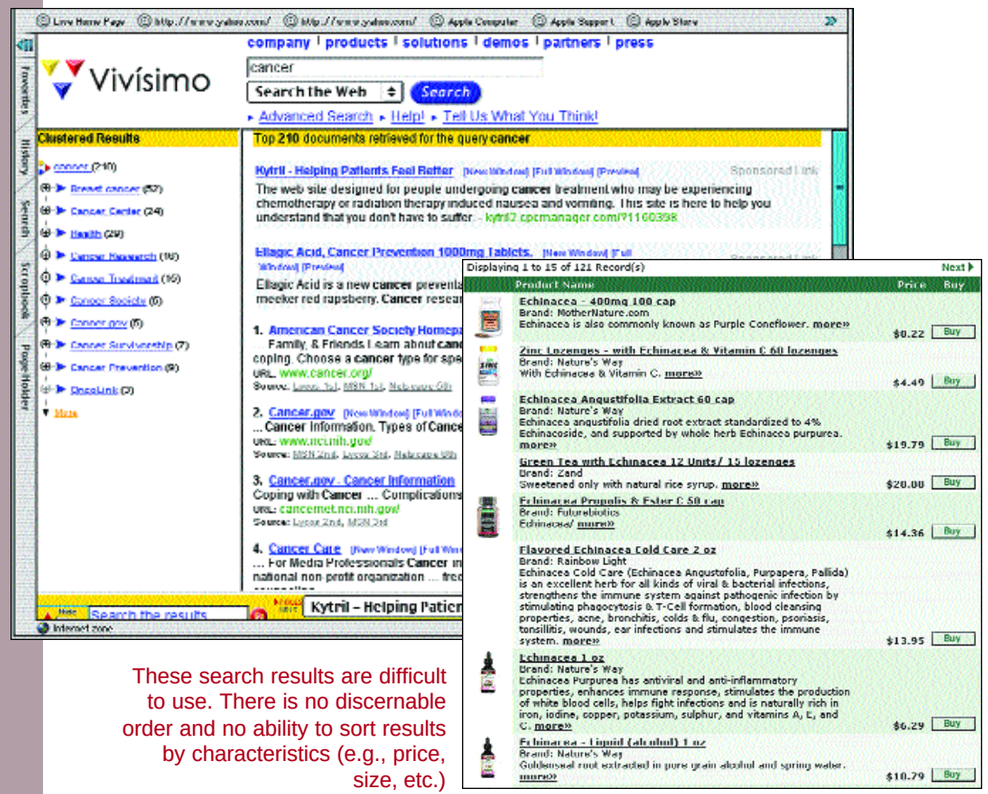
Strength of Evidence: 1 2 3 4

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.

Sources: Amento, et al., 1999; Dumais, Cutrell and Chen, 2001; Nielsen, 2001a; Nielsen, et al., 2000; Pollock and Hockley, 1996; Rosenfeld and Morville, 2002; Spool, et al., 1997.

Example: Returned search results in the main panel contain snippets of the searched page with the user's search terms highlighted (allowing the user to gain a sense of the context in which the terms are used) and a clustered list of related search terms is contained in the left panel.



These search results are difficult to use. There is no discernable order and no ability to sort results by characteristics (e.g., price, size, etc.)

See page xxi for detailed descriptions of the rating scales
1 2 3 4

17:3 Allow Simple Searches

Relative Importance: 1 2 3 4 5

Strength of Evidence: 1 2 3 4

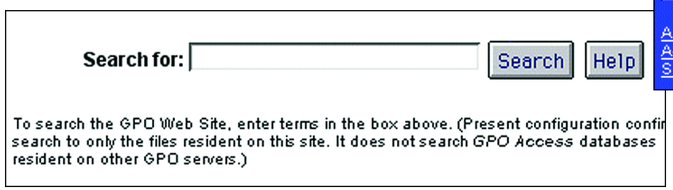
Guideline: Structure the search engine to accommodate users who enter one or two keywords.

Comments: The search function should be easy to use. Most users tend to employ simple search strategies, and will use few search terms and even fewer search features (e.g., Boolean operators, query modifiers). If most users are inexperienced Web searchers, provide simple instructions and examples to help guide users' searches.

Sources: Bayles and Bernard, 1999; Koyani and Nall, 1999; Nielsen, 2001a; Nielsen, et al., 2000; Pollock and Hockley, 1996; Spink, Bateman and Jansen 1999; Spool, Schroeder and Ojakaar, 2001b.

Example:

Simple search engines will accommodate most users' search strategies.



This search page is far too complex for the average user. Such advanced search capabilities are best presented on a page dedicated to advanced searches.

17:4 Make Upper- and Lowercase Search Terms Equivalent

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

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 ○ ○ ○

Comments: For example, "STRING," "String," and "string" should be recognized and accepted equally by the website. 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.

Sources: Smith and Mosier, 1986.

17:5 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.

Relative Importance: 1 2 3 4 ○

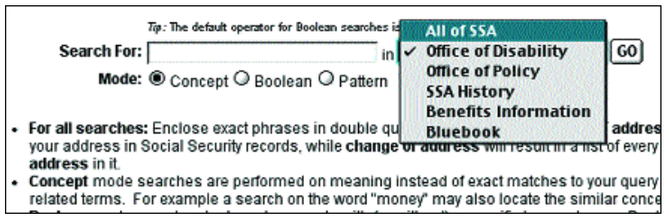
Strength of Evidence: 1 ○ ○ ○ ○

Comments: Designers may want to allow users to control the range of their searches. However, users tend to believe that a search engine will search the entire website. 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. Bottom line—make sure it is clear to users what part(s) of the website are being searched.

Sources: Spool, et al., 1997.

Example:



This design allows users to easily bound their search to a selected subsection of the website, or to run an unbounded search by selecting the "All of SSA" menu choice.

17:6 Design Search Around Users' Terms

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

Relative Importance: 1 2 3 4 ○

Strength of Evidence: 1 2 3 4 ○

Comments: Users seem to rely on certain preferred words when searching. Determining the appropriate keywords may require considerable data collection from users. Designers should research the most preferred search words for their site, and make information relevant to those terms easy to find through the site's search engine. Remember that designers' keywords may not match users' keywords, and content writers may overestimate the specialized vocabulary of their audience.

Sources: Dumais, Cutrell and Chen, 2001; Egan, Remde, Landauer, et al., 1989; Evans, 1998; Hooke, DeLeo and Slaughter, 1979; Koyani and Nall, 1999; Schiano, Stone and Bectarte, 2001; Spyridakis, 2000.

17:7 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.

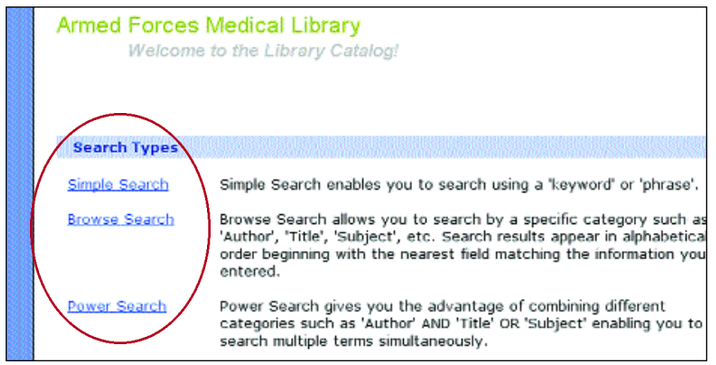
Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 ○ ○

Comments: Most users assume that a website 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.

Sources: Bailey, Koyani and Nall, 2000; Levy, et al., 1996.

Example:



See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

17:8 Provide Search Templates

Relative Importance: 1 2 ○ ○ ○

Strength of Evidence: 1 2 3 ○ ○

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 websites than those not using templates.

Sources: Fang and Salvendy, 1999.

Example: Some 'search template' examples include:

To find information on 'human error' use

errors	fault	miscalculation
slips	blunder	slip-up
mistakes	inaccuracy	

To find information on 'usability testing' use

user interface testing	cognitive walkthroughs
performance testing	automatic tests
heuristics evaluations	remote testing

To get more specific search results, try using the following tips:

Check spelling

Use multiple words
Example: our free product

Use similar words
Example: safe secure privacy security

Use appropriate capitalization
Example: Search Template Reference

Use quotation marks
Example: "our pledge to you"

Use plus (+) or minus (-)
Example: +"template language"

Use field searches
Examples:
title:about
desc:"Our Team"
keys:membership
body:security
alt:"try now"
url:help
target:Atomz

Use wildcards
Examples:
wh*
"wh* are"
415-*-*

See page xxi for detailed descriptions of the rating scales
1 2 3 4 ○

Glossary

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.

Active voice
Active voice makes subjects do something (to something). For example, in "John caught the ball," the verb "caught" is in the active voice: John did to the ball what the verb caught expresses.

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

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

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.

Auto-tabbing
A website 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.

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.

Breadcrumbs
Breadcrumbs are a navigation element that allows users to orient themselves within a website, 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.

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 website.

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 is usually done by writing items on individual paper cards, and then asking users to group together similar cards.

The grouping information from all card sorters is then combined and analyzed using cluster analysis software.

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 websites.

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 "√" appears in the box. Check boxes are conventionally used when users may select one or more items from a list of items.

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.

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.

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.

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 28,800 to 56,000 bps, DSL/cable at approximately 500,000 bps, and T1 at up to 1,500,000 bps.

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 website. 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.

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

Data entry field
A visually well-defined location on a page where users may enter data.

Density, page
A measure of the percent of the screen that is filled with text and graphics.

Destination page
The location in a website where a given user goes after clicking on a link. See also **'Target page.'**

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

Drop-down list
Drop-down lists are 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.

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.

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.

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

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.'

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.

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.

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

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.

Image map
A graphic designed to assist users' navigation of a website. Regions of the graphic are designed to be clickable.

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

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

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

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.'**

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.'**

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.

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.

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).

Paging
A website 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.

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.

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 ball was caught by John." Some argue that passive voice is more indirect and wordier than active voice.

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

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.

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.

Physical consistency
Physical consistency refers to the "look and feel" of a website. Physically 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.

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

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.'**

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-unders appear "below" the active browser window, whereas pop-ups appear "above" the active window and can obscure screen contents.

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

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

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 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 website.

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).

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

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.

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.

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.

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.

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.

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.

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.

Sequential menus
Menus that involve multiple choices that must be made in some predetermined order, with the impact of a given choice constrained by the sum total of all previous choices.

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 them.

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.

Site map
A clickable, graphic- or text-based display of a website's hierarchy.

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.

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.

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

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

Task analysis
A method used to identify and understand the activities to be performed by users when interacting with a website.

Thumbnail image
A small copy of a larger image.

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

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.

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 website.

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

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.'**

Appendices

Guidelines Ranked by **Relative Importance***

Chapter: Guideline #	Guideline Heading	Relative Importance
1:1	Set and State Goals	5
1:2	Use an Iterative Design Approach	5
1:3	Evaluate Websites Before and After Making Changes	5
1:4	Provide Useful Content	5
2:1	Display Information in a Directly Usable Format	5
2:2	Do Not Display Unsolicited Windows or Graphics	5
3:4	Do Not Use Color Alone to Convey Information	5
4:1	Design for Common Browsers	5
5:1	Create a Positive First Impression of Your Site	5
5:2	Ensure the Homepage Looks like a Homepage	5
5:3	Show All Major Options on the Homepage	5
7:1	Provide Feedback on Users' Location	5
8:1	Eliminate Horizontal Scrolling	5
9:1	Use Clear Category Labels	5
9:2	Use Unique and Descriptive Headings	5
10:1	Provide Consistent Clickability Cues	5
11:1	Use Black Text on Plain, High-Contrast Backgrounds	5
11:2	Ensure Visual Consistency	5
13:1	Distinguish Required and Optional Data Entry Fields	5
13:2	Detect Errors Automatically	5
13:3	Minimize User Data Entry	5
13:4	Label Data Entry Fields Clearly	5
13:5	Put Labels Close to Data Entry Fields	5
16:1	Organize Information Clearly	5
16:2	Put Critical Information Near the Top of the Website	5
17:1	Provide a Search Option on Each Page	5
17:2	Ensure Usable Search Results	5
17:3	Allow Simple Searches	5
1:5	Understand and Meet Users' Expectations	4
1:6	Establish User Requirements	4
1:7	Use Parallel Design	4
1:8	Consider Many User Interface Issues	4
1:9	Focus on Performance Before Preference	4
1:10	Set Usability Goals	4
1:11	Select the Right Number of Participants	4
1:12	Be Easily Found on the Web	4
2:3	Provide Assistance to Users	4
2:4	Provide Printing Options	4

* Within each scale, the guidelines are listed in the order they appear in the chapters.
See page xx for an explanation of the Relative Importance scale.

Guidelines Ranked by **Relative Importance**

Chapter: Guideline #	Guideline Heading	Relative Importance
2:5	Standardize Task Sequences	4
2:6	Minimize Page Download Time	4
2:7	Warn of 'Time Outs'	4
3:2	Design Forms for Users Using Assistive Technology	4
3:3	Provide Text Equivalents for Non-Text Elements	4
4:2	Account for Browser Differences	4
4:3	Design for Popular Operating Systems	4
4:4	Design for User's Typical Connection Speed	4
5:4	Enable Access to the Homepage	4
5:5	Attend to Homepage Panel Width	4
5:6	Announce Changes to a Website	4
6:1	Set Appropriate Page Lengths	4
6:2	Use Frames When Functions Must Remain Accessible	4
6:3	Establish Level of Importance	4
7:2	Use a Clickable 'List of Contents' on Long Pages	4
7:3	Do Not Create Pages with No Navigational Options	4
7:4	Differentiate and Group Navigation Elements	4
7:5	Use Descriptive Tab Labels	4
10:2	Avoid Misleading Cues to Click	4
10:3	Use Text for Links	4
10:4	Use Meaningful Link Labels	4
10:5	Match Link Names With Their Destination Pages	4
10:6	Ensure that Embedded Links are Descriptive	4
10:7	Repeat Important Links	4
10:8	Designate Used Links	4
10:9	Link to Related Content	4
11:3	Format Common Items Consistently	4
11:4	Use at Least 12-Point Font	4
12:1	Order Elements to Maximize User Performance	4
12:2	Display Related Items in Lists	4
12:3	Introduce Each List	4
12:4	Format Lists to Ease Scanning	4
12:5	Start Numbered Items at One	4
13:6	Label Pushbuttons Clearly	4
13:7	Label Data Entry Fields Consistently	4
13:8	Allow Users to See Their Entered Data	4
13:9	Display Default Values	4
13:10	Use a Minimum of Two Radio Buttons	4
14:1	Use Video, Animation, and Audio Meaningfully	4
14:2	Include Logos	4

Guidelines Ranked by **Relative Importance**

Chapter: Guideline #	Guideline Heading	Relative Importance
14:3	Limit Large Images Above the Fold	4
15:1	Define Acronyms and Abbreviations	4
15:2	Use Abbreviations Sparingly	4
15:3	Use Familiar Words	4
15:4	Use Mixed Case with Prose	4
15:5	Avoid Jargon	4
16:3	Facilitate Scanning	4
16:4	Group Related Elements	4
16:5	Display Only Necessary Information	4
16:6	Ensure that All Necessary Information is Displayed	4
16:7	Format Information for Multiple Audiences	4
17:4	Make Upper- and Lowercase Search Terms Equivalent	4
17:5	Design Search Engines to Search the Entire Site	4
17:6	Design Search Around Users' Terms	4
1:13	Recognize Tester Bias	3
2:8	Reduce the User's Workload	3
2:9	Use Users' Terminology in Help Documentation	3
2:10	Provide Feedback When Users Must Wait	3
2:11	Inform Users of Long Download Times	3
2:12	Do Not Require Users to Multitask While Reading	3
2:13	Design For Working Memory Limitations	3
3:1	Comply with Section 508	3
3:5	Provide Equivalent Pages	3
3:6	Ensure that Scripts Allow Accessibility	3
3:7	Provide Client-Side Image Maps	3
3:8	Enable Users to Skip Repetitive Navigation Links	3
3:9	Provide Frame Titles	3
3:10	Test Plug-ins and Applets for Accessibility	3
5:7	Communicate the Website's Purpose	3
6:4	Place Important Items at Top Center	3
6:5	Place Important Items Consistently	3
6:6	Structure for Easy Comparison	3
6:7	Use Moderate White Space	3
6:8	Align Items on a Page	3
7:6	Present Tabs Effectively	3
7:7	Use Site Maps	3
7:8	Use Appropriate Menu Types	3
8:2	Use Scrolling Pages For Reading Comprehension	3
9:3	Use Descriptive Row and Column Headings	3
9:4	Use Descriptive Headings Liberally	3

Guidelines Ranked by **Relative Importance**

Chapter: Guideline #	Guideline Heading	Relative Importance
9:5	Provide Descriptive Page Titles	3
9:6	Highlight Critical Data	3
10:10	Link to Supportive Information	3
10:11	Use Appropriate Text Link Lengths	3
10:12	Indicate Internal vs. External Links	3
10:13	Use 'Pointing-and-clicking'	3
10:14	Clarify Clickable Regions of Images	3
11:5	Use Familiar Fonts	3
11:6	Emphasize Importance	3
12:6	Place Important Items at Top of the List	3
13:11	Use Radio Buttons for Mutually Exclusive Selections	3
13:12	Use Check Boxes to Enable Multiple Selections	3
13:13	Use Familiar Widgets	3
13:14	Use a Single Data Entry Method	3
13:15	Partition Long Data Items	3
13:16	Do Not Make User-Entered Codes Case Sensitive	3
13:17	Place Cursor in First Data Entry Field	3
13:18	Provide Auto-tabbing Functionality	3
13:19	Label Units of Measurement	3
13:20	Ensure that Double-Clicking Will Not Cause Problems	3
14:4	Limit the Use of Images	3
14:5	Label Clickable Images	3
14:6	Ensure that Images Do Not Slow Downloads	3
14:7	Use Thumbnail Images to Preview Larger Images	3
14:8	Graphics Should Not Look Like Banner Ads	3
14:9	Use Simple Background Images	3
14:10	Include Actual Data with Data Graphics	3
15:6	Make First Sentences Descriptive	3
15:7	Use Active Voice	3
15:8	Write Instructions in the Affirmative	3
15:9	Limit the Number of Words and Sentences	3
15:10	Limit Prose Text on Navigation Pages	3
16:8	Design Quantitative Content for Quick Understanding	3
17:7	Notify Users When Multiple Search Options Exist	3
1:14	Use Heuristics Cautiously	2
1:15	Use Cognitive Walkthroughs Cautiously	2
2:14	Develop Pages that will Print Properly	2
3:11	Synchronize Multimedia Elements	2
3:12	Do Not Require Style Sheets	2
3:13	Avoid Screen Flicker	2

Guidelines Ranked by **Relative Importance**

Chapter: Guideline #	Guideline Heading	Relative Importance
4:5	Design for Commonly Used Screen Resolutions	2
5:8	Limit Prose Text on the Homepage	2
6:9	Choose Appropriate Line Lengths	2
6:10	Avoid Scroll Stoppers	2
7:9	Keep Navigation-only Pages Short	2
8:3	Use Paging Rather Than Scrolling	2
8:4	Scroll Fewer Screenfuls	2
9:7	Provide Users with Good Ways to Reduce Options	2
11:7	Use Attention-Attracting Features when Appropriate	2
13:21	Do Not Limit Viewable List Box Options	2
13:22	Use Open Lists to Select One from Among Many	2
13:23	Prioritize Pushbuttons	2
14:11	Display Monitoring Information Graphically	2
14:12	Introduce Animation	2
14:13	Ensure Website Images Convey Intended Messages	2
15:11	Make Action Sequences Clear	2
16:9	Use Color for Grouping	2
17:8	Provide Search Templates	2
1:16	Apply Automatic Evaluation Methods	1
5:9	Limit Homepage Length	1
7:10	Use 'Glosses' to Assist Navigation	1
8:5	Facilitate Rapid Scrolling	1
9:8	Use Headings in the Appropriate HTML Order	1
12:7	Capitalize First Letter of First Word in Lists	1
12:8	Use Appropriate List Style	1
13:24	Minimize Use of the Shift Key	1
13:25	Use Data Entry Fields to Speed Performance	1
14:14	Use Images to Facilitate Learning	1
14:15	Emulate Real-World Objects	1

Appendices

Guidelines Ranked by **Strength of Evidence***

Chapter: Guideline #	Guideline Heading	Strength of Evidence
1:2	Use an Iterative Design Approach	5
1:4	Provide Useful Content	5
1:13	Recognize Tester Bias	5
1:14	Use Heuristics Cautiously	5
1:15	Use Cognitive Walkthroughs Cautiously	5
2:5	Standardize Task Sequences	5
2:13	Design For Working Memory Limitations	5
6:8	Align Items on a Page	5
6:9	Choose Appropriate Line Lengths	5
9:4	Use Descriptive Headings Liberally	5
11:1	Use Black Text on Plain, High-Contrast Backgrounds	5
11:2	Ensure Visual Consistency	5
11:4	Use at Least 12-Point Font	5
11:5	Use Familiar Fonts	5
11:6	Emphasize Importance	5
11:7	Use Attention-Attracting Features when Appropriate	5
12:1	Order Elements to Maximize User Performance	5
13:25	Use Data Entry Fields to Speed Performance	5
14:1	Use Video, Animation, and Audio Meaningfully	5
14:6	Ensure that Images Do Not Slow Downloads	5
14:9	Use Simple Background Images	5
14:14	Use Images to Facilitate Learning	5
15:4	Use Mixed Case with Prose	5
16:3	Facilitate Scanning	5
16:4	Group Related Elements	5
16:8	Design Quantitative Content for Quick Understanding	5
16:9	Use Color for Grouping	5
1:6	Establish User Requirements	4
1:7	Use Parallel Design	4
1:11	Select the Right Number of Participants	4
1:12	Be Easily Found on the Web	4
2:6	Minimize Page Download Time	4
2:10	Provide Feedback When Users Must Wait	4
2:12	Do Not Require Users to Multitask While Reading	4
3:4	Do Not Use Color Alone to Convey Information	4
5:1	Create a Positive First Impression of Your Site	4
5:2	Ensure the Homepage Looks like a Homepage	4
6:2	Use Frames When Functions Must Remain Accessible	4

* Within each scale, the guidelines are listed in the order they appear in the chapters.
See page xxi for an explanation of the Strength of Evidence scale.

Guidelines Ranked by **Strength of Evidence**

Chapter: Guideline #	Guideline Heading	Strength of Evidence
6:3	Establish Level of Importance	4
6:4	Place Important Items at Top Center	4
6:5	Place Important Items Consistently	4
6:6	Structure for Easy Comparison	4
6:7	Use Moderate White Space	4
6:10	Avoid Scroll Stoppers	4
7:4	Differentiate and Group Navigation Elements	4
7:7	Use Site Maps	4
7:8	Use Appropriate Menu Types	4
7:9	Keep Navigation-only Pages Short	4
8:1	Eliminate Horizontal Scrolling	4
8:2	Use Scrolling Pages For Reading Comprehension	4
8:3	Use Paging Rather Than Scrolling	4
9:1	Use Clear Category Labels	4
10:1	Provide Consistent Clickability Cues	4
10:3	Use Text for Links	4
10:4	Use Meaningful Link Labels	4
10:5	Match Link Names With Their Destination Pages	4
10:6	Ensure that Embedded Links are Descriptive	4
10:7	Repeat Important Links	4
12:2	Display Related Items in Lists	4
12:3	Introduce Each List	4
12:4	Format Lists to Ease Scanning	4
12:6	Place Important Items at Top of the List	4
12:8	Use Appropriate List Style	4
13:11	Use Radio Buttons for Mutually Exclusive Selections	4
13:14	Use a Single Data Entry Method	4
13:24	Minimize Use of the Shift Key	4
14:2	Include Logos	4
14:5	Label Clickable Images	4
14:8	Graphics Should Not Look Like Banner Ads	4
14:10	Include Actual Data with Data Graphics	4
14:11	Display Monitoring Information Graphically	4
14:15	Emulate Real-World Objects	4
15:5	Avoid Jargon	4
15:6	Make First Sentences Descriptive	4
15:7	Use Active Voice	4
15:9	Limit the Number of Words and Sentences	4
15:11	Make Action Sequences Clear	4
16:1	Organize Information Clearly	4

Guidelines Ranked by **Strength of Evidence**

Chapter: Guideline #	Guideline Heading	Strength of Evidence
16:5	Display Only Necessary Information	4
17:2	Ensure Usable Search Results	4
17:3	Allow Simple Searches	4
17:6	Design Search Around Users' Terms	4
1:3	Evaluate Websites Before and After Making Changes	3
1:8	Consider Many User Interface Issues	3
1:9	Focus on Performance Before Preference	3
1:10	Set Usability Goals	3
1:16	Apply Automatic Evaluation Methods	3
2:1	Display Information in a Directly Usable Format	3
2:2	Do Not Display Unsolicited Windows or Graphics	3
2:3	Provide Assistance to Users	3
2:7	Warn of 'Time Outs'	3
2:8	Reduce the User's Workload	3
2:9	Use Users' Terminology in Help Documentation	3
2:11	Inform Users of Long Download Times	3
3:7	Provide Client-Side Image Maps	3
5:4	Enable Access to the Homepage	3
5:5	Attend to Homepage Panel Width	3
5:8	Limit Prose Text on the Homepage	3
6:1	Set Appropriate Page Lengths	3
7:2	Use a Clickable 'List of Contents' on Long Pages	3
7:5	Use Descriptive Tab Labels	3
7:6	Present Tabs Effectively	3
8:5	Facilitate Rapid Scrolling	3
9:2	Use Unique and Descriptive Headings	3
9:3	Use Descriptive Row and Column Headings	3
9:6	Highlight Critical Data	3
10:11	Use Appropriate Text Link Lengths	3
10:13	Use 'Pointing-and-clicking'	3
10:14	Clarify Clickable Regions of Images	3
13:1	Distinguish Required and Optional Data Entry Fields	3
13:2	Detect Errors Automatically	3
13:3	Minimize User Data Entry	3
13:4	Label Data Entry Fields Clearly	3
13:7	Label Data Entry Fields Consistently	3
13:8	Allow Users to See Their Entered Data	3
13:12	Use Check Boxes to Enable Multiple Selections	3
13:13	Use Familiar Widgets	3
13:18	Provide Auto-tabbing Functionality	3

Guidelines Ranked by **Strength of Evidence**

Chapter: Guideline #	Guideline Heading	Strength of Evidence
13:19	Label Units of Measurement	3
13:21	Do Not Limit Viewable List Box Options	3
14:3	Limit Large Images Above the Fold	3
14:4	Limit the Use of Images	3
14:12	Introduce Animation	3
14:13	Ensure Website Images Convey Intended Messages	3
15:3	Use Familiar Words	3
15:10	Limit Prose Text on Navigation Pages	3
16:2	Put Critical Information Near the Top of the Website	3
16:7	Format Information for Multiple Audiences	3
17:7	Notify Users When Multiple Search Options Exist	3
17:8	Provide Search Templates	3
1:1	Set and State Goals	2
1:5	Understand and Meet Users' Expectations	2
2:4	Provide Printing Options	2
2:14	Develop Pages that will Print Properly	2
3:1	Comply with Section 508	2
3:2	Design Forms for Users Using Assistive Technology	2
3:3	Provide Text Equivalents for Non-Text Elements	2
3:5	Provide Equivalent Pages	2
3:6	Ensure that Scripts Allow Accessibility	2
3:8	Enable Users to Skip Repetitive Navigation Links	2
3:9	Provide Frame Titles	2
3:10	Test Plug-ins and Applets for Accessibility	2
3:11	Synchronize Multimedia Elements	2
4:1	Design for Common Browsers	2
4:2	Account for Browser Differences	2
4:3	Design for Popular Operating Systems	2
4:4	Design for User's Typical Connection Speed	2
4:5	Design for Commonly Used Screen Resolutions	2
5:3	Show All Major Options on the Homepage	2
5:6	Announce Changes to a Website	2
5:7	Communicate the Website's Purpose	2
5:9	Limit Homepage Length	2
7:1	Provide Feedback on Users' Location	2
7:3	Do Not Create Pages with No Navigational Options	2
7:10	Use 'Glosses' to Assist Navigation	2
8:4	Scroll Fewer Screenfuls	2
9:5	Provide Descriptive Page Titles	2
9:7	Provide Users with Good Ways to Reduce Options	2

Guidelines Ranked by **Strength of Evidence**

Chapter: Guideline #	Guideline Heading	Strength of Evidence
9:8	Use Headings in the Appropriate HTML Order	2
10:2	Avoid Misleading Cues to Click	2
10:8	Designate Used Links	2
10:9	Link to Related Content	2
10:10	Link to Supportive Information	2
10:12	Indicate Internal vs. External Links	2
11:3	Format Common Items Consistently	2
12:5	Start Numbered Items at One	2
12:7	Capitalize First Letter of First Word in Lists	2
13:5	Put Labels Close to Data Entry Fields	2
13:6	Label Pushbuttons Clearly	2
13:9	Display Default Values	2
13:10	Use a Minimum of Two Radio Buttons	2
13:15	Partition Long Data Items	2
13:16	Do Not Make User-Entered Codes Case Sensitive	2
13:17	Place Cursor in First Data Entry Field	2
13:20	Ensure that Double-Clicking Will Not Cause Problems	2
13:22	Use Open Lists to Select One from Among Many	2
13:23	Prioritize Pushbuttons	2
14:7	Use Thumbnail Images to Preview Larger Images	2
15:1	Define Acronyms and Abbreviations	2
15:2	Use Abbreviations Sparingly	2
15:8	Write Instructions in the Affirmative	2
16:6	Ensure that All Necessary Information is Displayed	2
17:1	Provide a Search Option on Each Page	2
17:4	Make Upper- and Lowercase Search Terms Equivalent	2
3:12	Do Not Require Style Sheets	1
3:13	Avoid Screen Flicker	1
17:5	Design Search Engines to Search the Entire Site	1

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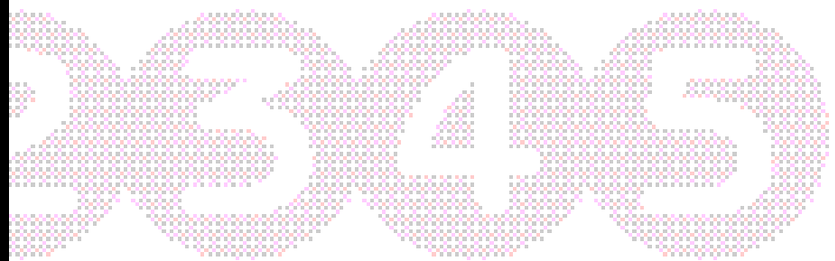

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