Bridging the GAP
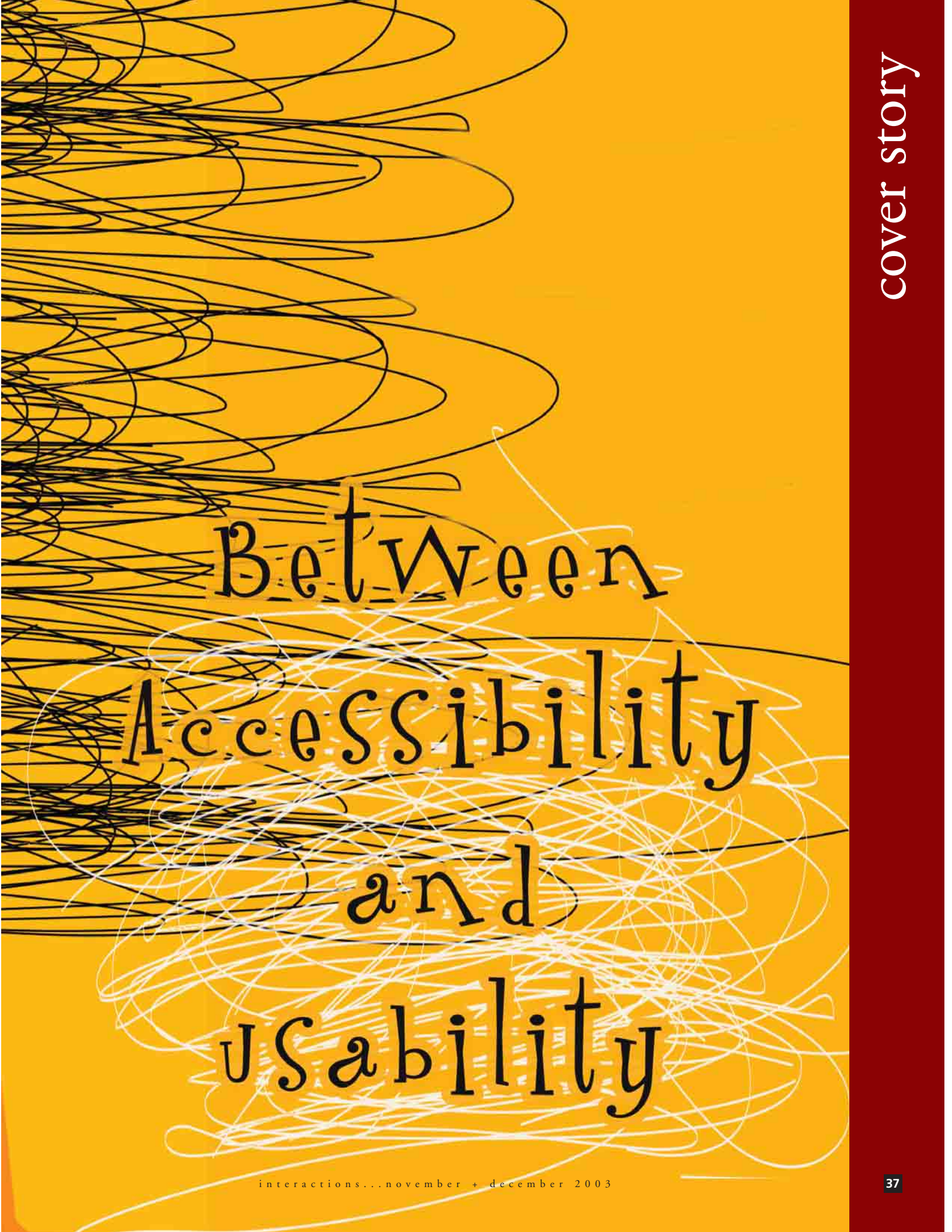
Between Accessibility and Usability

Guidelines for Accessible—*and Usable*—Web Sites: Observing Users Who Work With Screenreaders

By Mary Frances Theofanos
National Cancer Institute
Rockville, Maryland
mtheo@mail.nci.nih.gov

By Janice (Ginny) Redish
Redish & Associates, Inc.
Bethesda, Maryland
ginny@redish.net

The Communications Technology Branch of the United States National Cancer Institute (part of National Institutes of Health and Department of Health and Human Services) has been conducting usability testing with people with disabilities, specifically blind and low-vision users, to:

- Understand the relationship between accessibility and usability
- Understand how blind and low-vision users work with Web sites
- Develop research-based guidelines for accessibility and usability
- Assess the usability of specific Web sites for blind and low-vision users

Since June 2001, U.S. federal Web sites must comply with Section 508 of the Rehabilitation Act (29 U.S.C. §794.d). This law requires that agencies provide access to electronic information to people with disabilities. Section 508 identifies 16 specific standards for Web site accessibility.[1]

Meeting the required accessibility standards does not, however, necessarily mean that a Web site is *usable* for people with disabilities. And if a Web site is not usable, it is not really accessible, even if it has all the elements required by law.

Why Accessibility?

Why should you design Web sites that are both technically accessible and usable for people with disabilities? Here are six compelling reasons:

1. **Disabilities affect many more people than you may think.** Worldwide, 750 million people have a disability and three of every 10 families are touched by a disability [10]. In the United States, one in five people have some kind of disability and one in 10 have a severe disability. That's approximately 54 million Americans [8]. In 2001, 180 million people worldwide were blind or visually impaired, including 7.7 million people in the United States. This is a substantial consumer segment that should not be ignored.

2. **It's good business.** According to the President's Committee on Employment of People with Disabilities [6], the discretionary income of people with disabilities is $175 billion!

3. **The number of people with disabilities—and income to spend—is likely to increase.** The likelihood of having a disability increases with age, and the overall population is aging.

4. **The Web plays an important role and has significant benefits for people with disabilities.** Of the 54 million Americans with a disability, four in 10 are online [2]. These users spend more time logged on and surfing the Internet than non-disabled users. On average they spend 20 hours per week online. In addition, they report more positive feelings about their interactions.

    Our participants told us repeatedly how the Internet has opened up a whole new world for them and has given them a sense of independence and freedom. For example, P7 is able to read the newspaper herself for the first time. P5, who was unemployed at the time, spends more than 12 hours a day online, listening to the radio, "reading" Web sites, and chatting.

According to a Harris Poll, 48 percent of respondents with disabilities reported that the quality of their lives had been significantly improved by the Internet compared with 27 percent of respondents without a disability [2].

5. **Improving accessibility improves usability for all users.** As you'll see in the findings and guidelines in this paper, making Web sites work for people who use screenreaders takes little extra effort while bringing great benefits for everyone.

6. **It's morally the right thing to do.**

The Project

Between November 2002 and February 2003, we observed and listened to 16 blind users as they worked with Web sites using assistive devices that read the screen to them (screenreaders). Participants used the screenreader that they work with regularly: 13 used JAWS [3] and three used Window-Eyes [9].[2]

A spokesperson for the U.S. National Federation of the Blind estimates that, in the United States overall, JAWS commands 65 percent of the market in screenreaders; Window-Eyes has 35 percent of the market. The 80 percent of JAWS users in our sample reflects the situation in the Washington, D.C., area, where JAWS is the software most commonly used by U.S. federal workers.

For information about available screen-reading software, see www.tiresias.org/equipment/eb9.htm. [11]

Our 16 participants ranged from unemployed to consultants on Web accessibility.

What the Participants Did

Each participant worked with us for two hours (except P7, who was able to spend only one hour because she had transportation difficulties). At the beginning of each session, we invited the participants to customize the screenreader software. Most checked the voice and speed but did not customize it further. We have found that users who work with screen magnifiers customize them extensively, but users who listen to screenreaders do not.

Most users of screenreaders listen at an incredibly fast rate. Some of our participants indicated that they were slowing the speech for us—that they typically listened at an even faster rate than the one they used in the usability test session.

We began each session with a few questions about expectations and about how the participant typically works with Web sites. At the end of each session, we asked questions about reactions to the experience and to the specific sites the participant visited.

For most of the session, participants used the Internet to complete scenarios that we suggested:

- November: eight scenarios starting at www.hhs.gov, including one of their own
- December: 11 scenarios (the ones from November plus three to test applications)
- January: seven scenarios (three related to forms and four related to anchor links)
- February: nine scenarios (on search engines, anchor links, and frequently asked questions)

All of the sites in the study were U.S. government sites in the .gov domain. However, in the study of search engines, participants went to both www.firstgov.gov and www.google.com.

What We Learned

Our focus has been understanding how blind users work with Web sites and what that means for designers and developers. Our focus therefore is users rather than specific Web sites. In the following sections we describe insights gained from our observations and we present guidelines that can help designers and developers meet both the letter of the law and actually make Web sites usable to people who listen to screenreaders. Following the guidelines that come from this study should take no more time or effort than developers are now spending to get a good score from an automatic program like Bobby [1] or LIFT [4] while doing a better job of meeting people's needs.

The following 16 sections are grouped into lessons learned about:

- Using a screenreader
- Navigating through Web sites
- Filling out forms

At the end of each section, we give guidelines, numbered Guideline 1, Guideline 2, and so on.

Using a Screenreader

1. Screenreader users scan with their ears.
Most blind users are just as impatient as most sighted

users. They want to get the information they need as quickly as possible. They do not listen to every word on the page—just as sighted users do not read every word. They "scan" with their ears, listening to just enough to decide whether to listen further. Many set the voice to speak at an amazingly rapid rate.

They listen to the first few words of a link or line of text. If it does not seem relevant, they move quickly to the next link, next line, next heading, next paragraph. Where a sighted user might find a keyword by scanning the entire page, a blind user may not hear that keyword if it is not at the beginning of a link or a line of text.

Blind users also object to listening to descriptions of elements, such as decorative bullets that add no meaning to the page and that make them wait through three words to get to the real meaning.

Guideline 1. Write for the Web. Write in short, clear, straightforward sentences. Use bulleted lists. Put the main point at the beginning of a paragraph. Write links that start with keywords. See www.usability.gov/methods/collecting_writing.html for more on clear writing for the Web.

Guideline 2. Use empty ALT text (ALT="") or use a space as ALT-text (ALT=" ") for decorative elements on a page so that users do not have to listen to "decorative bullet image" or "decorative line." Using empty ALT text for decorative elements complies with Section 508 guidelines. When links are bulleted, there is no need to identify the bullet, just the link name.

*2. Screenreader users must understand
the browser, the screenreader, and the Web sites—
quite a mental load.*

This is a realization that we came to partway through the project after watching our participants struggle with their screenreader software as well as with the browser and the Web sites. Vision-impaired users must get a good mental model of their assistive software as well as of the sites they are going to.

It's like always being in a "help" system—having to split your cognitive energy between the task you are doing and how to use the system that is helping you. We all do this somewhat on the Web in that we have to remember browser commands as well as a site's structure; but if we think that way, vision-impaired users are splitting their cognitive energy three ways—browser, screenreader, and site.

Most screenreader users do not use the mouse. That means they depend completely on keyboard commands, and some of the keyboard commands are non-mnemonic key combinations. One of our participants, for example, had recently switched from Outspoken, a Mac-based screenreader, to Window-Eyes for the PC. He brought along his own "cheat sheets" in Braille. You can imagine that having to work with them distracted him from his work on the Web site and often made him lose his place and train of thought.

Guideline 3. For developers of screen-reading software: Make the commands mnemonic and intuitive.

Guideline 4. For designers and developers of Web sites: Make the site structure clear and obvious. The

Figure 1. Department of Health and Human Services home page. Participants were able to get a "mental model" of this page, which has a clear and simple structure.

Chart 1

Word on the Screen	What JAWS says
Homepage	hommapodge
LiveHelp	livahelp
MEDLINEPlus (a very large database of medical information)	Medlynepalus
FY (meaning "fiscal year"	fie
VA (meaning "Virginia")	va (like the Spanish for "go")

more obvious the structure of the site, the easier it will be for screenreader users (as well as for sighted users) to understand and use the site. For example, most participants in this study found it easy to quickly understand and use the new home page of the Department of Health and Human Services, shown in Figure 1. The home page has 12 buckets with bullets as well as a right-side column of news and special features. The search box is near the top. When users first open this page, the screenreader tells them that the page has 43 links. Several participants commented that that was a reasonable number for a home page. On other pages that had several hundred links, several participants reacted strongly with words like, "Oh my!" and "Wow!" indicating dismay at having to deal with so much.

3. Many users do not know or use all the features of the software.

Given the mental load of browser, Web site, and assistive device, it should not be surprising that many of our participants did not know all the features of the screenreader software. How many of us take advantage of all the functionality of any of the products that we use? How many of us update our software and yet do not learn to use all the new features that come with the update?

Most of our JAWS participants regularly used the Links List (Insert-F7). A few regularly checked the Window Title to see what page they were on (Insert-T). Only a few used the Headings List (Insert-F6) or moved from heading to heading by pressing H inside a document. No one used the JAWS command, N, to skip links. No one jumped directly to a form on a page. Only one of

our participants, a JAWS trainer, used the Virtual Viewer (Insert-F1), a JAWS feature that displays a description of a Web page so that the user can immediately find out how many headers, tables, links, and other screen elements are on a page.

Guideline 5. For developers of screen-reading software: Consider providing training to help users get the most value from the screen-reading software that they use. Consider building easy-to-use demos and tutorials on new features.

4. The software does an amazing job but still mispronounces words.

Both JAWS and Window-Eyes read amazingly well, but unusual words, acronyms, and abbreviations confuse them. JAWS mispronounced "content" in the link "Skip to Content." (See the later section "Many want to skip the navigation.") See Chart 1 for a list of some other words that came up in our study that caused problems for screenreaders—and, therefore, our participants.

Guideline 6. Write "home page" as two words.

Guideline 7. Do not make up unusual names for products, services, or elements of a Web site. Do not combine two or more words into one name. (Of course, these names often predate the Web site, and designers and developers cannot change them. Just do not add to the problem—and alert others to the problem as well.)

Guideline 8. To make screenreaders read an acronym or abbreviation as letters rather than attempting to read it as a word, use the <ACRONYM> and <ABBR>

tags as explained at www.w3.org/TR/WCAG10-HTML-TECHS/#text-abbr.

5. Many screenreader users do not want a special version ("text version")

Some of the sites that our participants visited offer a "text version" or a "screenreader version." Only two of the 16 participants said that they liked using text versions. Others argued strongly that two versions are not necessary; one version made accessible is better.

Guideline 9. For most Web sites, spend the available time and effort making one version that is accessible to all rather than creating and having to later maintain two separate versions.

Navigating through Web Sites

How do users working with screenreaders find what they need on a Web site? How do they deal with the repetitive global navigation that appears on every Web page?

6. Many want to skip the navigation but do not do so.

Many Web sites include a Skip Navigation link at the beginning of each Web page. Clicking on that link bypasses the global navigation at the top (and left—depending on where the developer has ended the skip navigation).

Our participants desperately wanted to not listen to the navigation each time they got to a page. They wanted to get right to the content. But only half our partici-
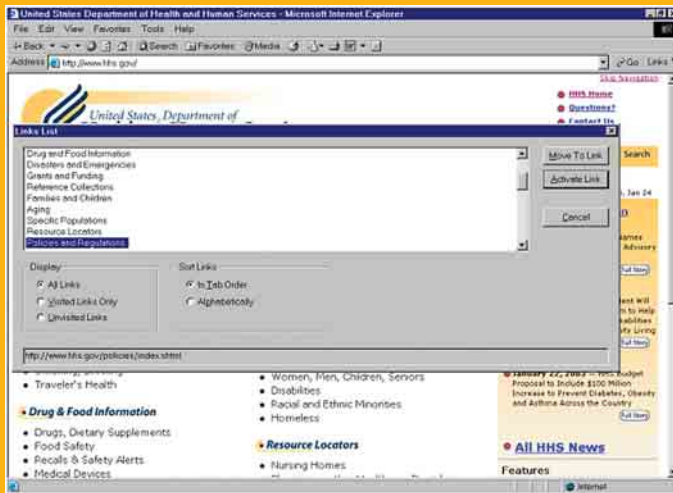
Figure 2. Example of Web page with Links List. A Links List brings all the links on the page into a separate box. The user can then navigate in this box with the arrow keys or the first letter of a link.

pants knew what "skip navigation" means. Some ranted to us about having to listen to the same "stuff" on each page, but they did not choose "skip navigation." Some jumped to the bottom of each page and scanned back up the pages to avoid the "stuff" at the top.

If we think about that, it's not surprising. "Navigation" in this context is Web jargon. In fact, the half that knew "skip navigation" were the 508 consultants, the software engineer, and the highly sophisticated computer users.

Some developers have used the phrase "skip to content" instead of "skip navigation." That seems like a good idea. Unfortunately, it does not work in JAWS because "content" can be a noun or an adjective in English—and JAWS reads "skip to content" with the accent on the second syllable, like the word for "happy." Our participants did not understand that statement at all.

No one used the JAWS keyboard command, N, which the screenreader developers put into the product to meet 508 requirements and do what Skip Navigation does even if the Web site developer did not include a Skip Navigation tag.

Guideline 10. Include a "skip" link at the top of every Web page. Name it "Skip to main content." JAWS reads that correctly as the noun "content" with the accent on the first syllable. That wording was much more meaningful to participants than "skip navigation."

7. Many users jump from link to link
or use a Links List box.

We all know that Web sites are made up of naviga-

tion pages and destination pages. Some pages are primarily used to move toward a goal; others are content pages that contain the end-state information users are looking for. On pages that are primarily used for navigation, sighted users often scan the page, focusing on the underlined blue text (or whatever seems like links).

Blind users are no different. They want to move forward quickly. screenreaders assist them by allowing users to choose to listen only to links. In both JAWS and Window-Eyes, users can do this by either tabbing from link to link or by calling up a Links List (see Figure 2)—a separate window that lists all the links on the page. (The keyboard command is Insert-F7 in JAWS and Insert-Tab in Window-Eyes.)

Within the Links List window, users can move quickly through the list with the up and down arrow keys or they can jump by typing the first letter of a link name. Our participants used this feature regularly. Participants knew this feature more than any other feature of their screenreader software.

They still scanned with their ears—even through the Links List. They did not listen to all the links or to all of a link if the link was more than a few words long. If many links start with the same words, they get frustrated. If a link they are looking for is there but not with the keyword they are thinking of at the beginning, they may not find it—and again get frustrated.

Watching blind users work in a Links List makes it obvious why "click here," "more," and other meaningless links just do not work. The Links List removes all the context from the links.

A screenreader set to Links List would say only "Answer."

Guideline 11. Make links descriptive. Be sure that the link will be useful by itself, with no surrounding text. Do not use "click here," "more," "answer," or other repetitive words or phrases as links. Look at www.aarp.org for a site that consistently expands what used to be "more" into meaningful links, such as "more travel articles," "more of today's news," and so on.

Guideline 12. Start links with relevant keywords.

Guideline 13. Try to not have many links that start with the same word or phrase.

In some ways, these guidelines are obvious and easy to implement. We know that even for sighted users, links should be descriptions of what they go to rather than "click here" or the URL. See www.usability.gov/guidelines/links.html.

In many situations, if you write well for those who listen to Web sites, you will also be writing well for those who look at the sites. For example, even sighted users have difficulty when all the headings start with "how to" instead of action verbs.

However, in some situations in which we write links, the needs of screenreader users may seem to conflict with what works best for sighted users. For example, questions make excellent headings and links (see Figure 3), but questions usually do not start with the keyword of the subject matter.

A possible solution to meet the needs of everyone is

Frequently Asked Questions

- What is literacy?
- How is adult literacy measured?
- How literate is the adult population?
- Where can I find out about literacy rates in my area?
- How does literacy in the US compare with other countries?
- How can I get funding for my adult literacy program?
- How do I find a nearby literacy program?
- How do I start an adult literacy program?
- Where can I find tutoring materials?

- Where can my organization donate books?
- Where can I get a poster about literacy?
- Where can I volunteer to work with adult learners?
- What are learning disabilities and what is their relationship to literacy?
- Where can I learn about literacy related policy in my state?
- Is there a National Literacy Day?
- What is International Literacy Day?
- What has NIFL done to raise public awareness about literacy?

Figure 3. A list of questions like this works very well for most sighted users, but our screenreader users were impatient with the question words at the beginning and could not find out how to volunteer. They wanted to use "v" to jump to a link about volunteering.
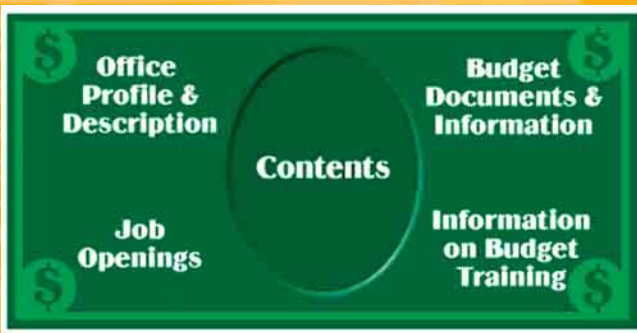
Figure 4. Find will not pick up these words because they are part of an image. (This page does have redundant text links elsewhere on the page that helped users find the budget they were looking for.)
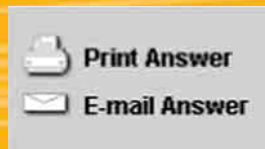

Figure 5. Example of conflict between text in ALT tag and text in image. The user found this by listening to the page. The screenreader read "printer-friendly version" for this. The user wanted to find it again, and so typed "printer" in the Find dialogue box. The response was no matches. The user was confused because she was sure she had user the printer-friendly option just a few minutes ago on the same page.

to start links like this with a keyword followed by a question, such as:

- Literacy: What is it?
- Volunteering: Where can I volunteer to work with adult learners?

Guideline 14. Start question headings with a keyword followed by the question.

8. The Find feature does not cycle through the page, and the screenreader moves the cursor as it talks.

Looking at the example of question headings where users wanted information about volunteering to help in a literacy program, you might suggest that users try the Find feature. Find tells users whether the word they are looking for is on the page. Almost half our participants, seven of 16, tried Find. Some tried it repeatedly but were often unsuccessful.

One problem is that both the Window-Eyes Find box (Ctrl-Shift-F) and the JAWS Find box (Ctrl-F) only search either down the page or up the page from wherever the cursor is on the page. It does not cycle through the page. Internet Explorer's Find box works the same way; however, sighted users usually do not have a problem because they leave the cursor at the top of the page while scanning for keywords.

Our screenreader users had a problem because they were often in the middle of a page when they decided to try Find. If the word they were looking for was higher on the page than where JAWS or Window-Eyes had

stopped reading, Find would say that the word was not on the page even when it was. Most participants did not realize that the Find feature had not searched the entire page.

Another problem is that Find cannot read what is in an image (see Figure 4).

Guideline 15. Pay attention to the wording on pages and be sure that keywords that users would look up are actually on the page. (This is useful for sighted users, too.)

Guideline 16. Make sure that the keywords are not in images.

Guideline 17. For makers of screenreading software: Make Find cycle through the entire page.

9. When the ALT tag and the text on a page differ, users may type the wrong information in the Find dialog box.

When listening to a page, P16 heard an option to get a "printer-friendly version." That's how Window-Eyes read the option. However, the text on the page was "Print Answer." When this participant wanted to find the option again, she tried to get it by going to the Find box and asking for Printer. Find reported "Search string not found"—presumably because "Printer" is not on the page, even though it was what the software read to her from the ALT tag. (See Figure 5.)

Guideline 18. Do not create subtle differences between the text on the page and the ALT text that can trip users up when they search for words on the page.

10. Some users are poor spellers, which makes searching difficult.

If users cannot find what they want by browsing links or using Ctrl-F, you would imagine that they would try searching. However, some vision-impaired users spell poorly, which makes successful searching difficult. P7, for example, said that she does not search because her spelling is poor. She commended the U.S. National Institutes of Health site search at www.nih.gov/ because it has spelling help. Several participants mentioned the spelling help on Google.

Guideline 19. Use a search engine that provides help with spelling, such as the one at www.google.com.

11. Anchor links can work well, but not if the page refreshes.

In portals and information-rich Web sites, second-level navigation pages and content pages often include several topics on the same page. "Anchor links" are links at the top of a Web page that users can click to jump quickly to information further down the same page.

Our research with both sighted users and blind users shows that anchor links can be quite helpful. For example, both sighted users and blind users found information quickly and easily on the Web site *Chemotherapy and You*, which has anchor links and did not find information nearly as quickly or as easily in the Web site *Facing Forward*, which does not have anchor links.

Watching both sighted and blind users work with *Chemotherapy and You* was a pleasure. We had a different experience with the second-level pages of

www.hhs.gov. We knew the pages worked well for sighted users, but we watched with great frustration as our screenreader users tried to use the anchor links. When participants clicked on an anchor link, the page would briefly jump to the correct place, but then it reverted to the top of the page and JAWS or Window-Eyes would start to read the page again from the top, moving immediately to the right-hand column of news. For the longest time, we could not figure out why these pages would not work properly with a screenreader.

It turns out that the culprit is the date and time stamp! Because the page is stamped for a continuously updated date and time, it refreshes with each click on an anchor link. For a sighted user, this quick refresh is hardly noticeable. For the screenreading software, it makes the page unusable. The screenreader interprets the refresh as a new page.

Guideline 20. Use anchor links when a page has several topics.

Guideline 21. Keep pages from refreshing when users select an anchor link. Do not include a time stamp on a page with anchor links.

12. Some screenreader users jump from heading to heading.

Even on content pages, most sighted users don't read. They skim and scan. If a document has lots of descriptive headings in bold or in color, many sighted people use those to quickly get a sense of what is in the document and to find a particular section. They read only the few sentences that pertain to the specific topic they are looking for.

Most screenreader users also want just the section that has the information that they need. JAWS now allows them to skim through a document as sighted users do, moving from heading to heading by pressing H or using Insert-F6 to get a Headings List (just like a Links List).

Users who know about this feature like it very much. This is a new feature in the latest version of JAWS, and only a few of our participants were familiar with it, but it is likely that others will learn of it soon, and it may become as popular with screenreader users as the Links List is for navigation pages. Window-Eyes plans to introduce this feature in its next release.

As with the Links List, however, if many of the headings start with the same words, screenreader users will be frustrated when trying to scan the headings with their ears. If the keywords they are looking for are not at the beginning of the heading, they won't find the right heading by jumping through the list with first letters.

Guideline 22. Encourage authors to use many headings in their content and to be sure that those headings are clear, meaningful, and parallel. This guideline is critical for both sighted users and screenreader users. (For more about writing useful headings, see www.usability.gov/methods/collecting_writing.html.)

Guideline 23. Be sure that the headings are coded properly in HTML, for example, as <H1>, <H2>, and so on. JAWS looks for the heading tag.

Guideline 24. Put the keyword at the beginning of the heading. If many headings are about the same thing, differentiate them in meaningful ways.

Filling Out Forms

A major—and growing—use of Web sites is transactional; part of our study involved observing users working with JAWS and Window-Eyes as they tried to find and fill out forms.

13. First, screenreader users must find the form.
The first problem that many participants had was finding the form. Although JAWS allows users to find out if there is a form on the page (with the Virtual Viewer) and to jump to the form by pressing F on the page, none of our participants did that. They listened (scanning with their ears) to the page until they got to the form—or they gave up. When there was a lot of text on a page or the form was far to the right, the form was hard to find. (Window-Eyes 4.2 has no quick way to jump to a form; this feature will be in the next release.)

Guideline 25. Do not put a lot of text on the same page as a form.

Guideline 26. Do not put a form far down on the page or far to the right.

*14. Users do not want to switch
between text and fields.*
Once they have found the form, users must figure out what each field is asking for. This can be much harder for screenreader users than for sighted users.

Screenreader software must be modal. The program needs to know whether a key press is a command to control where it goes and how it reads or a letter that the user wants to type. The default mode is for reading. Therefore, users must signal the program when they want to change to typing (Edit) mode. Switching between modes for every field in a form is annoying; users, understandably, don't want to do that.

As P10 explained, if the software does not read the label when you tab to the field, "each time you've filled in a specific box, you hit the plus key to go back to the virtual cursor and then down arrow to make sure that you are getting all the information before you come to the next field." Then you have to press Enter at the field to shift to Edit mode. A form in which you have to keep switching modes is not "well behaved."

A well-behaved form is one in which, as P10 says, "you don't have to come in and out of the Edit mode." A well-behaved form gives the screenreader user all the information to fill out a field within the field label that the user hears when in Edit mode at the field. (See Figure 6.)

Most forms that our participants came across were not well behaved. One had done such a poor job that the tag for question seven was repeated as the tag for question eight and question nine. An automated accessibility checking program like Bobby would not have given the form a poor score; Bobby only checks that the page has ALT tags, not that their contents makes sense to the user.

Guideline 27. Make sure that all fields are coded so that users do not have to switch to and from Edit mode. Use the HTML [label] element. To add more information

Figure 6. Example of well-behaved form. After filling in the Name field, the user presses Tab. The cursor moves to the field box for Current address and JAWS says, "Tab. Current address colon. Edit type text." The user fills out that box and presses Tab again. The cursor moves to the next field box and JAWS says, "Tab. Daytime phone number colon. Edit type text."

Figure 7. Users listening to JAWS did not hear "recommended or" and thus assumed they had to put in both zip and state.

than is in the label, use the Title attribute. For more information on how to do this, see http://ncam.wgbh.org/cdrom/guideline/guideline3.html.

Guideline 28. In addition to checking your site with an automated tool like Bobby or LIFT, listen to it with a screenreader.

*15. If screenreader users are in
form-filling (Edit) mode, they do not hear
text that is not part of a field.*

Even when a form is well behaved enough to read the labels with the fields, other critical information may appear between the fields. screenreader users who are tabbing from field to field will not hear that information. (See Figure 7.)

Guideline 29. Do not put information between fields on a form.

Guideline 30. If the user has an option of filling out either of two fields, and they are mutually exclusive, indicate it to the user in the label of the first field.

Guideline 31. Do not exclude labels from fields.

*16. When filling out a field makes
the page refresh, the software starts reading
from the top as if it were a new page.*

The same problem that we discussed under anchor links happens with forms. One form that our participants worked with suggested putting in the ZIP code first so that the form would return with at least part of the address filled out. That's a time-saver for sighted users, but it made the page refresh so that the screen-

reader started over at the top of the page.

Guideline 32. Avoid making pages refresh.

Conclusions

Richard Rubenstein and Harry Hersh said some years ago about software development [7, p. 29]:

In the absence of detailed information, we all work from assumptions about who the user is, what he or she does, and what type of system would meet his or her needs. Following these assumptions, we tend to design for ourselves, not for other people.

This is as true of Web development as it is of software development. As usability specialists, we know that in most cases, neither we nor the designers and developers we work with are truly representative of even our sighted users. With few exceptions, we as usability specialists—and the Web designers and developers we work with—are certainly *not* representative of our vision-impaired users. Observing, listening to, and talking with representatives of the target audience—in this case, users of screenreaders—are critical.

To truly meet the needs of all users, it is not enough to have guidelines that are based on technology. It is also necessary to understand the users and how they work with their tools. For example, just realizing that vision-impaired users do not listen to the entire page is critical for designing usable pages for them. In this paper, we have developed guidelines for bringing accessibility and usability together based on observing, listening to, and talking with blind users as they work with Web sites and their screenreaders.

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12. www.usability.gov [site with links to resources about accessibility, guidelines for good Web design, guidelines for writing for the Web]

13. www.w3.org/WAI/ [Web Accessibility Initiative of the World Wide Web Consortium]

FOOTNOTES

1. See our Web site (www.usability.gov/accessibility/index.html) for links to the U.S. law, the 508 standards, and other accessibility resources [12]. See also the World Wide Web Consortium Web Accessibility Initiative at www.w3.org/WAI/ [13].

2. This paper reports on research with users who are blind and use screenreader technology to interact with Web sites. We know that there are many ways to use the Web depending on an individual's specific disability and that vision impairment is only one of many disabilities. We also recognize that we worked only with English-speaking people in one part of the United States and that we are reporting here only on users who use one assistive technology: screenreaders. We are currently working with users who have low vision and use screen magnification software to view Web sites, and we hope to report on the results of that study soon.