Unweaving the Web: An Exploratory Study of Low-Literate Adults’ Navigation Skills on the World Wide Web

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For traditionally underserved populations, the Web can potentially unlock resources that could fundamentally improve health and wellbeing. However, there are many barriers to using Web-based content. While physical access issues are well documented, there is little understanding of how nonmainstream populations use or will use the Web. Based on an ethnographic study of a group of low-literate adults, we have identified specific navigational and content issues that present barriers to this population. We discuss preliminary assumptions that can be used to inform the development of Web tools for this target audience, and directions for future applied research.

The Web is a growing channel for communication and education about health, environment, welfare, and a range of other issues that affect the public good. That channel is seen as a quick and efficient way to present interactive information, as well as a tool for democratizing science knowledge (Eng et al., 1998). According to a recent National Science Foundation report, 1999 was the first year a majority (54%) of Americans had home computer access, reflecting an 11% increase from a similar 1997 survey (National Science Foundation, 2000). Almost as many homes can reach the Web. The same study reported that 46 percent of Americans have access to a modem in their home, up from 21 percent in 1995.

Future increases in numbers of Web users will not simply be a matter of hardware access. The manner in which content is presented on the Web will also affect those numbers. Much of the current Web content requires a relatively high level of reading comprehension skills and, according to one estimate, could affect the Web use of 41 million Americans (Children’s Partnership, 2000). Users, who are nonmainstream,
low-literate, or speakers of languages other than English, are most affected. To date, there is very little theoretical or empirical work examining the complexity of Web-based information (Graber, Roller, & Kaeble, 1999; Haas & Grams, 2000).

The digital divide, the gap between those accessing and using computers and the Web and those who are not, has been a well-documented phenomenon for low income, low-literate consumers and speakers of languages other than English (National Telecommunication and Information Administration, 1999). The U.S. Commerce Department’s National Telecommunications and Information Administration (NTIA) states that the gap between Whites and Blacks grew 39.2% during 1998, while the disparity between Whites and Hispanic grew 42.6%. A more recent privately funded study found that the rate of computer ownership grew faster over the past two years within Hispanic households (68%) than within the White population (43%) (Cheskin Research, 2000).

While one aspect of the digital divide is closely scrutinized from both policy and programmatic perspectives, the actual accessibility of format and content of Web information to low-literate, undereducated, or ethnic minority populations is much less understood. As Eng states, “one set of barriers is related to the infrastructure and hardware necessary for accessing these technologies; the other is associated with the characteristics of users and the information and applications themselves” (Eng, et al., 1998, p. 1372).

The literacy level and formats in which topics are presented on the Web are relatively high as compared to the literacy level of the U.S. and world populations. Almost 50% of the U.S. population reads at or below the 8th grade level (Kirsch, Junegeblut, Jenkins, & Kolstad, 1993), while most Web information is written at the 10th grade level and higher. There has been very little academic work examining Web-based information delivery to low-literate, low-income populations (Haas & Grams, 2000).

**Methods**

We designed and conducted an ethnographically based, semistructured observation protocol and survey interview of 24 low-literate adults as they moved through a predetermined set of Web sites. All sessions were audiotaped and researchers took notes throughout the sessions and prepared informal reports (quick notes) after each session.

Between June 6 and June 20, 2000, in the greater Providence, Rhode Island, area, we observed and interviewed 24 participants, including English-dominant and Spanish-speaking adults who are low-income and low-literate (an average reading level of 5th–7th grade). All were on public assistance, and were enrolled in literacy classes and/or introductory computer classes at two community-based organizations. Participants were recruited by the community-based organizations, and were reimbursed $25 each for their time.

**Protocol Design**

The research team reviewed the content and design of numerous Web sites, identifying tasks that might be included in the study. Each web site selected either presents information directly relating to health (e.g., medical information, access routes to medical information) or utilizes specific tools for web navigation identified as potential barriers to successful communication. The sites included in the protocol are [http://www.healthfinder.gov](http://www.healthfinder.gov), [http://www.weather.com](http://www.weather.com), and [http://www.miamiherald.com](http://www.miamiherald.com). For Spanish speaking participants, Spanish mirror sites were used when available.
Through modified heuristic evaluations we conducted usability inspections of sites anticipating the needs of actual users (Nielsen, 1994a). In addition, other researchers working on analysis of Web design and usability informed our thinking about appropriate web testing protocols (Spool, Scanlon, Schroeder, Snyder, & DeAngelo, 1998; Terrill, 2000; see also http://www.usableWeb.com and http://www.Webword.com)

Participants were asked to provide a general assessment of each site’s content and what information they could find at each site. Other specific tasks included:

- finding information about a specific health condition of their choosing (at Health-finder.gov),
- learning what the weather would be like in a specific geographic region,
- maneuvering through navigation devices such as pull-down menus,
- assessing whether all the information on the site was apparent in the screen view,
- determining and entering search words into search engine windows to seek out information of their choice,
- interpreting and maneuvering through interactive and active graphics such as TV listings,
- reading and responding exercises to assess the readability of content, and
- informing researchers how they would determine what information on the Web to trust.

The method of inquiry used during the Web sessions was a combination of ethnographic observation [for a description, see, Usability in Acts (USINACTS, 2000) at http://atwww.hhi.de/USINACTS/tutorial/choice.html], contextual inquiry (Holtzblatt & Jones, 1993), and a think aloud protocol (Nielsen, 1994b; Rubin, 1994). We designed and conducted a semistructured “shadowing” activity in which the researcher sat beside the Web user while observing and discussing the process. We introduced tasks and gave specific directions as well as supportive feedback throughout the sessions. In addition, when Web users were stalled or had a question, we provided guidance remarks following a predetermined protocol.

At the end of the session, participants were asked a series of additional questions about the role the Web might play in their life in the near future. A coding sheet was used to record users’ movements through the session. Researchers took notes during each session. In addition, we collected basic demographic information and information relevant to the study through the use of a written questionnaire given to the participants prior to the sessions.

In the final protocol participants were asked to navigate a weather site (http://www.weather.com), a health information site (http://www.healthfinder.gov), and a metropolitan newspaper’s site (http://www.miamiherald.com and http://www.elnuevoherald.com). The researchers asked participants to do some free-surfing activities, find the weather forecast, find information on a specific disease/illness, use an online TV guide, and look for a job.

During the first 5–10 minutes of each session, the researcher observed and categorized the participants’ overall Web navigation skills. The inventory included use of basic navigational devices, such as links, graphic links, active graphics, pull-down menus, the opportunity to use the back arrow, and entering Web addresses. Following a predetermined coding established by the researchers, participants were coded as either already knowing, intuited (figured out), or taught each of those navigation skills.
Numerically coded data were tallied and cross-tabulated using a combination of Microsoft Excel for tallies and SPSS 10 for cross-tabulations. Qualitative data were first analyzed through the creation of individual researcher’s quick notes. Closer analysis was done using the observational protocol sheet where notes were kept during each session. Audio tapes were used to supplement that information. Individual quotations were selected for inclusion when they add special emphasis, insight, or opposition to the quantitative data.

Findings

We gathered information using both quantitative and qualitative methods. Basic demographic and computer use information, for example, is presented quantitatively. Quantitative and qualitative information is used supportively in this study (Bryman, 1988; Lofland & Lofland, 1995; Singleton, Straits, & Straits, 1993, pp. 127–156). The quantitative information is not meant to form the basis for a statistical prediction of a larger population but rather to highlight characteristics of the consumers with whom we spoke. Qualitative findings, often in the form of representative quotes from participants, capture the range of responses to texts and tasks.

Participants

Of the 24 participants, 17 self-identified as Hispanic/Latino, 3 as African American, 2 as Asian, and 2 as White/Anglo. Participants reported their dominant (most used language) to be as follows: 5 English, 8 both English and Spanish, 1 English and Cambodian, and 11 Spanish. Most of our participants were between the ages of 18 and 25 (9 people) and 26 and 35 (9 people). Four reported being between 36 and 45, and 2 were over the age of 46. Most (20) have children as well.

Our participants are individuals who are low-literate, generally under- or unemployed and in the lower economic brackets in the United States. However, most of them have managed to obtain access to computers and the World Wide Web. That access often occurred as a result of adult learners being given older computers by the organization/school they are working with, purchasing inexpensive equipment, or using computers at community-based organizations. Ten participants reported owning a computer,1 and 15 said they had searched the Web before participating in this study. At the time of the study, those who owned computers had done so, on average, for 14.5 months.2

Prior to the start of the sessions, 15 people said they were comfortable using the Web, 2 said they were very comfortable, and 4 said they were uncomfortable. Through our observations, we subsequently classified 6 as very comfortable, 10 as somewhat comfortable, 7 as tentative, and 1 as frustrated. (Our assessments cross-tabulate with computer ownership, in that those owning computers were more comfortable overall).

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1 Community-based organizations (CBOs) reported giving or selling computers to participants when the organizations upgraded.

2 They arrived at this position in part as a response to the Welfare to Work initiatives which have placed a priority on computer literacy skills as a preparation for entering the workforce. Thus, it appears the participants are fairly well-motivated individuals, some expressing a desire to attend college in the future.
Navigation Successes

Enthusiasm

Twenty-three of our 24 participants were very excited at the opportunity to begin to explore the World Wide Web. One participant, like a wonder-filled recipient of a new gift, said, “Wow! You can click on just about anything you want to know.” She drew her breath in sharply as the next page unveiled itself in front of her – “Wow” is all she could say. “Oh this is so cool, if I learn,” she said, and later, “I wish I had a computer. Wow.”

One individual was not excited about exploring the Web and had very negative opinions about it even before the sessions began. “I don’t like it,” she said. “If I get a computer, I wouldn’t get Web. That’s what you get a TV for. Same stuff is on there.” Early in the session, she said, “I’m not an Internet freak.” However, at the end of the session this participant said that she was likely to spend more time on the Web in the next few years. Thus, it seems that all of our participants now see the Web as a growing factor in their lives.

At the end of the interviews, most of the participants said something like “That’s it?” They were disappointed because the hour had passed so quickly. They also gave very positive feedback to the community based organization that recruited them. Many participants said that every person should know “how to utilize it.” They viewed the Web as part of their evolving future and a fast way of getting information. One participant, whose children use the Web, summed it up when she said, “It’s useful, helpful, and saves a lot of time researching for information needed.”

The participants’ enthusiasm caused a few problems. For example, one woman became so excited by what she saw on the Web that she could not stay on task. The novelty of the Web seemed to simply overwhelm her.

Others liked the convenience of using the Web. One participant said, “I can get the address and get it at my own pace.” Another said that the Web,

Definitely helps you out if you were computer smart and everything and know how to get through the Web without getting stuck somewhere. I think it would help someone a great deal because it is so much easier than running around, calling someone or using the phone book or the newspaper. At the beginning when I was first on-line, I did get stuck. When I first started I was really getting stuck. Now I know how to get in and everything. I was really illiterate. I am just now getting on it.

Utility

All but one (23 of 24) of our participants believe they will be using the Web more in the next few years:3 “Because I might be working in an office and I might use it,” or for “keeping up with the news” and “chatting about countries.”

Our participants want to use the Web for a wide range of information and entertainment activities. Most participants viewed it as a tool that could improve their lives. One participant said, “I am going to have my own [Web access] in my house in the next three years. It is the business way to go. It makes you feel more intelligent than you are. It makes you feel more important.”

A number (6 of 24) said that they could save time and energy in day-to-day tasks by using the Web. One participant said the Web is “easier than running around,  

3 The sole individual thinking otherwise attributed that to a lack of economic means, not a lack of interest or desire.
calling.” Another said, “It is fantastic—it is the way to go, everything is at your fingertips.”

When asked what types of information they would use the Web for, participants mentioned the following, in descending order: health information, school/homework, child care/parenting, job search, news, my home country/other countries, entertainment, chat/E-mail. The following received one mention each: weather information, history, apartment search, shopping, church/religion, maps, literature/poetry, travel, real estate/finance, and languages.

**Learning by Doing**

The primary focus of this study was on navigation skills. We discovered that all of our participants could quickly learn Web skills such as clicking on links, and using search windows, pull-down menus and scrolling. However, when participants were concentrating on a Web site they often forgot to use the newly discovered techniques.

“If you take your time, It’s going to come to you,” one participant said, expressing her feelings about navigating the Web after finding a particularly difficult-to-find link. Later this person said, “You just got to have that open eye. You’ve got to look for that one word that is going to take you where you want to go.”

We continuously documented any assistance given to participants, and at six predetermined points in the protocol, we made a specific effort to quantify that process (Figure 1). At five of the six points, the researchers had to remind participants to scroll. At four of the six points, researchers gave typing/spelling assistance. In raw totals, the type of assistance the researchers gave most often was to remind participants to look for action buttons (22 times), about the mechanics of entering Web addresses (18 times) and to correct typing/spelling errors (12 times). Those raw tallies reflect the difficulty of Web design at each of the six points in the protocol as much as they indicate participants’ skill levels. The fact that scrolling and spelling were the help most consistently offered is perhaps more a reflection of the skill levels of our participants (in terms of spelling skills and ability to preview the page beyond the browser window) and it supports qualitative observations made throughout the protocol.

**FIGURE 1** What assistance given.
**Navigation Barriers**

Researchers assessed participants’ basic skill sets during the first five to 10 minutes of the session. We assessed skills for each of the following tools: basic links, graphic links, back arrow, scrolling, pull-down menus, clickable art/maps, and entering Web addresses (Figure 2). We later combined pull-down menus and clickable art/maps into a category we call *action graphics*.

Cross-tabulation with previous computer ownership data (as reported by participants), indicates that proficiency in basic navigation skills relates strongly to computer ownership. Participants’ navigation skills rapidly improved during the sessions, reinforcing that apparent relationship.

**Links**

During the initial assessment, most (16 of 24) participants either knew (12) or intuited (4) the function of basic links (underlined words of a different color). Eight (8) participants knew and eight (8) figured out graphic links (that is, some sort of artwork that was a clickable link). However, graphic links were often not recognized as linked if they were not clearly labeled as such. Eight (8) individuals did not recognize graphic links unless they were pointed out by the researcher. Whether or not a graphic link was
recognizable as such seemed to depend on the particular design and labeling as well as on participants’ skills.

For example, one graphic link that proved particularly troublesome for participants was a small, simple drawing of a television set that was a link to the TV listings at the *Miami Herald* ([http://www.miamiherald.com](http://www.miamiherald.com))

Fifteen (15) participants missed that link, some with multiple passes, and required help finding the TV listings (Figure 3). Of the participants who did find their way to the TV listings, several found alternative routes and did not encounter the graphic.

In another instance, we asked participants if they could find information about hurricanes at the Weather Channel ([http://www.weather.com](http://www.weather.com)). The most direct route to this information was a graphic link—a picture of a hurricane with the words “The Eye of the Storm” and more text introducing the link below that headline (Figure 4). Finding that link required scrolling down the page, but 21 participants successfully identified that graphic link. Those who did not identify that link were often misled by similar sounding categories—some of which were ultimately fruitful.

**Scrolling**

Most (18 of 24) participants either knew (11) or intuited (7) how to scroll through a page. However, none of our participants routinely scrolled to preview Web pages so that they would be aware of additional information existing beyond the frame of the browser window. Throughout the sessions, we found ourselves having to point out the possibility of scrolling to participants so that they could see all of the information on each Web page visited.

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4 While there were several routes to get to the TV listings, most encountered this graphic.
Active Graphics

We describe photos, artwork, and maps that can be enlarged, recentered, or zoomed by clicking on them as active graphics. Active graphics were somewhat less likely to be understood by our participants. Eight (8) people were taught to use them, six (6) knew and three (3) intuited how to use this feature. Seven (7) individuals knew how to use pull-down menus, seven (7) intuited and nine (9) needed instruction. Both active graphics and pull-down menus were Web navigation items that challenged our participants' initial skill levels. However, we saw that the participants had the ability to acquire skills quickly. A very important caveat is that graphics and pull-down menus need simple, direct, and noticeable instructions.

Arrows and Addresses

The two most used navigation skills for all Web users are probably using the back arrow and entering Web addresses. Both were significant barriers for many participants. We had to teach these two tasks more than others. We taught 11 or 24 participants how and where to enter Web addresses and 12 of the 24 participants the use of the back arrow.

For many of our participants, the dynamic jump from the body of the Web browser to the small URL address window was a difficult transition. However, we must note that we have on occasion witnessed the same navigation skill as a hurdle for new Web users with

5 Not all participants made it to each stage of the initial skill survey before time constraints required the researcher to move on to the next section of the protocol.
high literate levels. Perhaps this is a systemic design problem related to usability of the Web and Web browsers. Web browsers come with practically no instructions, so we are actually a bit perplexed to determine how it was that we ourselves learned to enter Web addresses.

**Spelling**

The need to spell accurately when searching is a barrier to Web use. At numerous instances, participants misspelled search words or Web addresses. When this occurred while using search engines or windows, “0 matches to your search term” was a significant barrier to further use.

Text tip pages⁶—often a link to an alphabetical listing of potential topics—helped participants find the searched for item and continue successfully navigating the Web.

One participant said,

I am not a very good speller, that is part of what I am afraid of. I have my dictionary (at home) so whenever I don’t know any words I can look it up. I think that is what a lot of people are afraid of, that they cannot spell that well and that is why they are afraid of getting into the computer.

When Hispanic participants encountered a navigation hurdle because of a misspelling, it was difficult for them to identify the problem. “You know working with computer is not easy, there are always problems,” was the explanation of one participant who was frustrated because she could not access a Web site due to a spelling error. She didn’t know what the problem was, but knew that she always encountered difficulties working with computers.

**Searching**

In this protocol we gave participants the opportunity to search for information on more than one occasion, and at other times we directed them to search. When given the choice of searching or following links, our participants generally chose links. However, most were able to use search windows when we requested they “search for” a topic.

Using superordinate categories for searching can be a barrier. Eight (8 of 24) participants chose categories that did not result in the desired information. For example, participants chose to click on a link named “living” or “business” when asked to find a job listing (the most appropriate choice would have been the link “classifieds” at this juncture), or to click on “movie listings” when asked to find the TV schedule.

**Trusting Web Information**

Participants were split over whether to trust information they found on the Web, and no one could specify how they might determine what to trust. While eleven (11) individuals said that people should not trust everything on the Web, nine (9) said that people should trust everything. Four (4) were unsure.

Reasons participants offered for trusting Web information included the level of detail in the information, the number of links to other information and Web sites, whether or not the information sought is discovered, and, “because it probably has to be from a professional because it is typed on a Web site.”

⁶ For an example, see http://www.healthfinder.com/texthints.htm
The most frequent means of establishing trust was by comparing information found on the Web to other sources (such as books and other media). Still, several participants suggested they would truth-check information found on the Web against personal experience and perceptions of the world. For example, one participant elaborated on health related issues, “No, I would not trust it (the Web), in medicine all bodies are different and they react in a different way so, I would not trust the information.” Another simply said, “I would trust it only if it makes sense.”

“It is in here,” one participant said as she pointed to her heart. “I think they should check it out first, but don’t believe everything they see.”

We are not sure if the level of trust our respondents placed on the Web is a function of the Web sites we showed them, our presence, or their lack of experience with the Web. They may very well have the same respect for information found on the Web as they do for that found through traditional media.

**Cultural Issues**

Many Hispanic/Latino participants expressed a desire to use the Web to research their native countries, to access daily news in their countries of origin, and to use chat rooms as a means of keeping family and friends present in their lives.

We found a large number of similarities in basic navigation skills across the participants from different cultures. Perhaps navigation devices are in a sort of universal language, but content must be in appropriate languages and the quality of the translations must be high.

**Implications**

**Design**

We identified significant barriers to Web use for our participants. We believe these can be overcome by changes in design and language, and increased exposure to the Web.

We believe that busy Web pages, packed with graphics or text, while possibly an attempt to help low-literate readers, actually presented multiple barriers to our participants.

In one sense, this contradicts designers’ traditional thinking that the more tools they give users, the easier they will find it to access information on the Web. Our position is reinforced by an eye-track study by the Poynter Institute which found that, in contrast to traditional print media findings, graphics are not the dominant focus point for users of Web sites (Lewenstein, Edwards, Tatar, & DeVigal, 2000).

In general, basic links were easier, graphic links were harder, and active graphics became a significant obstacle for our participants. Thus, for our participants, it seems that lower graphic use, more labels for graphics when used, and Web sites kept within the natural boundaries of browser windows will enhance the usability of Web sites.  

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7 As a basic precaution, we advise designers to consider our users as having low-cost systems that may be more than two generations removed from current technology. That is, for example as of 8/2000, they may be running 386 or 486 machines or pre-G3 Apple machines with 12 or 14 inch monitors, no graphic cards and little to no understanding of how to download and install plug-ins. This recommendation is based solely on our awareness that many of our participants who owned computers received or purchased them from nonprofit organizations that have upgraded systems.
More and more people are moving into the work force as a result of the Welfare to Work initiative, and we expect a companion rise in the level of computer literacy and usage in this group as a whole. While this might improve the situation overall, Web designers should take care to use design elements that purposefully aid this population’s ability to access Web-based forms and information.

One barrier that arises for our participants whose primary language is other than English is that when sites are mirrored in other languages, the quality of translation is especially critical.

**Policy**

The Web has become a primary channel for communication and education about many aspects of everyday life, and policy makers, both public and private, now have another opportunity to affect the lives of millions of people positively. Our study demonstrates that Web site designs can influence access and use among low-literate populations. Ignoring fundamental principles of “low barrier” design further disenfranchises a significant portion of the population who are already compromised in our society. Improving Web access and navigation can substantially empower that same group to obtain the information they need to manage their daily affairs and improve their health and well-being.

Although literacy issues have existed in this country and throughout the world for many years, it has been only in the last decade that the outcomes of low-literacy have become more widely acknowledged. Recently, for example, the American Medical Association’s Council on Scientific Affairs estimated that costs associated with low health literacy averaged about $73 billion annually (American Medical Association, 1999). Most of that expense is directly related to poor information sharing and exchange. Today, with the advent of countless health-related Web sites, a new means exists to substantially improve communication between patients and their care providers—but only if those sites can be accessed and used effectively by all consumers. Ensuring physical access to the hardware necessary to use the Web among low-income, low-literate populations is a necessary first step, but it must be accompanied by a concerted effort to ensure easy accessibility to understandable content.

A broad policy agenda regarding literacy certainly is needed and must include discussions about access to and use of information on the Web. To inform the policy process, a great deal more research is warranted.

**Further Study and Recommendations**

For future study opportunities, we see a need for reading comprehension studies of the Web targeting 8th grade and lower level readers. As part of that study, we believe that central questions should address the following:

- How do readers deal with the high linguistic level of much of the information on the Web?
- What effects are products of low-literacy versus unfamiliarity with the technology?
- How well are Web skills retained?

Additionally, we believe studies should be initiated that investigate how low-literate users react to Web-based interactive forms and requests for personal information. Also, there is a need to discover a way to alert users effectively and consistently to the fact that there is additional material beyond the browser window at most Web sites. There
is also room for comparative studies of each of the main media (e.g., TV, print, Web, radio) in order to determine what, if any, differences result from delivery via different media.

In general, we find that very few formal academic studies have been completed regarding the interaction of low-literate users and the Web. Combining the large amount of activity by both private and public institutions geared toward conquering the previously defined “digital divide” of physical access to technology with the Welfare to Work initiative, we are convinced that low-literate users will be making their way to the Web in larger numbers. The broad question that this first study only begins to answer is: will low-literate users be able to use the Web successfully when they gain physical access to the technology?

The largest effort to harmonize Web technical and design standards with accessibility as a goal comes from the World Wide Web Consortium (W3C). The consortium’s accessibility guidelines provide specific tips for Web designers. Those guidelines were developed with more of a mind to individuals with physical or visual disabilities, though they allude to creating positive results for a wide audience as well (World Wide Web Consortium, 2001). Further, the guidelines seem to be developed through a collaborative process between consortium members rather than a research program as presented here.

We did identify navigation barriers to Web use for our participants. However, those barriers, while significant upon first encounter, are also potentially overcome by fairly simple modifications to Web sites. Design and language modifications could address many of the usability issues for our participants. In particular, we recommend the following. Many of these recommendations are in line with W3C guidelines.

* Links should be clearly labeled and functional. This is especially true for graphic links. Simply changing the mouse-controlled pointer into a hand or other indication that the graphic is an active link was not sufficient on its own to alert our participants that the graphic was, in fact, linked.

* Active graphics should be accompanied by clear, simple instructions. A map that can be zoomed by a mouse click, for example, but that is accompanied by no instructions is simply a one-dimensional map to users with limited Web experience. If Web designers are going to exert the time and energy required to create such navigation and design elements, accompanying instructions will ensure that the feature is identified by users.

* Where possible, designers should keep all information in the browser window and not require scrolling, or they should explicitly inform users that more information is below the browser frame. We realize this will not be possible at all times for all sites, which may be the reason it is not addressed within the W3C accessibility guidelines. However, efforts in this direction will make it easier for our participants to receive the full benefit from Web sites. We believe more study in this area could help determine exactly what indicators are useful to alert users to the fact that more information exists beyond the browser window. In the meantime, we suggest that Web designers make an effort to explicitly indicate that content extends beyond the browser window.

* The fact that users may have difficulty spelling should be taken into consideration when designing interfaces. The interactive potential of the Web has been touted as one of its true advantages. However, an interactive capability that does not include the capacity to anticipate misspellings will present a real barrier to our target users.
Google (http://www.google.com), for example, uses an approximation system that prompts the user when a misspelling occurs with the message, “Did you mean ___?” Other possible improvements that would help our participants when they encounter spelling difficulties include linking unproductive searches directly to an index, table of contents, or a site map. Additionally, Web designers could register and create Web sites reflecting common misspellings of the actual domain name, automatically linking those sites to the actual site. This is also a recommendation that goes beyond any developed by the W3C Accessibility initiative.

- **Web designers should build redundancy into all pages by providing multiple means of entering pages.**
- **Designers could include a table of contents, links to the side, links at the bottom and at the top of each page.** Web users, like print readers and TV viewers, are not all the same. Users will bring their own cognitive mapping skills to the Web site.
- **Include instructions to the reader and helpful tips for navigation throughout Web sites.** We cannot stress this enough. The more guidelines provided to users in simple, direct language, the more seamless visits to the site will become. While this is addressed through the W3C accessibility guidelines, we take a stronger position than their simple recommendation for the presence of navigation bars and consistent design.
- **Displaying user’s path history on each page would allow users an easy method to retrace their steps after unsuccessful searches.** This is a simple addition to any Web site. Simply put the titles of the Web pages used to link to the current page as links on the current page. For example, at a hypothetical Web site for Web usability that had a link to a page on Active Graphics and a further link to a page on interactive maps, the last page could have an element such as:

  Web usability home > Active Graphics > Interactive Maps.

In the example, each of the page titles would be active links, with the exception of the last, which is the page the user is currently visiting. This enhancement of Web sites requires very little design effort and very little space on Web pages, but goes a long way in assisting low-literate and/or novice Web users to find their way in and around a Web site.

- **Building a Web site in English only is roughly analogous to establishing a business in every capital city of the world, but hiring English-speaking employees only.** Many interactive telephone systems have understood this for several years. There are significant populations within the United States, and a clear majority of the world’s population, who do not speak English as a first language—if at all. It seems clear that globalization of commerce and, to some extent, culture is unstoppable. Web developers should include a variety of audiences and multilingual capabilities in their planning.

To conclude, we believe this study has provided insights into the somewhat daunting task low-literate users face when encountering the Web. While it seems likely that extended use will help our participants solve some of those difficulties on their own, it is even more clear that Web designers could and should make an effort to reach out and ease the learning process. For designers of Web sites that contain potentially critical information for our participants—such as health, government, and legal information and access sites—these steps seem, to us, to be mandatory for any responsible Web-based information providing service.
References


