

Automated Support for Older Adult Accessibility of E-Government Web Sites

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Abstract

The NSF-funded¹ research described in this paper focuses on the development of automated software tools for improving Web accessibility for older adults. The Web offers great promise for immediate access to government information and resources that might not otherwise be available. Yet, there are design and information content barriers to the use of these Web sites making them virtually inaccessible to many older users. As such, automated support is essential for improving the accessibility of government Web sites by minimizing the cost and resources required to modify them. This paper describes some of the issues associated with Web accessibility for older adults and the proposed software solutions for addressing them.

Introduction

It is widely accepted that electronic government (e-government) offers an unprecedented opportunity for individuals to access a wealth of online services regarding healthcare, social security, taxation, registration, housing, agriculture, education, childcare, social services, and aging. This is significant for those who suffer from chronic illness, are homebound, or live in rural or remote areas, as they may have difficulty accessing government services through traditional means. However, providing online access to government services and resources does not automatically guarantee that individuals will be successful at getting the information they seek. Poorly designed e-government sites that do not meet the online needs of targeted users, supplemented with the complexity of government infrastructure may pose virtual barriers that prevent information seekers from attaining their goals. Users may already be overwhelmed with the notion of having to deal with the government based on past experience or a general lack of knowledge about government and how it works (Stowers, 2002).

Older adults represent one of the largest groups of users benefiting from online access to government resources. Twenty percent of the US population will be comprised of older adults who are sixty years or older by 2030 according to the Administration on Aging (1999). The number of older adults that are getting online continues to grow, as community resources are made available and the benefits of online resources become known. They will account for approximately 20% of all new users by 2004 (Pastore, 2000), and they will log in more online hours per week than other age groups (Holt, 2000).

Many older adults use the Web for improving both quality and longevity of life often searching for information to support these goals. Government Web sites offer great promise for immediate access to health and other information that might not otherwise be available or difficult to obtain. Yet, there are barriers to the use of these Web sites that must be addressed in order to make e-government viable for many older adults. Some government Web sites are not readily accessible because of design layout issues that impact readability. In addition, the reading grade levels required to comprehend information content on e-government sites are often misaligned with the reading comprehension abilities of this targeted group. Though there are others, these two barriers may significantly affect the use of e-government by aging citizens.

One of the objectives of building automated tools as proposed in this work is to offer government, industry and non-profit organizations an opportunity to improve Web site accessibility for older adults while

minimizing cost and resources. An important side effect is that the usability of government Web sites will be improved for other user groups including middle age adults and persons for whom English proficiency is poor. Thus, this research promotes the concept of universal usability whereby computing technology is accessible to all users regardless of age, ethnicity, gender, disabilities, education, income, culture, and religion.

E-government Initiatives

The federal government has made great progress in terms of developing policies aimed at promoting e-government to meet the needs of its citizens. The Clinton administration developed the Framework for Global Electronic Commerce in 1997, which became the impetus for electronic government. The Government Paperwork Elimination Act of 1998 provided for electronic maintenance, submission, and disclosure of information. The FirstGov.gov portal site was the result of the 1999 Presidential Memorandum on Electronic Government thereby addressing the need for easy access to federal and state governments. Other government initiatives have also taken place to promote online access to government resources by all citizens.

Many of these policies were aimed at “bridging the digital divide” in order to improve quality and longevity of life, address social problems, and promote educational advancement in our communities. Significant strides have been made to make Web sites accessible to those with disabilities primarily in the e-government sector. Section 508 of the Rehabilitation Act ([http://www/Section508.gov](http://www.Section508.gov)) requires that individuals with disabilities, who are members of the public seeking information or services from a federal agency, have access to information comparable to that provided to the public who are not individuals with disabilities. In order to comply with Section 508, government agencies have had to revise their Web sites to remove the barriers that were impeding their use by those with disabilities.

The National Institute on Aging (NIA) developed Web accessibility guidelines in order to improve the usability of a Web page for older adults. These guidelines provide for the effective design of a Web page by taking into account font sizes, types, colors, and styles, background images and colors, vertical scrolling, and text formats, among others (NIA, 2001). Several government agencies have made their Web sites more accessible by taking the NIA guidelines into account. Medicare (www.medicare.gov), for example, enforces many of NIA guidelines to improve the readability of its Web site by older adults. However, many other government Web sites are still virtually inaccessible to older adults because of design layout, navigation, and information content, among other factors.

Older Adults and Web Accessibility Challenges

The past administration’s push to bridge the digital divide initially focused on making computing technology widely available and providing training for its use. But, it was quickly discovered that bridging the divide goes beyond community centers, libraries, and homes having computing and Internet capabilities in order to bring electronic resources to older adults. Web accessibility strides have been made as a result of the Section 508 mandate and the voluntary NIA guidelines for removing barriers to Web use. However, more needs to be done to ensure that Web accessibility barriers for older adults are eliminated.

One of the challenges facing e-government is designing Web pages that are readable by older adults with vision problems due to the aging process. Vision is impacted for older adults in terms of visual acuity, contrast sensitivity, visual field, and ability to discern colors. Visual acuity is an important consideration when designing objects on a Web page because of the reduced ability to resolve fine details. Reduced contrast and increased glare compound the problem especially when the page is crowded with a lot of Web objects. Color discrimination declines with age, especially for violet, blue, green, and yellow ranges. It also becomes more difficult for an older adult to discriminate colors of the same hue or desaturated colors such as pastels (Morrell, et al., 2001). As such, font and background color combinations

together may negatively impact the readability of a Web page. When colors are used to convey meaning, the older adult may find the site virtually inaccessible.

Effective Web designs remains elusive for many e-government sites in terms of readability, understandability, and ease of use. The results of usability assessments for 32 state government Web sites are used to illustrate this point. Over 90% of these Web sites made use of font sizes smaller than 12-point font making text on links, images, and content illegible for many older adults. Ninety-one percent of the state homepages had font and background color combinations that negatively impact readability of information content. Many state government sites used mouse-over technology requiring older adults to precisely move the mouse over menu items to display additional links.

Another challenge is the reading comprehension requirements of a Web site. A government Web site that complies with Section 508 and adheres to the NIA guidelines still may not be accessible to older adults due to the reading complexity of its contents. This is particularly important for ethnic older adults for whom English proficiency is low. US census data (www.census.gov, 2001) shows that the education level for today's older adults is lower than the general population in terms of attaining a high school education. In particular, the ethnic, aging population has an education level that is significantly lower than its white counterpart. Seventy-four percent of white, older adults completed high school; whereas, 63% Asians and Pacific Islanders, 46% of African-Americans, and 37% Hispanic aging adults have high school degrees. Health literacy guidelinesⁱⁱ recommend writing content ranging from fifth to eighth grade reading grade levels in order to accommodate the reading proficiency of most adults. Many e-government sites require a twelfth grade reading level in order comprehend its contents. Table 1 summarizes the reading comprehension requirements of sampled government, nonprofit, and commercial Web content to illustrate the online literacy challenges facing older adults.

There are insurmountable barriers to Web use for persons with no English proficiency when translated versions of an e-government site contain English text. This is particularly an important issue when addressing Web accessibility for ethnic, older adults. An assessment of government Web sites found that translated versions contained English text on navigation bars, links, error messages, and help pages (Becker & Crespo, 2001). Too often, the translated versions are not readily found on the homepage of government Web sites or require a basic understanding of English to navigate to the translated site.

Table 1: Readability Statistics

Web Sites	No.	3 > Syllable Words	Ave. RGL	Min. RGL	Max RGL	Ave. Sentence Length
Commercial	14	20%	11.53	8.87	14.35	18.47
Nonprofit	8	21%	12.15	7.67	17.36	18.7
Fed. Gov.	12	23%	14.01	10.70	18.03	21.06
Total	34					

RGL = Reading Grade Level Reading Ease Score = 0 (complex) to 100 (easy)

Automated Support

In order to address these barriers, we are developing an automated toolset that promotes Web accessibility for older adults. The tools are available for public use and they are being updated with new versions as improvements are made to the tools. Several of the stools are briefly described below.

The objective of the **Dottie** software tool is to automate the process of checking a Web page for compliance with many of the NIA guidelines. Once a Web page is checked, a report of error types is generated along with the source code line numbers. This allows the Web developer an opportunity to review and fix source code in order to make a Web page more accessible to an older adult. This is an important feature of Dottie because most developers don't have the time or resources to manually search a Web page for potential improvements. This is especially pertinent given that the law does not mandate Web accessibility for older adults; and as such, governments have less incentive to addresses these issues given tight budgets and time constraints.

The functionality of Dottie is similar to an automated tool called Bobby available at www.watchfire.com. Bobby has proven to be extremely useful in both the government and commercial sectors in identifying Web accessibility problems based on Section 508 guidelines. Bobby focuses primarily on Web accessibility for the visually, audio, and physically impaired, but it does not specifically address accessibility issues associated with older adults. The Dottie tool has been developed to address the NIA guidelines for improving the accessibility of Web sites.

A second tool called the **Usability Enforcer** dynamically transforms a Web page into an accessible one for older adults by applying predefined usability rules (Becker & Nowak, 2003). For example, usability rules “font size must be 12 point or greater,” “no background images,” “no italicized text,” and “left justified text,” are used to generate a Web page that meets the needs of an older adult user. It also takes into account the user’s computing environment and browser settings during the transformation process. The significance of this tool is the automated generation of HTML source code that could be readily used by a developer to improve the design of a Web page. Thus, the time and resources for improving a Web site are both minimized.

The **ReadMe** tool produces readability metrics for a Web page using popular reading indexes. It identifies average sentence length and word complexity based on the number of syllables in the words. Overall, the syllable counts are approximately 96% reliable, which is deemed acceptable given the complexity of the English language. The data presented in Table 1 was produced using the ReadMe tool in order to show the reading comprehension complexity associated with e-government, commercial, and nonprofit Web pages.

Ongoing Research

The tools presented in this paper are being used to assess both state and federal government Web sites that are available via the Firstgov.gov portal. These findings will be shared with both state and federal governments in order to provide an opportunity to make improvements to their Web sites. Several other tools are currently under development and will be made available in future updates of the Web site.

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ⁱⁱ The Joint Commission on Accreditation of Healthcare Organizations recommends fifth to eighth grade reading levels. The National Work Group on Literacy and Health (1997) recommends a fifth reading grade level.