A usability analysis of municipal government website home pages in Alabama

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1. Introduction

Usability experts involved in developing websites for governments—whether city, state, or federal—often point to the need to account for usability in terms of user experience (e.g., Zappen, Harrison, & Watson, 2008). Zappen et al. (2008) describe current thought about usability this way: “Concurrent with Web 2.0 conventions, theory and practice in information design has become conflicted. One school of thought holds to the traditional belief in functional, task-oriented usability principles...while the other school of thought urges that this traditional belief be either supplanted or supplemented by a new information-design paradigm that emphasizes not mere functionality but a more satisfying total user experience” (p. 17). As these researchers make clear, now more than ever, user experience is clearly considered to be critically important. That said, it is also clear that in the past, many government websites (e.g., Asiimwe & Lim, 2010; Holzer & Kim, 2004), particularly of small- to medium-sized cities (e.g., Moon, 2002), struggle to achieve basic, task-oriented usability as assessed via industry-standard heuristics (e.g., Nielsen & Tahir, 2001; Pearrow, 2000). Closely tied to this—indeed, subsumed within this problem—government websites at all levels have often had problems with accessibility, despite federal and state accessibility legislation, including Section 508 of the Rehabilitation Act, the U.S. federal mandate that government websites be accessible to users with disabilities (Evans-Cowley, 2006; Fagan & Fagan, 2004; Olatere & Lazar, 2011). Section 508 applies specifically to federal agencies and organizations. Similar standards have been adopted at the state level, including in Alabama (Georgia Tech Research Institute, 2009). The current study built on this research and found that usability and accessibility problems are endemic in many Alabama municipal (i.e., city) websites.

Site usability is an important component of website quality, and as Scott (2005) says, developers of government sites “must regularly monitor and enhance the quality of their sites to attract and satisfy users” as content site and use site increase (p. 151). Scott argues that a quality e-government site manifests five characteristics, three of which relate to the expected content: transparency, transactions, and connectivity. Two other components of site quality relate to site design: personalization and usability. In regard to the former, personalization, Scott notes that “there are legitimate privacy issues related to the personalization techniques that require policy debate” (p. 155), but he does point out that sites including personalized features such as customized e-mail alerts “are regarded as being of higher quality” (p. 155). Lack of usability diminishes user experience. It leaves many citizens—including but not limited to citizens with disabilities—unable or unwilling to pursue online government services (e.g., Abanumy, Al-Badi, & Mayhew, 2005). Usability problems can also undermine overall trust in an e-government system (Teo, Srivastava, & Jiang, 2008). Although usability is important in creating quality, as Scott points out, “the technologies, software, and analytical requirements of creating a site that adheres to even basic usability standards “may be challenging for municipalities with limited resources” (p. 155).

Similarly, Baker (2009) meta-analyzed six studies of e-government usability and found that usability encompasses a number of variables, including online services, user help, and “legitimacy” (i.e., credibility). He also found that navigation aids, information architecture, and accessibility accommodations play an important role in the extent to which a site is usable. These last three variables relate in kind to the variables that we examined as we assessed usability of municipal websites. Although we recognize that using a broad assessment of usability like the one that Baker (2009) proposes (or an assessment of quality like...
the one Scott proposes) would provide a more substantive view of how well citizens can use and interact with their city government via the city's site, we limited our study to basic and research-based determinants of site usability to determine the extent to which city sites achieved even a basic level of usability.

This study uses corporate and e-government usability benchmarks to compare 129 municipal government websites in Alabama (Cappel & Huang, 2007; Pew Center on the States, 2008; West, 2008) and examines correlations between municipal resources, as measured through population and per capita income, and home-page usability scores (see also Moon & deLeon, 2001; Weare, Musso, & Hale, 1999). Examining a possible correlation between site usability and municipality population is interesting in that, as Moon (2002) writes, “larger municipal governments may have more stakeholders and be more sensitive than smaller municipal governments to the external pressures to make the government more efficient” (p. 429–430). Also, smaller governments are hampered by “lack of technical, personnel, and financial capacities” (p. 431). Because municipality finances dictate the resources municipalities can put toward their government websites, we also examined a possible correlation between the three site usability measures and per capita income.

We focused on e-government in Alabama for two reasons. First, our land-grant university is located in Alabama, and this research furthers our mission of community outreach. Second, Alabama is an interesting case in terms of e-government: it has put resources at the state level toward improving e-government services. In 2008, Alabama ranked in the top 10 states that capitalized on interactive web features (such as multimedia, surveys, and message boards) to improve public outreach and delivery of services—after three years of being ranked in the bottom three (West, 2006, 2008) and after having been identified as having substantial accessibility problems at the state level in 2003 (Potter, 2002). However, this success in improving e-government has not necessarily trickled down from the state to the municipal level.

Our study first tests possible correlations between city size and three measures of basic usability, as well as per capita income and these same measures of usability, to determine whether a city’s size and resources relates to its site’s usability. Then, our study examines the usability guidelines that city sites enact most often and those that city sites fail to reach. It also examines the scores of city sites on two popular yardsticks of usability: the W3C’s online HTML Validation Service (W3C, 2010b) and WAVE, WebAIM’s automated web accessibility evaluation tool (WebAIM, n.d.d).

2. Why web usability is important

Prior research suggests that usable websites benefit cities in at least two ways. First, a website offers a first impression of a city to company executives thinking of starting or moving a business. As Sicilia, Pérez, and Heffernan (2008) write, “The website of a city represents a city’s window into this connected, global and electronic world. It has become the first information source for most people and most companies interested in a particular city” (p. 6). For this reason, cities need to consider site usability—a critical component of site visitors’ first impression. Indeed, as Grodach (2009) points out, a city’s website is one “place” that a city has total control over what people will see: “Unlike the physical city, websites are a space in which...public officials can selectively decide which buildings, people, and places will symbolize the city” (p. 184). Part of making a visit to the city’s site—the online representation of the physical place—a positive experience is considering how easily site visitors are able to access and use the site.

Second, usability improves users’ trust in e-government. Without trust, users—faced with no other alternative—may go back to traditional means of interacting with the government (Teo et al., 2008; Warkentin, Gefen, Pavlou, & Rose, 2002) rather than using the e-government site. Teo et al. (2008) studied continued usage of a site and found that trust in an e-government site is significantly associated with perceived site quality, including system quality, which is a site’s “technical reliability and ease of use” (p. 106). And once citizens trust an e-government site, they will use it more frequently, which in turn improves citizens’ ratings of government responsiveness and leads to more process-related trust (Tolbert & Mossberger, 2006).

As Akgay, Wolf, and Kracman (2010) argue, the study of trust crosses a range of disciplines, and most definitions of it include the concept that the person who is trusting is putting him or herself at (perceived or actual) risk of losing something. In the case of e-government, users must put their trust in at least two entities: the government and the internet. Bélanger and Carter (2008) stress government agencies must combat user concerns about risk in both realms, and they point to the importance of finding ways to reach trust-averse users. One tactic is to develop e-government delivery systems that users perceive as high quality and useful. Perception of these characteristics has been linked with increased trust of an e-government system (Colesca, 2009). Prior research shows that usability plays a major role in consumer perception of site usefulness, and site quality, including for high-trust activities such as banking (Casaló, Flavián, & Guinalíu, 2008a, 2008b), and site usability can affect a user’s decision to use a consumer e-commerce site (Green & Pearson, 2011). Thus, the findings of this prior research strongly suggest that website usability impacts users’ impressions of a city and their trust in a city’s e-government.

Accessibility is an important element of usability. Website accessibility refers to the usability of a website by users with disabilities. These disabilities might be cognitive, visual, mobility, auditory, or neurological related (Loiacono, McCoy, & Chin, 2005). Ensuring that websites are accessible to these users is both an ethical and legal imperative. Tim Berners-Lee, Director of the W3C and creator of the World Wide Web, argues that “the power of the Web is in its universality. Access by everyone is an essential aspect.” The web, in his view, offers the opportunity to level the playing field, removing some of the communication and interaction barriers that people with disabilities may face in the real world (W3C, 2010a). In many cases, accessibility is also a legal requirement, particularly in e-government. Section 508 of the Rehabilitation Act Amendments of 1973, the Americans with Disabilities Act of 1990, and Section 225 of the Telecommunications Act of 1996, all provide mandates for web accessibility (Loiacono et al., 2005). A number of states have followed the federal lead. In Alabama, Standard 53052-00: Universal Accessibility, directs that most state-level websites comply with Section 508 standards (State of Alabama, 2011). In addition to ethical and legal imperatives, designing websites for accessibility also offers the potential for greater overall usability. The W3C (2010a) and Vanderheiden (1997) both point to designing for accessibility as making sites more generally usable and more portable—usable on a wider variety of devices—which is particularly important as users turn to mobile devices to access the internet. As of August 2011, over half of mobile phone users used their phones for online activities. Mobile phones account for 4.4% of digital traffic in the United States—over half of the noncomputer digital traffic. Tablets such as the iPad account for another 1.5% of noncomputer traffic. (comScore, 2011)

Assessing government website accessibility has typically taken one of two paths: using an automated system such as Bobbie or WebAIM’s WAVE or using human participants. Recent studies of government websites (e.g., Jaeger, 2006; Oalère & Lazar, 2011) use a variety of methods to improve validity. As accessibility experts have pointed out, testing that involves human participants—particularly participants with disabilities—remains the best method of determining the extent to which a site is accessible. For example, Jaeger (2006) uses policy analysis, testing by persons with disabilities, expert testing, and questionnaires of webmasters to assess accessibility level. Oalère and Lazar (2011) use evaluation by multiple experts and inspection for guideline compliance. That said, a number of studies (e.g., West, 2008) use automated accessibility testing as a canary-in-a-coalmine approach; that is, results of automated tests provide a sense of the severity of a site’s accessibility problems in that they reveal the number of problem types (e.g., missing alternative
text for images, use of blinking content) and the number of tokens of each type (e.g., 10 instances of missing alternative text). Such type/token data gives a sense of the urgency with which the site being tested should receive further scrutiny (from users, experts, and webmasters). For example, an expert evaluation might reveal that although a site provides alternate text for images using the alt attribute, the alternate text consists of semantically vacuous descriptions such as “image 2.”

Given that website usability at a state level had improved when the state of Alabama allocated funds toward the effort, we sought to determine whether a city's resources (operationalized via population and per capita income) related to a city website's usability scores on three measures: (1) a list of 10 dichotomous usability standards, (2) a web-based test for accessibility, and (3) a web-based test for adherence to best HTML-coding practices. We posed the following two research questions:

RQ1: Does city population correlate to city score on the three measures?
RQ2: Does city per capita income correlate to city score on the three measures?

However, our main goal was to study the extent to which city sites demonstrate basic usability. Our main research question, then, was this:

RQ3: To what extent do city sites follow basic, widely used usability standards, including adherence to basic accessibility standards (see Cappel & Huang, 2007; WebAIM, n.d.c; West, 2008)?

In the next section, we describe the methods we used to answer these questions. Then, we discuss our results and recommend some changes that developers of municipal sites can make to bring their sites up to a basic level of usability.

3. Methods

We addressed RQ1, which looked for correlations between city population and city usability score, by combining cities’ population data from the 2010 census with city usability scores and then looking for significance using a Pearson product–moment correlation coefficient. We addressed RQ2, which looked for correlations between city per capita income and city usability score the same way, relying on a Pearson product–moment correlation coefficient to check for significance.

To address RQ3, the extent to which city sites follow basic, widely used usability standards, including adherence to basic accessibility standards, we conducted a heuristics-based content analysis. This technique has been used to assess website usability levels in both the public and private sectors. We applied this technique to official websites for Alabama cities—144 in all—collected based on a list from the state of Alabama website (Alabama Department of Finance, n.d.). Of these, we eliminated 15 based on problems with the link or the site: several site links were broken, and some sites turned out to be for an organization other than the city, usually the local chamber of commerce. In addition, we removed Fort Rucker from the list, as it is a U.S. military installation, not a municipality.

In a few instances, we were able to replace deleted entries by using Google to identify city-owned sites. We then conducted a content analysis on the remaining 129 websites during a six-day period in March 2011 using the three measures. When examining and coding the websites, we used Firefox 3.6.15 on an Apple computer running OSX 10.6.6, with the browser resolution set to 1024 x 768, and placed the coded data into an Excel spreadsheet for analysis.

For measure 1, the 10 dichotomous web usability standards, we coded each site based on 10 dichotomous usability standards. Two were based on web design errors: (1) the use of a splash page and (2) the need for horizontal scrolling at 1024 x 768 resolution or below. Five were based on the use of standard web design conventions: (3) blue text links, (4) underlined text links, (5) text links that change color if the user has visited the linked page, (6) a link labeled “home” on internal (secondary) pages, and (7) a city logo/name as a home link on internal pages. Coding for link color and underlining standards excluded main navigation (i.e., was based on links elsewhere), as main navigation is usually presented through buttons or a graphical navigation bar, or links styled as buttons or a graphical navigation bar. We included two measures based on the presence of features designed to make the site easier to use: (8) a breadcrumb trail as part of the navigation and (9) a search box (Cappel & Huang, 2007, pp. 117–120). Because part of having a usable site is being able to be found online, we also checked for web presence by seeing (10) whether the site showed up in the first page of Google search results when the city name plus “Alabama” were entered into the search box (Pew Center on the States, 2008, p. 11). Measures 2 and 3 examined adherence to web standards: accessibility and use of valid HTML markup, respectively. Intercoder reliability for items 1–10 in measure 1, based on an 11% overlap, had a Cohen’s kappa value of .99.

We included measure 2, a web-based test for accessibility, because accessibility is a critical component of e-government usability and helps assure equal access to government material. In addition, following accessibility-design best practices typically promotes overall usability as well as portability.

According to the U.S. Census Bureau (2010), over 16% of Alabama’s noninstitutionalized population has a disability. In the 18–64 age range, the percentage is 14.4%; however, in the case of those 65 and older, the percentage increases to 44.1%. Over 3% of Alabamians have a vision-related disability, increasing to over 9% in those who are 65 and older—a demographic that is already likely to be technologically disadvantaged. This group of adults over 65 also has a higher rate of cognitive disabilities: 13% compared to about 6% in the general population. While older studies have often relied on Watchfire’s Bobby for automated accessibility analysis, the tool is no longer available. Based on similar research (West, 2008, 2011), we selected WebAIM’s WAVE 4.0 online accessibility tool as an alternative. Developed at Utah State University by the Center for Persons with Disabilities, WAVE helps developers identify potential accessibility problems. It tests a page against those portions of the U.S. government’s Section 508 standards and the W3C’s Web Content Accessibility Guidelines (WCAG) that can be examined by automated testing. While WAVE cannot replace human evaluation to determine true compliance, it can provide at least a surface analysis of a webpage’s accessibility, though any automated tool runs the risk of false negatives and false positives (WebAIM, n.d.b).

We checked each municipal home page to see whether it included any WCAG 2.0 Level A accessibility compliance errors, standards that the W3C state developers “must satisfy” (West, 2008, p. 5). These errors are identified at the top of the results page, and icons indicate the errors present on the page. We then recorded the number of total errors. For analytical purposes, based on West (2008), we judged a site as being noncompliant if WAVE returned any these errors. Again, however, this measure was used to get a sense of compliance rather than providing a full analysis of compliance. A list of items that WAVE detects as errors is included in Table 1.

Finally, for measure 3, we examined best HTML-markup practices by using the W3C’s online HTML Validation Service to check each home page for basic coding errors (W3C, 2010b). As with our evaluation of accessibility, we recorded the number of errors. The W3C argues that using valid HTML markup enhances accessibility, demonstrates professionalism, and future-proofs a site, making it less susceptible to changes in browsers (W3C, 2010c). That said, such automated HTML validation does have limitations. For example, a single HTML coding mistake may generate multiple error messages.

4. Results

RQ1 and RQ2 examined whether or there was a correlation between a city’s resources and website usability and accessibility based on three
measures: a list of 10 dichotomous usability standards, a web-based test for accessibility, and a web-based test for adherence to best HTML-coding practices. RQ1 looked for correlations between city population and usability/accessibility scores, while RQ2 looked for correlations between city per capita income and usability/accessibility scores. We found no correlation between either population or per capita income and any of our three measures of web usability, with the highest r value being .23 for per capita income and basic usability. This result—a lack of substantial relationship between resources and usability—means that usability problems for municipal websites are not found only on the sites of small cities, many of which have limited resources, or cities in which citizens struggle to get by. Rather, the improved usability that Alabama has enacted at the state level has failed to manifest itself (or trickle down) to cities of all sizes and incomes. At a municipal level, lack of basic usability is still a problem.

RQ3 questioned the extent to which city sites follow 10 basic and widely used usability standards. The percentage of sites that upheld a standard are indicated below (see Table 2) as “% Yes” codes. We found that a majority (more than 50%) of these municipal sites upheld five of the 10 standards. In accordance with the advice of many usability experts, Alabama city sites overwhelmingly met the usability standard of avoiding splash-screen website introductions.

Because a key component of a usable site is the ability to be located easily by potential users, we included findability in our measure of usability. Cities’ sites were for the most part quite findable: over 96% appeared on the first page of Google search results. Google’s search algorithm accounts for variables such as frequency with which a search term (e.g., “Abbeville Alabama”) appears on a site’s home page and in the site’s metadata; thus, the cities’ sites effectively incorporated the kinds of content that Google uses to generate relevant search results. Also, most of the cities’ sites used common extensions, which also increased each site’s findability. Table 3 shows the Alabama city sites split in their use of .org (suggesting a nonprofit) and their use of .com (suggesting a business). Together, these extensions account for 81% of the extension types. It appears that city webmasters are choosing .com extensions because that extension is so common in the U.S.

In addition, most sites avoided the need for horizontal scrolling (84.5%) and contained a home or return link on internal pages (85.3%). A majority of city sites also adhered to the convention of underlining links; over 62% of the sites followed this convention. In contrast to these positive findings, most of the cities’ sites failed to uphold usability standards related to navigation. The most prevalent problem—lack of a breadcrumb trail—stands out: only 8.6% of the sites, including the site of Pelham, Alabama, contained this navigational characteristic (see Fig. 1).

This result likely stems from the fact that breadcrumb trails require more information-architecture savvy to implement than other usability features. Using a breadcrumb trail implies that the site developer has considered the structure of the site—the hierarchical relationship among the pages. Developers of city sites may lack background in information architecture. In fact, many small-city sites appear to be amateurish projects developed by interested and generous citizens.

Other navigation problems were quite widespread: only 39.6% of sites had search capability; only 34.9% of sites used blue (the conventional color) for links; only 32.6% used a logo as a link to the home page. (Even if a logo was present, it was not linked.) Also, just 24.9% of the sites contained links that changed color after the link was clicked. (Fig. 2 illustrates a site that did in fact follow this convention.) Users of these sites would not have any signal of the site territory that they had already covered. Without such signals, users are likely to waste time by (re)following already clicked links. Of these three criteria for evaluating usability, the one most debatable is the criterion of blue links. This conventional link color signals that a link is present, but of course, other style differences (e.g., bold) could work too.

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**Table 1**

<table>
<thead>
<tr>
<th>WAVE errors</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing alternative text</td>
<td>Alternative (alt) text is not present for an image.</td>
</tr>
<tr>
<td>Spacer image missing alt text</td>
<td>Alt text is not present for an image used as a layout spacer.</td>
</tr>
<tr>
<td>Linked image missing alt text</td>
<td>Alt text is not provided for an image that is the only thing within a link.</td>
</tr>
<tr>
<td>Image button missing alt text</td>
<td>Alt text is not present in a form image button.</td>
</tr>
<tr>
<td>Image map missing alt text</td>
<td>Alt text is not present for an image that has hotspots.</td>
</tr>
<tr>
<td>Image map area missing alt text</td>
<td>Alt text is not present for an image map area (hotspot).</td>
</tr>
<tr>
<td>Server-side image map invalid longdesc</td>
<td>A server-side image map is present. The longdesc attribute does not contain a URL.</td>
</tr>
<tr>
<td>Form label missing</td>
<td>A form &lt;input&gt;, &lt;select&gt;, or &lt;textarea&gt; does not have a corresponding label. (Note: Labels are not required for image, submit, reset, button, or hidden form element types.)</td>
</tr>
<tr>
<td>Empty form label</td>
<td>A form label is present, but it does not contain any content.</td>
</tr>
<tr>
<td>Multiple form labels</td>
<td>A form element has two labels associated with it.</td>
</tr>
<tr>
<td>Orphaned form label</td>
<td>A form label is present, but it is not associated with any form &lt;input&gt;, &lt;select&gt;, or &lt;textarea&gt;.</td>
</tr>
<tr>
<td>Frame missing title</td>
<td>A frame does not have a “title” attribute or value.</td>
</tr>
<tr>
<td>Broken skip navigation link</td>
<td>A skip navigation link exists, but the anchor for the link does not exist.</td>
</tr>
<tr>
<td>Empty heading</td>
<td>A heading contains no content.</td>
</tr>
<tr>
<td>Marquee</td>
<td>A &lt;marquee&gt; element is present.</td>
</tr>
<tr>
<td>Blinking content</td>
<td>The &lt;blink&gt; element is present.</td>
</tr>
<tr>
<td>&lt;title&gt; is missing or not informative</td>
<td>The page title element is missing or not descriptive.</td>
</tr>
<tr>
<td>Empty link</td>
<td>A link contains no text.</td>
</tr>
<tr>
<td>Empty table header</td>
<td>A table header contains no text.</td>
</tr>
</tbody>
</table>

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**Table 2**

<table>
<thead>
<tr>
<th>Usability standard</th>
<th># “Yes” codes (N = 129)</th>
<th>% “Yes” codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A breadcrumb trail</td>
<td>11</td>
<td>8.6</td>
</tr>
<tr>
<td>Site search</td>
<td>125</td>
<td>99.9</td>
</tr>
<tr>
<td>Text link color</td>
<td>80</td>
<td>62.1</td>
</tr>
<tr>
<td>Site map</td>
<td>51</td>
<td>39.6</td>
</tr>
<tr>
<td>Horizontal scrolling</td>
<td>109</td>
<td>84.5</td>
</tr>
<tr>
<td>Site map</td>
<td>124</td>
<td>96.2</td>
</tr>
</tbody>
</table>

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**Table 3**

<table>
<thead>
<tr>
<th>Extension</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>.org</td>
<td>53</td>
<td>41</td>
</tr>
<tr>
<td>.com</td>
<td>52</td>
<td>40</td>
</tr>
<tr>
<td>.net</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>.gov</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>.us*</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>129</td>
<td>99</td>
</tr>
</tbody>
</table>

*a This category includes cityname.al.us; cityname.al.us; cityname.al.us.
*b Result due to rounding.
The question is whether they would work as well. In short, these are all basic characteristics of usability, and users have come to expect them.

We used two automated tools to assess the usability and accessibility of municipal sites: the W3C’s online HTML Validation Service and WebAIM’s accessibility evaluation tool (see Table 4). Using the W3C HTML Validation Service allowed us to check the sites for non-valid HTML markup (our measure 3). The sites’ scores overall jibe with our other findings. The sites contained 48.89 errors on average. As an example, the home page of Abbeville’s site reveals 27 errors; the page—besides having other problems—includes unsupported and unspecified attributes and does not contain a document type declaration (DTD). Given the number of usability problems as measured via the W3C HTML Validation Service, it is not surprising that the cities’ sites also contained accessibility problems—an average of 10.41 accessibility errors as measured via the WAVE evaluation tool (our measure 2).

Abbeville’s home page, for example, contains 17 accessibility errors. In Fig. 3, two of the icons (red in color) in the screenshot of Abbeville’s home page represent missing alternative text for an image (a red box with the slash through it) and missing alternative text for a linked image (a red box with a slash through it and a hand).

While data for specific errors-per-page were not recorded, the most common errors WAVE detected were images with missing alt attributes, linked images with missing alt attributes, and missing form labels. Images with missing alt attributes are a significant problem for users who rely on text readers, typically those with a visual impairment, particularly when the images replace text. Without alt attributes, these users are unlikely to be able to decipher the meaning of an image. Using images without alt attributes as part of the navigation exacerbates this problem, as there is no clear indication of where the link leads for text-only users. In a few instances, home pages included image-map-based navigation without using appropriate alt attributes, making the navigation largely useless for users relying on text-only browsers such as screen readers. Missing form fields are also an issue for users with a visual impairment, but can also pose a problem for users with motor disabilities, as missing form fields can make it difficult for users to select radio buttons and checkboxes (WebAIM, n.d.a). As we previously stated and here reiterate, we used WAVE to get a general sense of accessibility compliance; WAVE and other machine-based accessibility analysis tools come with limitations. What the WAVE results suggest, however, is that many of the municipal sites have accessibility problems that need to be addressed. The results of this study argue that future research should look at conducting a more in-depth, accessibility-
specific analysis of local government sites, using a multimethod approach similar to Jaeger's (2006).

5. Conclusion

Based on the results of this study, there is clearly room for improving the usability of many of the Alabama municipal websites. Some of the problems on a site can likely be solved fairly simply, such as by including a home button in the navigation, linking the municipal logo to the home page, and ensuring that text links are underlined and change color after the linked page has been visited. Other problems, such as eliminating the need for horizontal scrolling, may involve more complicated fixes. Some of the major accessibility problems WAVE identified can be solved easily as well, such as making sure that all images, including those that serve as links, have well-written alt-text descriptions and that all form fields include labels. The number of basic usability and accessibility problems found in this study underscores the need for basic usability and accessibility testing during the development process. Both decision makers and designers need to keep in mind that it is more efficient to fix problems during the design phase than it is after a site has been deployed. Early in planning and design, web developers should:

• leverage online tools such as WebAIM’s WAVE and the W3C’s online HTML and CSS validation services. These tools also democratize the evaluation process because people with limited design background can use them to look for problems, even if they need help to solve the problem.
• develop a usability-testing plan during the website planning process and use it early on—during planning and especially early on in the design process.
• include users with disabilities as part of the usability testing during the development process.
• conduct periodic evaluations of the website to make sure the content is current and accurate and that the site is still well placed in the results of Google and other search engines.
• engage in self-critique by conducting in-house analysis of existing pages using standard usability heuristics such as the ones used in this research.

Cities must improve the usability of their municipal sites for several reasons: to motivate citizens to use available e-government resources, to improve citizens’ experience in doing so, and to improve the impression that their cities make on interested parties such as entrepreneurs and business executives who can create jobs and move jobs to the community. Our results suggest that some Alabama cities have clearly already considered website usability, perhaps taking a cue from state-level sites, which saw rapid improvement between 2007 and 2008. Many others, it seems, have not, or they have lacked the resources to tackle usability problems. Our results have implications for developers of government sites—including developers working for countries with emerging economies and limited budgets—who are interested in maintaining and increasing citizen access, satisfaction, and trust because the results reveal usability benchmarks that

| Table 4 |
| Results of measures of error (measures 2 and 3). |

<table>
<thead>
<tr>
<th>Measures of error</th>
<th>Range # errors</th>
<th>Avg. # errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure 2: WebAIM’s WAVE</td>
<td>0–64</td>
<td>10.41</td>
</tr>
<tr>
<td>Measure 3: W3C HTML validation</td>
<td>0–373</td>
<td>48.89</td>
</tr>
</tbody>
</table>

Fig. 3. Abbeville screenshot of errors on WAVE. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)
developers can prioritize as they modify existing e-government services and move more services online.

References


Jo Mackiewicz teaches at Auburn University. She is coauthor of Visual Composing, a text that provides research-driven advice for effectively integrating visual and verbal elements in professional documents.