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**A Taxonomy of Usability Issues in US
Census Bureau Web Sites: A Review of
12 Years of Web Site Usability Test Reports**

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Abstract:

Ensuring one's Web site is usable is essential to ensuring an effective, efficient and satisfying experience for users. In a review of 12 years of Web site usability tests at the US Census Bureau, the most prevalent usability issues were discovered. The majority of issues across all the tests concerned Web site navigation, text and terminology, user expectations and Web site organization. This paper describes the top 10 usability issues and provides recommendations for avoiding such issues.

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Usability is defined as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use” (ISO 9241-11, 1998). In usability testing, we assess if users can interact with products effectively (i.e., Can they accomplish their goal?), efficiently (i.e., Can they complete their tasks quickly?) and with satisfaction (i.e., Do they feel satisfied rather than frustrated?). One can conduct usability testing at any stage of product development (Genov, 2005; Nielson, 1993; Romano Bergstrom, Olmsted-Hawala, Chen & Murphy, 2011). In this review, we assess external, public data dissemination Web sites of the U.S. Census Bureau. Specifically, we focus on usability tests of Web sites that were fully functional and live to the public.

Usability testing is important because designers of the user interface often do not take the users’ mental model into account. Designers create Web sites based on their expert knowledge and often do not consider the cognitive limitations, capabilities and expectations of end users (Norman, 1998; Rubin, 1994). Thus, it is pertinent to always test a product on the end user prior to its release to ensure optimal usability.

There are various methods that can be used to evaluate the usability of a product. These include expert reviews (heuristic evaluations), card-sorting studies, focus groups, low/medium-fidelity usability testing, and high-fidelity usability testing. The Human Factors and Usability Research Group (henceforth referred to as the Usability Lab) in the Center for Survey Measurement (CSM) at the U.S. Census Bureau provides many of these usability services to the Census Bureau. Since 1997, the Usability Lab has conducted usability and accessibility testing on various products, such as decennial Census forms, Census Web sites and Web-based surveys.

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From 1997 to 2009, the Usability Lab conducted 145 evaluations, including 21 usability tests of fully functioning Web sites. This report provides a comprehensive review of the 21 usability tests. We describe our method and findings and summarize the taxonomy of usability issues on U.S. Census Bureau Web sites from 12 years of usability tests, and we provide recommendations to alleviate these prevalent issues.

Method

Twenty people were authors across all 21 reports, with an average of 2.75 authors per report (range 1-5). To create a taxonomy of the issues from these tests, two members¹ of the Usability Lab reviewed the reports. For the first two reports, they jointly coded the identified usability issues into categories. For the subsequent 19 reports, they read and coded the reports independently. They then reviewed their coding together, and when a disagreement occurred, they discussed the usability issue and came to an agreement for the code. At times, based on their disagreement and discussion, the reviewers invented new codes and added them to the list. Inter-rater reliability for the coding of the 19 reports (prior to reconciling disagreements) was 0.83.

Many of the issues and recommendations occurred repeatedly, and thus natural groupings developed. For example, issues with unfamiliar terminology, unclear wording or labeling and jargon were grouped together into the *Text and Terminology* category. Issues with the search function, instructions about how to search, and unconventional search tools were grouped together into the *Search* category. Sometimes there was more than one usability issue from a defined category in a report. For example, in one report, there were issues with labels and with jargon, both of which fall into the *Text and Terminology* category. In these cases, the category in which there were usability issues was counted once in the review. We counted them only once to

¹ One reviewer was co-author of four of the reports included in this review. The other reviewer was not an author of any of the reports in this review.

control for the different author styles. For example, some authors combined the issues into one finding, while other authors reported a similar issue numerous times if it, for example, occurred on different pages of the site.

Results & Discussion

The average number of usability findings cited per report was 5.75 (range 2-8). We calculated the percentage by dividing the number of reports that had at least one occurrence of this issue and dividing it by the total number of usability issues across all reports. For example, 18 of the 21 reports had issues with Expectations, and there were 115 total usability issues across all the reports; therefore, 16% of the issues were with Expectations. See Figure 1.

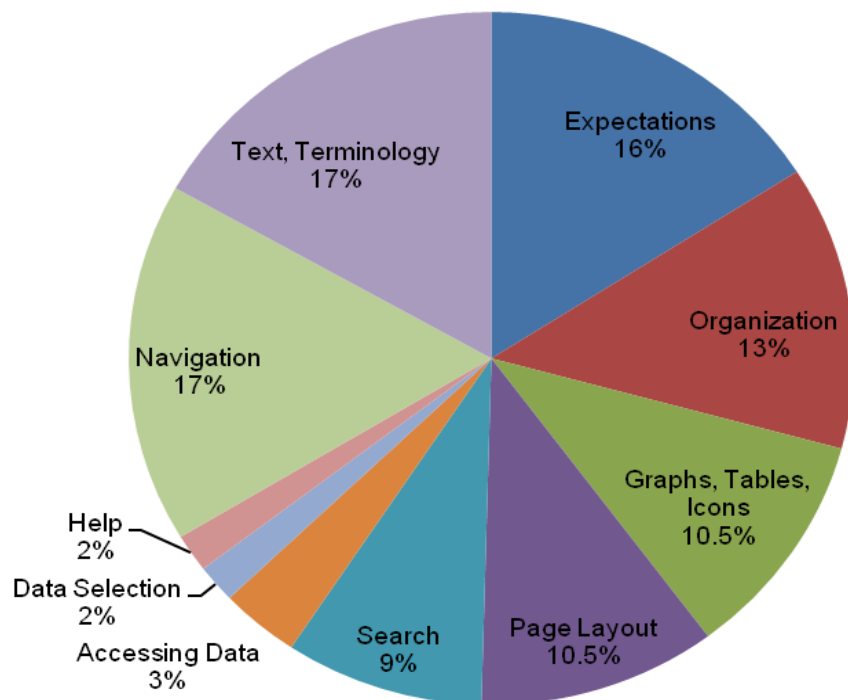


Figure 1. Top ten usability issues discovered from 12 years of Web site usability tests at the U.S. Census Bureau.

Navigation

Navigation issues encompassed 17% of the reported issues and occurred in 19 of the 21 studies. These issues included problems related to resizing the screen, finding links and labels,

expecting links and labels that were not available, backward navigation, problematic navigation by way of links, strange or unconventional navigation tools, general issues with the left navigation bar, general issues with the top navigation bar, lack of using the top or left navigation and lack of feedback on location within the site.

Recommendation: Navigation should be a consistent presence throughout the Web site (Gee, 2009; Lazar, 2001), and users should find it easy to navigate both forward and backward through the site. Shifting between different navigational styles can be confusing to users and aesthetically displeasing (Mullet & Sano, 1995; Van Duyne et al., 2003). Feedback should be provided to let user know where they are, where they have been and where they can go on a Web site (Nielsen, 2000). This can be accomplished by using visual cues, such as breadcrumbs or by highlighting active tabs on the top navigation (Mandel, 1997). These elements of the site will cue users on where they have navigated and guide them in their browsing experience. Users navigate Web sites in various ways and multiple navigation tools should be made available. If the navigational tools are difficult to find or missing, users may find the site difficult to use (Mullet & Sano, 1995; Van Duyne et al., 2003), and thus, they will be likely to abandon the site prematurely.

Text & Terminology

Text and terminology issues encompassed 17% of the reported issues and occurred in 19 of the 21 studies. These issues included problems related to unfamiliar terminology, use of jargon, and unclear wording and labeling. Many Census Web sites contained large amounts of Census Bureau jargon (e.g., “Census products”) that caused difficulty for those unfamiliar with the technical information covered, even when the purpose of these sites was to inform the general public (e.g., Chen, Holland, Olmsted-Hawala & Su, 2010).

Recommendation: To fix this problem, Web sites should use short, bulleted phrases and sentences, and use language and real-world metaphors that are familiar to novice users (Mandel, 1997; Kilian, 1999; Redish, 2007). Users often skip reading long, complex words (Forsythe, Grose & Ratner, 1998). Plain language should be used as much as possible (Redish, 2007) making it easier for users to understand content on the site.

Expectations

User expectation issues encompassed 16% of the reported issues and occurred in 18 of the 21 studies. These issues included problems with getting started on the site, user frustration with long PDF documents, lack of consistency across Web pages within the site, lack of guidance or instruction to the user, lack of feedback when users leave the site, and general unfulfilled expectations.

Recommendation: Users have certain expectations about the way things should work on Web sites, and it is important that their expectations are met (Mandel, 1997). This has the ability to enhance their satisfaction with the site, making them more likely to use the site as a future resource for information. In addition, conforming to the mental models of users makes use of what they already know so that they don't have to relearn how things work (Krug, 2005), which thus makes the site more predictable and understandable (Van Duyne et al., 2003).

Organization

Organization issues encompassed 13% of the reported issues and occurred in 15 of the 21 studies. These issues included problems related to too much content displayed on the page, dense text, related items not grouped distinctively, disorganized information, lack of alphabetization or order, information not featured prominently on the page and outdated information shown on the site.

Recommendation: Users expect to find information on Web sites quickly and easily and do not want to spend time reading to determine how the site is organized (Head, 1999; Nielsen, 2000). They will often scan for information, instead of reading text word-for-word (Forsythe et al., 1998). Reducing the amount of text and using bullet points, headings, and lists to highlight important content will make it easier for users to scan for relevant information (Redish, 2007). Content on the site should be organized based on its importance and the frequency of use (Shneiderman, & Plaisant, 2005), and the most relevant information should be presented most prominently since it is seen first by users (Navon, 1977). When working with long, scrolling pages, providing ways to jump to the beginning of various sections by using links at intermediate points in the page keeps long pages organized and assists users in easily navigating to different sections (Kilian, 1999).

Graphics, Tables & Icons

Issues with graphics, tables and icons encompassed 10.5% of the reported issues and occurred in 12 of the 21 studies. These issues included problems related to presentation of data in data tables, unclear icon functionality, distracting or unclear meaning of graphics, graphics that were inconsistent with the feel of the Web site, and inconsistent icons on the Web site.

Recommendation: Graphics, tables and icons should behave in a manner consistent with users' mental models and previous experiences (Mayhew, 1992). Users should not have to guess the functionality of a graphic; instead it should be clearly presented. If necessary, captions or alt text, which is text associated with an image that serves the same purpose and conveys the same essential information as the image, should be used. The amount of graphics on Web pages should be minimized, and text should never be rendered as an image (Mullet & Sano, 1995; Nielsen, 2000): when text is provided as an image, search engines cannot read the text, blind users may

not be able to “read” the text if it is not coded properly with alt text, and the image may get pixilated as users zoom, making the text difficult to read.

Page Layout

Page layout issues encompassed 10.5% of the reported issues and occurred in 12 of the 21 studies. These issues included problems related to the use of colors on Web pages, font-related problems, such as size or color, unconventional text, graphics and appearance, excessive horizontal scrolling, excessively long text length links that spanned two lines and unconventional placement of information, such as below the fold of the page or in the right navigation.

Recommendation: Consistent formatting should be used throughout the site, and inappropriate (e.g., blue text appears as links), inconsistent (e.g., error messages appear in different colors) or unnecessary (e.g., overusing colors for emphasis) color usage, font types and sizes should be reduced (Cato, 2001; Mandel, 1997; Schneiderman & Plaisant, 2005). Important information should be placed in the left navigation and/or towards the upper-center portion of the page so that users will be more likely to find it, and Web pages should be dominated by the users’ content of interest (Lazar, 2001; Nielsen, 2000; Romano, 2010). Color should be used sparingly, and needs of color-deficient users should be taken into consideration (Schneiderman & Plaisant, 2005).

Search

Ten studies reported problems with the search function. This category represents 9% of the total usability issues cited in the reports and included problems related to lack of a search function, unclear instructions about the search function, unconventional search function and general issues with the search function.

Recommendation: Most search engines on government Web sites are not as intuitive and powerful as users' desire, and users often complain of irrelevant search results. Most people are not "expert" searchers and often use terms that are too broad or too narrow (Brink, Gergle & Scott, 2002), or they use too many filler words, such as *the*, *of*, or *in* (Schneiderman & Plaisant, 2005). The search function is an important feature of a site and can serve as the last resort to finding information. Ensure that the search function is useful and usable with respect to the type of words (e.g., plain language) users enter, how the results are presented, and how users interact with the results (Van Duyne et al., 2003). Search results should provide meaningful messages to explain the search outcomes (Schneiderman & Plaisant, 2005).

Accessing Data

Four studies reported problems related to accessing data. This category represents 3% of the total usability issues cited and included problems related to saving or transferring data to other formats and difficulties accessing data.

Recommendation: Data output should be easy for respondents to manipulate and understand. Content should be in HTML format, and if another format, such as PDF or Excel is necessary, it should be clear to users what they need to do to open/use the data. These formats should not be used when the accessibility of information needs to be guaranteed. Not all users will have the PDF plug-in for their browser making the information contained in PDFs inaccessible to them, and others may be less inclined to open these types of documents due to security reasons, availability of memory on their computer systems, compatibility, limited time, etc. (Brink et al., 2002).

Data Selection

Issues related to selecting data encompassed 2% of the reported issues and occurred in two of the 21 studies. These issues included lack of clarity about which data entry field to use when multiple fields were present.

Recommendation: When there are multiple ways of entering information on a Web site, it should be clear to users what they need to do. This can be accomplished by including clear, succinct instructions to the user.

Help

Issues with the *Help* function encompassed 2% of the reported issues and occurred in two of the 21 studies. These issues included problems related to the online help, non-specific Frequently Asked Questions (FAQs) and confusing or unhelpful error messages.

Recommendation: Users may be less likely to utilize the help option because it requires more effort (Dillman, 2000), and they want to navigate in the quickest way possible. However, when users decide to use *Help*, it should be useful in guiding them to the information they are seeking. The *Help* section should be easy to find and contain specific FAQs. Online help should offer concise descriptions of the Web site objects and actions, and video recordings and tutorial training may be useful for complex sites or novice users (Schneiderman & Plaisant, 2005).

Conclusion

This review identifies the issues that were uncovered from 12 years of usability testing by the Human Factors and Usability Research Group at the U.S. Census Bureau. Over 60% of the issues across all the reports were concerned with Web site navigation, text and terminology, user expectations and Web site organization. This is consistent with an earlier review of five usability studies at the Census Bureau that found three top categories of usability issues: navigation,

jargon, and display of data (Olmsted and Marquis, 2002). These three issues appeared again with this broader review, and with added breadth, we were able to identify other common issues.

One caveat is that not all Web sites can have all the usability issues discovered in this review. For example, not all sites have the option to access data, and this may have played a role in the low frequency of *Accessing Data* issues. Another caveat is that, in usability studies, tasks are created to assess usability, and the tasks dictate to some extent, the usability issues that will be discovered. For example, if a task is not designed to ask participants to use the *Help* function, and the set of participants in the study do not use *Help*, there is no way of knowing if there are usability issues with the *Help* function. Therefore, while this review addresses the most frequently occurring usability issues that occurred over 12 years, it is not inclusive of all possible issues.

This review can assist in the formation of guidelines for future usability assessments, not only at the U.S. Census Bureau, but for any practitioner, developer, or designer of a Web site. This information can be shared with clients prior to the development of a Web site. With knowledge of issues that cause problems for users, developers can take these issues into consideration from the beginning and consequently, design more usable products. Developers should aim to avoid these errors when designing Web sites. Making sure one's Web site is usable is essential to ensuring an effective, efficient and satisfying experience for users.

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