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**A Medium-Fidelity Usability and Eye-Tracking Evaluation
of Iteration 2.0 and Iteration 2.5 of the New American
FactFinder Web Site: Capabilities and Functions**

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Executive Summary

In June, July, and September 2009, the U.S. Census Bureau's Statistical Research Division (SRD) conducted usability evaluations of medium-fidelity prototypes of the American FactFinder (AFF) Web site. These evaluations were the second and third in a series of planned, iterative tests in the redesign process. The testing evaluated the success and satisfaction of novice and expert users with prototypes of the new Web site. Testing took place at the Census Bureau's Usability Laboratory in Suitland, MD.

Purpose: The purpose of these medium-fidelity usability tests was to discover whether users understood the new AFF Web site's search and navigation capabilities and some table and map functions. Through iterative usability testing, we aim to improve the user interface of AFF.

Method: Fourteen individuals were recruited to participate in the usability study of Iteration 2.0, and thirteen individuals were recruited to participate in Iteration 2.5. Participants were recruited from a State Data Center conference that took place at the Census Bureau Headquarters, by referral, or through a participant database maintained by the Usability Lab. All participants had at least one year of experience navigating Web sites and using a computer. Each participant sat in a small room, facing one-way glass and a wall camera, in front of an LCD monitor equipped with an eye-tracking machine. For Iteration 2.0, participants' eye movements were recorded with eye-tracking equipment during the sessions. Eye-tracking did not take place for Iteration 2.5 because our equipment was down for maintenance. After finishing the tasks, all participants completed a satisfaction questionnaire and answered debriefing questions that were administered by the test administrator. Members from the AFF design team, composed of members from the Data Access and Dissemination Systems Office (DADSO) and IBM, observed several sessions from a television screen and monitor in a separate room.

Participants completed tasks designed to examine whether they understood the Web site's search and navigation capabilities and some table and map functions. Some tasks assessed how participants would begin looking for information on the Web site, some assessed how participants manipulated data tables, and some assessed how they manipulated maps. While they worked, participants discussed their actions and expectations aloud while the test administrator observed and communicated from another room.

Iteration 2.0 High-Priority Results:

- 1. There was no direct guidance on the Web site for the user on how to modify tables and how to select data to map.** Users did not use the Enable Table Tools button, which was required to modify the table. Many users did not select data values to map, as this was not an intuitive process.
- 2. Terminology, labels, and icons throughout the Web site were confusing to users.** Some of the terminology and labels used in Table and Map View were unclear to participants. The meanings of several map icons were unclear.

Iteration 2.5 High-Priority Results:

- 1. How to modify search results was not obvious.** Users often did not know how to add geographies to a search result.
- 2. Instructions to map data were not clear: Some users did not hover over the data table in Map View and consequently did not map a data item.** Some users failed to complete this task and none of these users hovered over the cells with data values.
- 3. Minimal visual changes occur when user navigates from Table View to Map View.** Some participants said that "nothing happened/changed" when they navigated from Table View to Map View, and this led to confusion about which page they were on.

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A Medium-Fidelity Usability and Eye-Tracking Evaluation of Iteration 2.0 and Iteration 2.5 of the New American FactFinder Web Site: Capabilities and Functions

1.0. Introduction

The user interface is an important element to the design of a Web site. For a Web site to be successful, the user interface must be able to meet the needs of the user in an efficient, effective, and satisfying way. It is the job of the user interface to provide cues and affordances that allow users to get started quickly and to find what they are looking for with ease. While the existing American FactFinder (AFF) Web site houses a massive amount of data, we have found that users currently encounter great difficulty accessing the information. Details about the difficulties that users encounter can be found in the first of a series of planned usability studies, Iteration 1, usability report (Romano, Olmsted-Hawala, & Murphy, 2009).

The present report specifies the methods that the Statistical Research Division (SRD) Usability Laboratory used to evaluate the usability of Iteration 2.0 and Iteration 2.5 of the new AFF Web site. Following the completion of typical usability studies at the Census Bureau, we report findings and recommendations to the sponsor and gather feedback from them about our recommendations. This report documents the results of the testing and the responses from the sponsor, Data Access and Dissemination System Office (DADSO), and IBM (henceforth referred to as the Design Team) to the findings. This report also compares the findings from Iteration 1 (Romano et al., 2009) to Iteration 2 and from Iteration 2 to Iteration 2.5.

1.1. Background on American FactFinder

AFF is a free online tool that allows users to find, customize and download Census Bureau data on the population and economy of the United States. AFF is available to the public, and a multitude of diverse users search the site for a vast range of information. Since AFF is undergoing a major redesign, a series of usability tests was planned in October 2008 to test successive iterations of the Web site as well as to gather baseline usability data on the current AFF site. This paper reports the second, Iteration 2.0, and third, Iteration 2.5, in the series of planned usability tests. These usability studies followed an earlier low-fidelity usability study of the new AFF Web site, which was carried out solely with paper versions of the interface and supporting materials and examined if participants understood the conceptual design of the site (Romano et al., 2009).

Iteration 2.0 was conducted between June 23 and July 23, 2009; seven novice users and seven expert users participated. A brief report of high-priority findings and recommendations was prepared for and disseminated to the sponsor on July 31, 2009. Members of SRD's Usability Team met with Design Team members on August 12, 2009 to discuss the findings; the Design Team's responses to the findings are included in this report following each of those items. See [Appendix A](#) for the screenshots used in this study.

Iteration 2.5 was conducted between September 9 and September 17, 2009; six novice users and three expert users participated. A brief report of high-priority findings and recommendations was disseminated to the sponsor on September 25, 2009. Members of SRD's Usability Team met with Design Team members on October 8, 2009 to discuss the findings. Responses from the Design Team to the findings are included in this report following each of those items. Four additional expert users were recruited from a State Data Center conference that took place at the Census Bureau Headquarters from October 14, 2009 to October 16, 2009. These four participants were exposed to the new design during a conference

presentation, before they participated in our study. Thus, in this report, their data are denoted with an asterisk. See [Appendix H](#) for the screenshots used in this study.

Iteration 2.5 testing took place following modifications that were made based on findings from Iteration 2.0 testing. Iteration 2.5 was an abbreviated evaluation that only tested some core concepts. The method and results of that round of testing can be found following the complete evaluation of Iteration 2.0, in Section 5.0 of this report.

1.2. Purpose

The primary purpose of Web site usability testing is to identify elements of the user-interface design that are problematic and lead to ineffective, inefficient, and unsatisfying experiences for people using the Web site. As the Web site is currently in production, only medium-fidelity prototypes were available to test. Medium-fidelity prototypes are those that have some clickable elements but are not fully functioning. The purpose of these medium-fidelity usability tests was to discern whether users understood the new AFF Web site's search and navigation capabilities and some table and map functions and to identify general areas where users had difficulties using the Web site.

1.3. Usability Goals

We defined the usability goals for these studies in two categories: accuracy and satisfaction. Typically we include an efficiency goal (i.e., time to complete tasks), but since these were not working Web sites and users did not interact with all the screens, an efficiency measure would have been uninformative.

Goal 1: To achieve a high level of accuracy in completing the given tasks using the AFF Web site prototypes. The user should be able to successfully complete 80% of the given tasks.

Goal 2: To experience a moderate to high level of satisfaction from experience using the AFF Web site prototypes. The overall mean of the Satisfaction Questionnaire ratings should be well above the mid-point (5 or above on a nine-point scale, where 1 is the lowest rating and 9 is the highest rating). The same should be true for the individual Satisfaction Questionnaire items.

2.0. Iteration 2.0 Method

This usability study, Iteration 2.0, is the second in a series of iterative usability tests for the redesign of the AFF Web site. Members of the Design Team developed the screenshots used in this study. The screens were not clickable; however, participants treated the screenshots as actual live Web site pages and clicked on areas of the screen that they thought would lead them to the information they were looking for.

Working collaboratively, members of the Design Team and the Usability Team created the tasks, which were designed to capture the participant's interaction with and reactions to the design and functionality of the AFF Web site screenshots. Each task established a target outcome for the user but did not tell the user how to reach the target. The tasks were designed to assess how participants would get started on the Web site, manipulate data tables, and manipulate maps. See [Appendix A](#) for the tasks paired with the screenshots used for each task and the ideal task-completion actions.

Participants attempted to find information to complete tasks that were given to them by the test administrator (TA). When a participant said that they would click on a link, the TA probed about what the participant would expect, and in some instances, the TA advanced to a screen that would appear if it were a working site.

2.1. Iteration 2.0 Participants and Observers

Statistical Research Division (SRD) Usability Lab researchers recruited seven novice users and seven expert users for the study. Five novice users were recruited externally through a participant database maintained by the Usability Lab, and two were recruited internally from SRD by the Usability Team. All novice users were unfamiliar with the AFF Web site. All seven expert users were internal Census Bureau employees who used the current AFF site on a regular basis. The mean age for novice users was 36.9 years (range 21-59), and the mean age for expert users was 49.4 years (range 25-69). Participants' education levels ranged from high school education to doctoral degrees. See Table 1 for participants' demographics, including the Census Bureau Divisions where the expert users worked. Each participant reported having at least one year of prior experience in navigating different Web sites. See Table 11 in [Appendix J](#) for participants' self-reported computer and Internet experience. One novice user had impaired vision. As this participant performed similarly to the other novice users in this study, he is not separated from the novice users in the majority of this report. However, his complete results are reported in [Section 3.6](#) of this report.

Table 1. Iteration 2.0 Participant Demographics

Gender		Age range		Education		Race		Census Bureau Division of employment	
Novice users									
Male	3	≤30	4	HS, GED	1	African American	4		
Female	4	31-45	1	Some college, AA	1	Asian	1		
		46-60	2	Bachelor's	2	White	2		
		61+	0	Master's +	3				
Mean across novice users		36.86 years*							
Expert users									
Male	1	≤30	2	HS, GED	1	African American	2	CLMSO	2
Female	6	31-45	0	Some college, AA	3	White	5	DID	2
		46-60	2	Bachelor's	2			EPCD	2
		61+	3	Master's +	1			SSSD	1
Mean across expert users		49.43 years*							
Mean across all participants		43.14 years*							

Note: * The mean age was calculated from the exact values for each participant. The exact self-reported values were placed in ranges in Table 1 to help the reader get an overview of the data.

CLMSO = Customer Liaison and Marketing Services Office, DID = Data Integration Division, EPCD = Economic Planning and Coordination Division, SSSD = Service Sector Statistics Division.

Observers from the Design Team watched some of the usability sessions on television and computer screens in a room separate from the participant and TA. Near the end of each session, and unbeknownst to the participant, the TA asked the observers if they had any questions for the participant. If so, those questions were asked during debriefing, following standard debriefing questions. At the end of each test session, the TA and observers discussed the findings from that session and compared them to findings from other sessions.

2.2. Iteration 2.0 Facilities and Equipment

Testing took place at the Usability Lab (Room 5K512) at the US Census Bureau in Suitland, MD.

2.2.1. Testing Facilities and Computing Environment

The participant sat in a room, facing one-way glass and a wall camera, in front of an LCD monitor equipped with an eye-tracking machine that was on a table at standard desktop height. During the usability test, the TA sat in the control room on the other side of the one-way glass. The TA and the participant communicated via microphones and speakers. Observers sat in a separate room watching the session on television and computer screens.

The participant's workstation consisted of a Dell personal computer with a Windows XP operating system, a 17" Tobii LCD monitor equipped with cameras for eye tracking, a standard keyboard, and a standard mouse with a wheel.

2.2.2. Eye Tracking

Using the ClearView 2.0 software program, the Tobii eye-tracking device monitored the participant's eye movements and recorded eye-gaze data. In addition to eye-gaze data, we also collected eye fixations for areas of interest (AOIs). Following the completion of the usability testing, the Usability Team identified the following AOIs to support usability findings: Start Here search box, left navigation on main page, Map View tab, Enable Table Tools button, and Manual Zoom button on map-view page (not shown in Figure 1). See Figure 1 for locations of the pre-determined AOIs.

2.2.3. Audio and Video Recording

Each session was video and audio recorded. Video of the test participant's monitor was fed through a PC Video Hyperconverter Gold Scan Converter, mixed in a picture-in-picture format with the wall-camera video, and recorded via a Sony DSR-20 Digital Videocassette Recorder on 124-minute, Sony PDV metal-evaporated digital videocassette tape. Two microphones (one desk and one ceiling) near the participant captured the audio recording for the videotape. The audio sources were mixed in a Shure audio system, eliminating feedback, and were then fed to the videocassette recorder.

2.3. Iteration 2.0 Procedure

Following security procedures, "external" participants (i.e., those who did not work at the Census Bureau) individually reported to the visitor's entrance at the U.S. Census Bureau Headquarters and were escorted to the Usability Lab. Internal employees met the TA at the Usability Lab. Upon arriving, each participant was seated in the testing room (5K512). The TA greeted the participant and read the general introduction (see [Appendix B](#)). Next, the participant read and signed the informed consent form (see [Appendix C](#)). After signing the consent form and doing a practice task (from www.craigslist.org), the TA calibrated the participant's eyes using the eye-tracking software. Calibration took approximately 15 to 20 seconds and involved the participant looking at a dot moving across the computer screen. After

calibration, the TA placed the task questions and Satisfaction Questionnaire on the desk beside the participant and went to the control room for a sound check (see [Appendix A](#) for the tasks paired with the screenshots used for each task and the ideal task-completion actions). During this time, the participant completed the Questionnaire on Computer-and-Internet Experience and Demographics (see [Appendix D](#)). Upon the participant's completion of the questionnaire, the TA began video and eye-tracking recording.

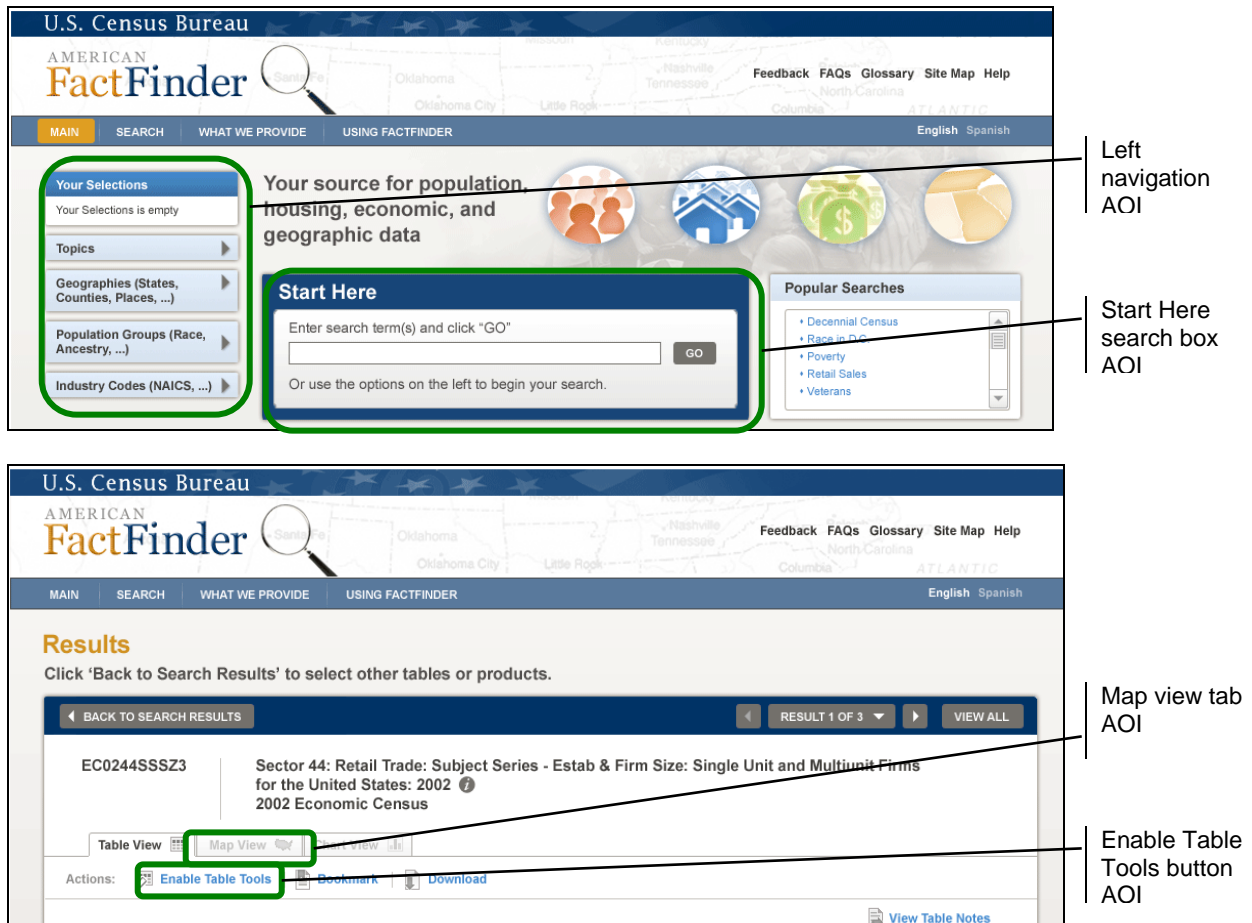


Figure 1. The four areas of interest (AOIs) for Iteration 2.0 of the new American FactFinder Web site.

At the start of each task, the participant read the task aloud. While completing the tasks, the TA encouraged participants to think aloud and share their thoughts about executing the task. The think-aloud technique (Ericsson & Simon, 1980; Olmsted-Hawala, Murphy, Hawala, & Ashenfelter, 2010) was used to understand the participant's cognitive processes as they interacted with the interface. If at any time the participant became quiet, the TA encouraged the participant to continue to think aloud, by using prompts such as "What are you thinking?" and "Tell me your thoughts." This method was used to maintain a running verbal commentary of the participants' thoughts as they interacted with the interface. Participants completed 14 tasks designed specifically for this AFF medium-fidelity Web site usability study. Participants were instructed to think and interact with the static Web pages on the computer screen as if the pages were fully-functioning on a Web site. When participants said that they would click on a link, the TA probed about what the participants would expect, and in the instances where a screen was available, the TA advanced to a screen that would appear if the site was working.

See [Appendix A](#) for the tasks with the corresponding ideal actions for successful completion and the screenshots that were displayed for each task. After completing all tasks, the TA stopped the eye-tracking device and asked the participant to complete the Satisfaction Questionnaire. Members of the Usability Team created the Satisfaction Questionnaire, which is loosely based on the Questionnaire for User Interaction Satisfaction (QUIS, Chin, Diehl, and Norman, 1988). In typical usability tests at the Census Bureau, we use 10 to 12 satisfaction items that are tailored to the particular user interface we are evaluating. In this study, the Satisfaction Questionnaire includes 10 items tailored to the AFF Web site prototype. See [Appendix E](#) for the Satisfaction Questionnaire used in this study.

After completing the Satisfaction Questionnaire, the TA asked the participant debriefing questions about their overall experience with the prototypes (see [Appendix F](#)). Debriefing provided an opportunity for a conversational exchange about the Web site. The TA also asked questions based on the specific issues each participant had during the session and questions that the observers had (although the participant did not know that some questions came from the observers). The TA remained neutral during this time to ensure that she did not influence the participant's reactions to the site. At the conclusion of the debriefing, the TA stopped the video recording. Overall, each session lasted approximately 60 minutes. External participants were paid \$40 each.

2.4. Iteration 2.0 Performance Measurement Methods

2.4.1. Accuracy

After each participant completed a task, the TA rated the task as a success (1), partial success (0.5), or a failure (0). In usability testing, successful completion of a task means that the design supported the user in reaching a goal. Failure means that the design did not support task completion. A successful task completion involved the participant successfully using the user interface to identify the correct piece of information on the Web site, based on the task objective. If the participant struggled to find the information but eventually arrived at the correct response, it was still considered a success. A failure was recorded when the participant was unable to identify the correct piece of information. A partial success score was only given to tasks that required more than one step, such that if participants completed the first step but not the second, they were given a partial success score for that task. The Usability Team calculated the average accuracy score across all participants for each task and across all tasks for each participant.

2.4.2. Satisfaction

After completing the session, each participant indicated his/her satisfaction with the prototypes using the tailored 10-item Satisfaction Questionnaire. For example, participants were asked to rate their overall reaction to the site by circling a number from 1 to 9, with 1 meaning "terrible" and 9 meaning "wonderful." The Usability Team calculated ranges and means for the various rated attributes of the Web site.

2.4.3. Eye-Tracking Data

Eye tracking was recorded for each participant, for each task. Eye tracking captures exactly where people look as they navigate through a Web site. The eye-tracking data allow us to look at eye-gaze pathways at both the individual level and group level, revealing unique (individual) and common pathways through a Web site. Eye tracking data includes fixations, gaze plots, and hot spots.

A fixation is an instant where the eyes are relatively still (Poole & Ball, 2005). Fixations can be measured in terms of frequency and length. Although the meaning of the variability in amount of fixations is a matter of discussion among experts, some evidence suggests that during an encoding task, such as looking at a Web page, a higher number of fixations indicate the need for processing time or greater difficulty identifying the target object (Poole & Ball, 2005). For the purposes of this usability test, the tasks fall into both the encoding and search categories. For this study, we report the total number of fixations for the Areas of Interest (AOIs) for each participant, as well as how much time elapsed before each participant first looked at each AOI.

A gaze plot represents the total number of fixations in a uniquely defined area. Gaze plots indicate which areas are getting the most attention (Poole & Ball, 2005) by showing the order and duration of fixations. Circles represent the fixations, and the size of the circle represents the duration. The numbers in the circles show the sequence of fixations, such that “1” represents the first recorded fixation, “2” represents the second recorded fixation, and so on. Gaze plots can be generated for one participant at a time. In this report, we show gaze plots for each predetermined AOI.

A hot spot is an area of the screen where people spend a few moments looking. Hot spots can be examined individually or can be collapsed across participants into a heat map for a mean image that displays the average of all hot spots for all the participants together. Heat maps range in color from green (few fixation points) to red (many fixation points). In this report, we examined predefined AOIs and determined whether these areas were hot spots.

2.5. Identifying and Prioritizing Usability Problems

To identify design elements that caused participants problems in completing the tasks, the Usability Team recorded detailed notes during the usability sessions. To bolster these notes, the team used the videotape recordings from each session to confirm or disconfirm findings. By noting participant behavior and comments, we inferred the design element(s) that likely caused participants to experience difficulties. We then grouped the usability issues into categories based on priority. We assigned each problem a priority code, based on the severity of its effect on performance. The codes are as follows:

- **High Priority** – These problems brought the participant to a standstill. He or she was not able to complete the task.
- **Medium Priority** – These problems caused some difficulty or confusion, but the participant was able to complete the task.
- **Low Priority** – These problems caused minor annoyances but did not interfere with the flow of the tasks.

3.0. Iteration 2.0 Results

In this section, we discuss the findings from the usability study. We present the qualitative and quantitative data, eye-tracking data, usability issues, and possible future directions based on the Design Team’s responses to the findings. Where statistical analyses are indicated, two-tailed independent *t*-tests were conducted.

3.1. Participant Accuracy

The overall accuracy score for novice users was 55%, and for expert users, it was 56%. This is below the pre-determined goal that was set for the Web site prototype. Accuracy scores ranged from 0% to 100% across all users. It appears that all participants experienced the most difficulty

with tasks 4, 10, 12, and 14, while novice users had greater difficulty with tasks 4 and 9, compared to expert users. See Table 2 for user and task accuracy scores.

The ambiguous wording in Task 4 likely led to participants experiencing problems. Many participants had trouble understanding the question and how it applied to the data table shown to them. In addition, Task 4 was the first table manipulation task and participants had difficulty enabling Table Tools because (1) they did not immediately see Table Tools, and (2) they were not sure what “Table Tools” meant. This is discussed in detail in [Section 3.5.1](#) of this report. Novice users likely did worse than expert users on Task 4 because of their lack of experience with data tables and because they were distracted by other parts of the table and page that were not relevant to the task. This is discussed further in [Section 3.3.3](#) of this report.

Task 12 required participants to click on the *i* icon but none of the participants did so. During debriefing, participants remarked that they did not know what kind of information they would receive if they clicked on the *i* icon. See Finding 2 in [Section 3.5.1](#) for further discussion on unclear icons.

Task 14 required participants to use the Manual Zoom button, but none of the participants used this option. According to eye-tracking data, participants did not look at the button. During debriefing, none of the participants said that they knew what the button would do if they clicked on it. See Finding 2 in [Section 3.5.1](#) for further discussion on unclear icons and [Section 3.3.1](#) for eye-tracking data.

3.2. Participant Satisfaction

The average satisfaction score for all tasks across all participants on the Satisfaction Questionnaire was 5.69 out of 9, and the ratings for individual items ranged from 1 to 9. The average score was slightly above the midpoint, the pre-determined goal that was set for this study, and 57% of the ratings for the individual items scored above 5. For novice users, the average satisfaction score was 5.49, and for expert users, the average score was 5.89. None of the individual satisfaction items had a mean score higher than 6.43. One expert user had ratings as low as 1, although this was much lower than the ratings from the other participants. See Table 3 for participants’ satisfaction scores for various attributes of the Web site and [Appendix E](#) for a complete list of satisfaction questions. When the mean satisfaction score was compared for expert users versus novice users, there was a trend for expert users to be more satisfied overall than novice users, $t(135) = 1.56, p = 0.12$. However, when each item on the Satisfaction Questionnaire was examined separately, expert users and novice users were not significantly different from each other (all $ps > 0.32$).

On the Satisfaction Questionnaire, participants had an opportunity to write any additional feedback they had. Comments by participants highlight the use of confusing terminology and icons in the Web site prototype. Participants were favorable toward the map and table tools. During debriefing, an expert user that works in the call center said that “Table Tools will be very popular” with users of AFF because the functionality provided by Table Tools is a “popular request” from callers. She also believed that the ability to change colors on the map “would be a big hit.” A few expert users well-versed in the current AFF site were concerned that it would be difficult to transition to the new version because the two versions were vastly different. One expert user wrote, “Some links do not seem as clear/defined as what I’ve experienced in the AFF. [It’s] harder to manipulate. It would take some time to learn this so I could continue to teach AFF.” The same expert user wrote, “I do like that there are functions to change look/order/sort/hide columns.” Another expert user wrote, “I believe that once we have been shown how to use the new look that it will catch on quickly for everyone.”

Table 2. User Accuracy Scores for Usability Testing of the American FactFinder Iteration 2.0 Web Site

Participant	Tasks														Average success by participant
	Getting started (1-3)			Working with data tables (4-8)					Working with maps (9-14)						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Novice 1	1	1	1	0	0	0	*	1	1	0	0	0	1	0	46%
Novice 2	1	1	1	0	0	1	1	1	0	0	1	0	1	0	57%
Novice 3	1	1	1	0.5	0.5	0.5	1	1	0.5	0	1	0	1	0	64%
Novice 4	1	1	1	0	0	0	*	0	0	0	1	0	0	0	31%
Novice 5	1	1	1	0	0.5	0	*	1	0.5	0	1	0	1	0	54%
Novice 6	1	1	1	0	1	1	0	1	0	1	1	0	1	0	64%
Novice 7 (visually impaired)	1	0.5	1	0	1	1	1	1	0.5	0	1	0	1	0	64%
Average success by task across novice users	100%	93%	100%	7%	43%	50%	75%	86%	36%	14%	86%	0%	86%	0%	55%
Expert 1	1	0.5	1	0	0	0	*	1	0	0	0	0	1	0	35%
Expert 2	1	1	1	0	0	0	*	1	0	0	1	0	1	0	46%
Expert 3	1	1	0	0.5	0.5	1	1	1	0	1	1	0	1	0	64%
Expert 4	1	1	1	0	0.5	0.5	0	1	1	0	1	0	1	0	57%
Expert 5	1	1	1	1	1	1	1	1	1	1	1	0	1	0	86%
Expert 6	1	0.5	1	0	0	0	*	1	1	0	0	0	1	0	42%
Expert 7	1	0.5	1	1	1	1	0	1	1	0	1	0	0	0	61%
Average success by task across expert users	100%	79%	86%	36%	43%	50%	50%	100%	57%	29%	71%	0%	86%	0%	56%
Average success by task across all participants	100%	86%	93%	21%	43%	50%	63%	93%	46%	21%	79%	0%	86%	0%	56%

Note: 1 = Success; 0.5 = Partial Success; 0 = Failure.

A task was considered a Success when a user was able to complete it as far as the prototype allowed.

* Task was skipped (and not factored in average). Task 6 needed to be successfully answered in order for participants to complete Task 7.

Table 3. User Satisfaction for the American FactFinder Iteration 2.0 Web Site (1 = low, 9 = high)

Participant	Satisfaction questionnaire items										Mean rating by participant
	Overall reaction to site: terrible - wonderful	Screen layouts: confusing - clear	Use of terminology throughout site: inconsistent - consistent	Information displayed on the screens: inadequate - adequate	Arrangement of information on the screens: logical - illogical	Tasks can be performed in a straight-forward manner: never - always	Organization of information on the site: confusing - clear	Forward navigation: impossible - easy	Overall experience of finding information: difficult - easy	Census Bureau specific terminology: too frequent - appropriate	
Novice 1	4	2	4	3	6	3	3	7	4	2	3.80
Novice 2	7	6	6	7	7	6	6	6	7	6	6.40
Novice 3	7	8	7	8	9	8	8	8	7	8	7.80
Novice 4	4	5	3	4	3	3	4	5	4	5	4.00
Novice 5	6	5	7	5	5	7	7	6	6	5	5.90
Novice 6	4	3	*	3	7	4	4	N/A	4	3	4.00
Novice 7 (visually impaired)	6	7	7	6	7	6	7	3	6	7	6.20
Mean rating by question across novice users	5.43	5.14	5.67	5.14	6.29	5.29	5.57	5.83	5.43	6.00	5.49
Expert 1	5	5	4	3	4	5	5	4	5	5	4.50
Expert 2	6	5	7	7	7	5	5	7	6	5	6.00
Expert 3	9	9	9	9	9	9	9	9	9	9	9.00
Expert 4	1	2	3	2	2	2	2	1	1	2	1.80
Expert 5	7	7	6	8	8	8	6	8	7	7	7.20
Expert 6	4	3	6	7	7	5	4	7	4	3	5.00
Expert 7	7	7	8	8	8	7	9	9	7	7	7.70
Mean rating by question across expert users	5.57	5.43	6.14	6.29	6.43	5.86	5.71	6.43	5.57	5.43	5.89
Mean rating by question across all participants	5.50	5.29	5.92	5.71	6.36	5.57	5.64	6.15	5.50	5.29	5.69

Note: * Participant did not answer item.

3.3. Eye-Tracking Findings

3.3.1. Fixations

3.3.1.1. Total Number of Fixations. Table 4 shows the total number of fixations for each of the four areas of interest (AOIs): Start Here search box, left navigation, Enable Table Tools button, and Map View tab. Refer to Figure 1 (page 12 of this report) to see the locations of each of the AOIs.

As shown in Table 4, the Start Here search box was often looked at by participants, as can be expected from its prominent location.

Table 4. Number of Fixations for the AOIs Throughout All Tasks

Participant	'Start Here' search box	Left navigation	'Enable Table Tools' button	'Map View' tab
Novice 1*				
Novice 2	20	22	9	28
Novice 3	170	121	113	58
Novice 4*	19	23	0	5
Novice 5	87	13	43	14
Novice 6	88	46	100	29
Novice 7*				
Expert 1*	27	17	1	0
Expert 2	34	51	4	0
Expert 3	20	20	56	44
Expert 4*	0	3	0	0
Expert 5	32	19	11	30
Expert 6	22	5	3	8
Expert 7	104	18	49	31
Total fixations across all participants	605	358	389	247

Note: *Eye-tracking data was not available for two novice users: the eye tracker was down for maintenance at the beginning of the study and no eye-tracking data was gathered for Novice User 1. Eye-tracking data could not be gathered from the visually-impaired participant (Novice User 7). In addition, limited eye-tracking data was available for two expert users (Expert User 1 and Expert User 4) and from Task 9 onwards for Novice User 4. This is likely due to particular participant movements such as leaning forward toward the monitor while working on the tasks, effectively moving into the eye tracker's "blind spot."

Although 'Enable Table Tools' was looked at quite a bit throughout the study, five participants never used the button to enable the tools during the table-manipulation tasks (Tasks 4, 5, and 6). Table 5 displays the number of times these five participants looked at the Enable Table Tools button during these tasks. These participants either never looked at the Table Tools button during these tasks or only looked at it one or two times. This suggests that the Enable Table Tools button is difficult for users to see and should be made more visually prominent. In

addition, the phrase “Enable Table Tools” is likely meaningless and unclear for participants. See Finding 1 in [Section 3.5.1](#) for further discussion.

Table 5. Number of Fixations for Enable Table Tools Button by Participants That Never Enabled Table Tools

Participant	Task 4	Task 5	Task 6
Novice 1*			
Novice 4	0	0	0
Expert 1	0	0	1
Expert 2	1	0	0
Expert 6	2	0	0

Note: *N1 never enabled Table Tools, and no eye-tracking data was collected for this participant.

3.3.1.2. Time Elapsed to First Look at AOIs. Table 6 displays participants’ elapsed time before first looking at the AOIs, and Figure 1 (page 12 of this report) displays screenshots of each AOI. On average, it took expert users 3 seconds to look at the Start Here search box, and 5 seconds to look at the left navigation during Task 1. For novice users, on average, it took 4 seconds to look at the Start Here search box, and 7 seconds to look at the left navigation during Task 1. Overall, participants looked at the Start Here search box and the left navigation on the main page quickly after being exposed to the Web page in the first task. The main page appeared to work well for novice and expert users alike. In contrast to Iteration 1, participants were able to get started more easily and more readily understood how to begin searching for information on the main page. See [Section 4.0](#) for further comparison on the usability findings for Iteration 1 and Iteration 2.

Start Here vs. Left Navigation: On average, it took participants 4 seconds to first look at the Start Here search box and 6 seconds to first look at the left navigation. Although participants tended to see the Start Here search box sooner than the left-hand navigation, many participants preferred using the left-hand navigation to get started on the Web site. Participants commented that the left-hand navigation options were “more targeted” than the global search. In addition, some said that they were unsure what terms the search engine would accept, how powerful the search engine was, or how helpful the results it returned would be. See [Section 3.5.3](#) for further discussion on participants’ wariness toward the search engine.

Enable Table Tools Button: On average, it took 42 seconds for expert users and 25 seconds for novice users to look at the Enable Table Tools button in Task 4. During testing, Task 4 was the first time participants were exposed to the Web page that had the Enable Table Tools button. The time elapsed ranged from 8 seconds to 1 minute 46 seconds for participants to first look at the button. This suggests that some participants found it difficult to see the Enable Table Tools button, and this may explain why five participants never enabled Table Tools. See Table 6 for details. Participants are supposed to enable table tools to modify the table. Without using that button, there are no options that allow users to modify the table rows and columns. The Enable Table Tools button is an important feature that should be emphasized and made more noticeable. See [Section 3.5.1](#) for discussions on how to make the button more prominent.

Map View Tab: The time it took for participants to look at the Map View tab varied widely across participants. Most participants saw the tab when working on the first task that involved data tables (Task 4). However, one participant did not see the Map View tab until the second task involving data tables (Task 5), and another participant did not see the tab until the third task involving data tables (Task 6). It took these participants 6 to 7 minutes since the start of Task 4

to look at the Map View tab. Tabs are usually reserved for primary navigation on Web sites and should be prominent. See Finding 1 of [Section 3.5.1](#) for further discussion on the Map View tab.

Table 6. Time, in minutes (m) and seconds (s), Elapsed Before Participants First Looked at AOIs

Participant	Area of interest			
	'Start Here' search box	Left navigation	'Enable Table Tools' button	'Map View' tab
	Task 1	Task 1	Task 4	Tasks 4, 5, 6
Expert 1	2s	6s	*	*
Expert 2	3s	3s	8s	*
Expert 3	2s	4s	12s	41s (in task 4)
Expert 4	*	13s	*	*
Expert 5	5s	5s	1m 46s	6s (in task 4)
Expert 6	6s	3s	1m 15s	1m 22s (in task 4)
Expert 7	3s	3s	10s	22s (in task 4)
Mean time across expert users to first look at AOI	3s	5s	42s	
Novice 2	6s	12s	23s	6m 7s (in task 6)
Novice 3	4s	3s	36s	25s (in task 4)
Novice 4	4s	13s	*	9s (in task 4)
Novice 5	3s	6s	17s	19s (in task 4)
Novice 6	3s	3s	*	7m 36s (in task 5)
Mean time across novice users to first look at AOI	4s	7s	25s	
Mean time across all participants to first look at AOI	4s	6s	36s	

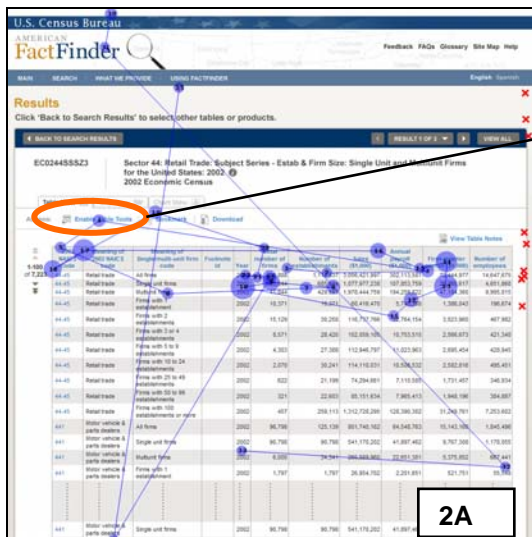
Note: *Participant did not look at the AOI.

Mean calculation does not include participants who never looked at the AOI.

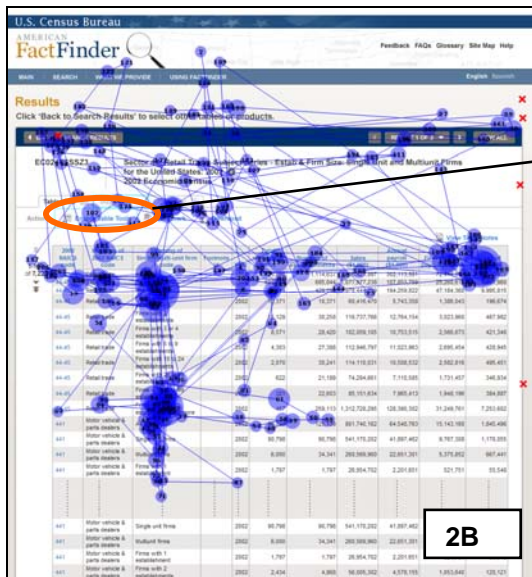
3.3.2. Gaze Plots

Examining gaze-plot data is ideal to identify patterns of search performance. In this section, we highlight scan-path data for Task 4, which required participants to enable Table Tools, and five of 14 participants (29.4%) never did. The gaze-plot data indicate that the participants who did not enable the tools often overlooked the button needed to successfully complete the task.

Figure 2 shows gaze plots for two expert users. In Figure 2A, the expert user looked at the Enable Table Tools button relatively soon after the Web page opened. The fourth gaze by this expert user, denoted by the "4" within the circle, was directed at the Enable Table Tools button, albeit the gaze duration is relatively small as denoted by the small size of the circle. The participant did not look long enough to click on it, implying that the label did not hold meaning for her, and then she went on to peruse the rest of the page. She never looked at that button again during that task. In Figure 2B, the expert user appeared to thoroughly inspect the page, looked at the Enable Table Tools a few times but she never clicked on it.

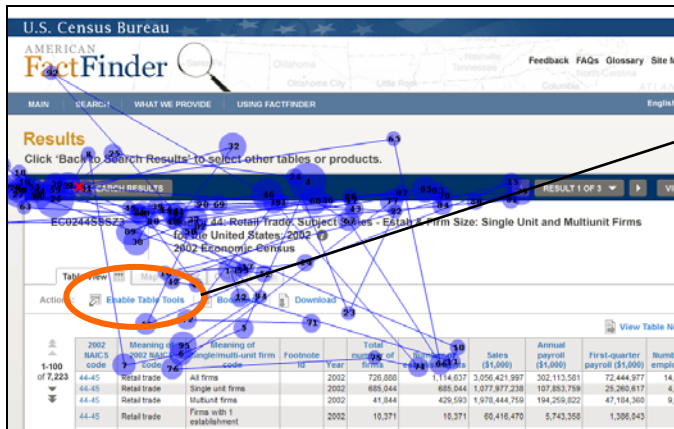


Despite gazing at the Enable Table Tools button briefly at the beginning of the task, the expert user never returned to look at the button and never used it during the session.



The expert user spent some time looking at many parts of the page. Although she looked at Enable Table Tools, she did not click on it.

Figure 2. Gaze plots for two expert users who never enabled Table Tools during Task 4.



A novice participant searched the upper portion of the page thoroughly, yet he/she missed the Enable Table Tools button.

Figure 3. Gaze plot for a novice user that never looked at the Enable Table Tools during Task 4.

Figure 3 shows the gaze plot for a novice user during Task 4 who never clicked on the Enable Table Tools button during that task. As shown in Figure 3, the novice user spent quite some time looking at the upper portion of the page but never looked below the fold of the page. Despite his search pattern, his gaze never landed on the Enable Table Tools button.

3.3.3. Heat Maps

The hot-spot data indicate areas where participants spent some time looking. Heat maps were generated using absolute- and relative-fixation duration measures. Absolute-fixation duration heat maps show all areas of the Web pages that received attention by participants. The reds and oranges indicate more fixations, and the greens and yellows indicate fewer fixations. The relative-fixation duration heat maps show areas of the Web page that received the most attention relative to the other areas on the Web page. The heat maps show all of the eye-tracking data captured during the entire task.

Red X's on the heat maps denote where participants left-clicked with the mouse. Green X's denote where participants right-clicked. The line of red X's displayed on some of the screenshots indicates where participants clicked on the right scrollbar and dragged the mouse. This would not normally occur on a live Web site but occurred here as these were static pages displayed in a browser application.

Figure 4 shows an absolute-fixation duration heat map of the main page of the AFF prototype for expert users in Task 1, and Figure 5 shows the same heat map for novice users. As shown by the heat maps, overall, novice users spent more time looking at the Web page during the first task, as demonstrated by the larger hot spots on the page compared to the smaller hot spots for the expert users. Novice users also looked at more areas on the Web page than expert users during the first task, as demonstrated by the larger quantity of hot spots on the page compared to the number of hot spots from expert users. Novice users looked at the circular graphics next to the page tagline and at the right-hand side of the page more than expert users did, during the first task.

Compared to expert users, novice users looked at the circular graphics next to the page's tagline and at the right-hand side of the page more.



Figure 4. Absolute-fixation duration heat map for seven expert users in Task 1.



Figure 5. Absolute-fixation duration heat map for five novice users in Task 1.

In Task 4, participants attempted to complete a task that required enabling and using Table Tools. During this task, novice users looked at more of the page, including below the fold as shown in Figure 7 compared to expert users, shown in Figure 6. With Table Tools enabled, expert users looked at the available Table Tools more than novice users, as shown in Figures 8 and 9. On the other hand, novice users looked at items below the fold more than expert users, as shown in Figures 6 and 7. Combined with participants' comments, this behavior suggests that (1) expert users may be more familiar with data tables and thus, spend less time looking at them in order to understand them; (2) novice users may have been unsure what parts of the data table needed to be modified to complete the task; (3) novice users may have spent more time looking at all parts of the Web site because they were unfamiliar with AFF content; and (4) novice users may have been distracted by other items on the page that did not help them succeed in completing the task. It appears that for novice users, simplicity will be crucial so they do not become overwhelmed or distracted by parts of the page that will not lead them to task success.

Compared to novice users, expert users looked less at items below the fold of the page.



Figure 6. Absolute-fixation duration heat map for Task 4, seven expert users. Table Tools disabled.



Figure 7. Absolute-fixation duration heat map for Task 4, five novice users. Table Tools disabled.

Compared to novice users, expert users looked at the items below the fold of the page less and looked at the Table Tool actions more.



Figure 8. Absolute-fixation duration heat map for Task 4, seven expert users. Table Tools enabled.

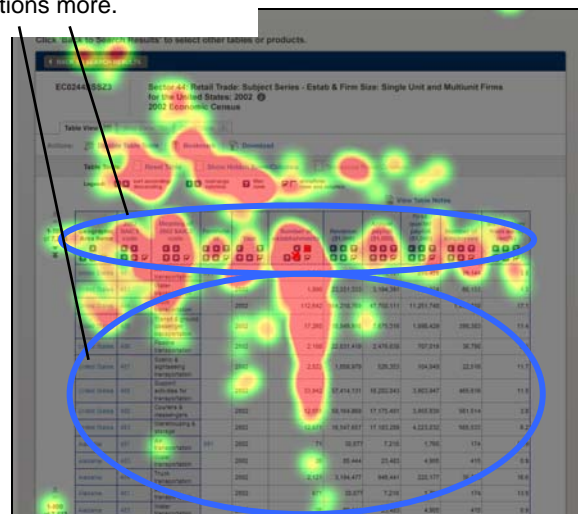


Figure 9. Absolute-fixation duration heat map for Task 4, five novice users. Table Tools enabled.

In Task 9, it appears that novice users did not read the instructions about how to select a data value to map. See Figure 11. Conversely, as shown in the heat map in Figure 10, expert users read the instructions. Both novice and expert users tended to click on the map underlying the data table (denoted by red Xs), even though it is a grayed-out image and is not clickable. See Finding 1C in [Section 3.5.1](#) for further discussion on this topic.

Compared to novice users, expert users looked at the line of instruction at the top more often.



Figure 10. Absolute-fixation duration heat map for Task 9 for seven expert users.

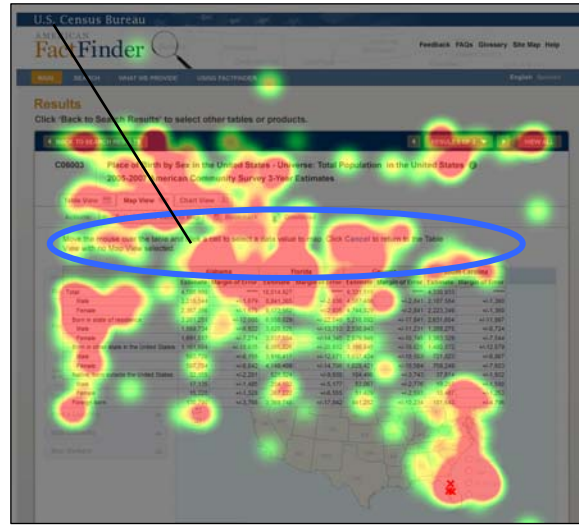


Figure 11. Absolute-fixation duration heat map for Task 9 for five novice users.

In Task 10, participants attempted to change the colors on the map. Expert users tended to look at the menu options on the left (Data Classes, Map Contents, Map Markers) more than novice users, as shown by the larger and more intense hot spot over those areas on the heat map for expert users in Figure 12 compared to the novice users in Figure 13. Expert users also made more clicks on the menu options compared to novice users. In contrast, novice users made more clicks on the map itself and used the map tools bordering the top edge of the map compared to expert users, as demonstrated by the red Xs in Figure 13.

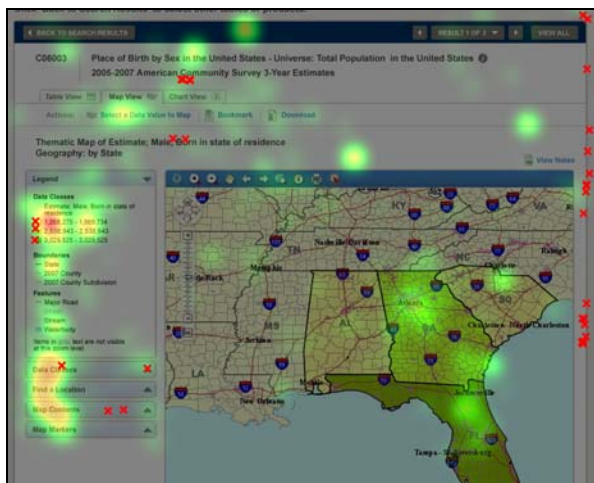


Figure 12. Relative-fixation duration heat map for Task 10, seven expert users. Duration: ~4.10 min.

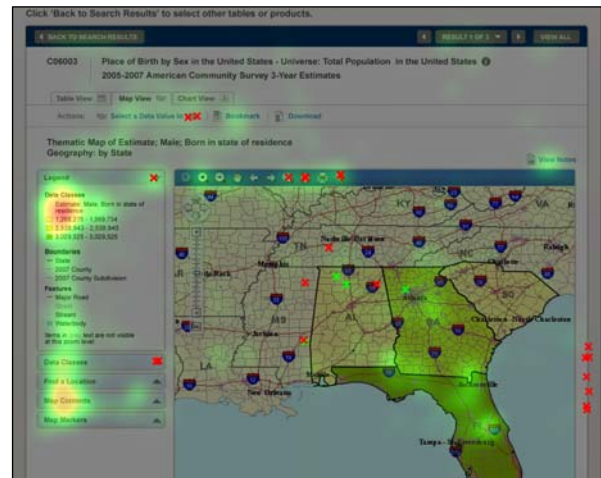


Figure 13. Relative-fixation duration heat map for Task 10, five novice users. Duration: ~ 5.12 min

More eye-tracking results are provided in the following sections to illustrate and provide support for the usability problems identified below.

3.4. Positive Findings

- Overall, people understood how to get started on the Web site. Tasks 1, 2, and 3, the getting-started tasks, had the highest accuracy of all the tasks. For the first task, 65% of the participants (nine of 14) used the Geographies tab in the left-hand navigation, and the remaining participants used the Start Here search box in the center of the page.
- Users commented that they generally liked the aesthetics of the site—from the lack of clutter on the main page, to the clarity of the map and ideal font sizes.
- Users said they liked the ability to go from Table View to Map View to Chart View by using the tabs.
- One participant said that it was very good that this version of AFF allows users the ability to “view all” on a results table. Regarding the current AFF site, he said, “one of the frustrations...is that you have to scroll down 100 lines and then load another page.” See Figure 14 for the View All button.
- All of the expert users and all but one novice user understood how to make a map of the results (Task 8). The Map View tab is well-worded in that people know exactly what they will find when they click on it.
- 79% of the participants (11 of 14) understood how to zoom in to a state on the map (Task 11). Ten of the 11 participants used the + magnifying glass icon, and one used the map scale icon. These icons are easily recognized by users.
- 86% of the participants (12 of 14) correctly used the Find a Location tab to find Sarasota, Florida in Task 13. This terminology is ideal in that it precisely describes what the user action will be when they click on the tab.
- One expert user was very satisfied with the new site and gave a score of 9 (out of 9) for each question on the Satisfaction Questionnaire.
- Accuracy increased from 40% in Iteration 1 to 55% in this iteration.
- Satisfaction ratings increased from 4.79 (out of 9) in Iteration 1 to 5.69 in this iteration.

3.5. Iteration 2.0 Usability Issues

Explanations for the performance deficits are discussed in the list of usability violations that follows. We prioritized them from high- to low-priority issues based on their effects on participant performance. The usability issues deal primarily with lack of instruction and confusing terminology and icons. Fixing the high- and medium-priority problems should result in improved usability and satisfaction with the site.

3.5.1. High-Priority Usability Issues

Testing identified two high-priority usability issues listed below. High-priority issues have the potential to interfere with user success by bringing the user to a standstill from which they are unable to recover. We include the Design Team’s responses¹ with each finding.

Finding 1. There was no direct, useful guidance displayed about what the user needed to do to modify tables and make maps.

A. Modifying Tables: Users did not use the Enable Table Tools button. On this site, users are required to click on the Enable Table Tools button in order to access options to modify the

¹ We presented the high-priority findings and recommendations to the Design Team upon completion of the study. At that time, we discussed the findings and received feedback on the recommendations.

table (e.g., filter and hide). Five tasks (Tasks 4, 5, 6, 7, and 8) required participants to use the Enable Table Tools button. A number of participants did not use the Enable Table Tools button until they were directly prompted by the TA or until they were on a later task. Some participants scrolled down on the page to maximize the amount of the data table that they could see at once, but this action obscured the tabs and Table View toolbar that contained the Enable Table Tools button. See Figure 14 for a screenshot of a Table View page. Only four of 17 participants used the Enable Table Tools button on the first table-manipulation task (Task 4). Eight of 17 participants used the Enable Table Tools button by the second table-manipulation task without guidance (Task 5). Three expert and two novice users never used the Enable Table Tools button at all. Overall, 29.4% of the participants did not use this important feature.

The screenshot shows a web interface for viewing economic data. At the top, there's a 'Results' header and a navigation bar with 'BACK TO SEARCH RESULTS', 'RESULT 1 OF 3', and 'VIEW ALL' (circled in orange). Below this is the title 'EC0244SSSZ3 Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multiunit Firms for the United States: 2002 2002 Economic Census'. There are tabs for 'Table View', 'Chart View', and 'Download'. An 'Actions' bar contains 'Enable Table Tools' (circled in orange), 'Bookmark', and 'Download'. Below the toolbar is a table with 10 columns: 2002 NAICS code, Meaning of 2002 NAICS code, Meaning of Single/multi-unit firm code, Footnote id, Year, Total number of firms, Number of establishments, Sales (\$1,000), Annual payroll (\$1,000), and First-quarter payroll (\$1,000). The table shows data for retail trade firms, categorized by establishment size (1, 2, 3-4, 5-9, 10-24). A 'View 1' button is visible on the right side of the table.

One user commented that he liked this option, which is not available on the current AFF Web site.

Five participants did not use the Enable Table Tools button.

Figure 14. Screenshot of the Table View page.

According to the fixation data in [Section 3.3.1](#) of this report, most participants looked at the Enable Table Tools button during Task 4. However, the time elapsed before participants looked at the button ranged from 7.5 seconds to one minute and 46 seconds, implying that for some participants the Table Tools button was not easily noticed, and for others, the label itself was unclear.

Making the Enable Table Tools button more prominent, and moving it closer to the table should increase usability. Currently the Table View toolbar items, including the Enable Table Tools button, are visually separated from the table. The line separating the Table Tools from the table likely plays a role in suggesting that the Table Tools are not associated with the data table. The toolbar and tabs should be visually grouped with the table. Some suggestions by participants to make the Enable Table Tools button more prominent included making the button larger and bringing it closer to the table.

Since the site is intended for public use, it is best to avoid misunderstandings by using terminology that is appropriate for all users (Fleming, 1998). For example, "Modify Table" is clearer than "Enable Table Tools." It also provides direct guidance and is consistent with what the user is attempting to accomplish, which is modifying the table. "Enable Table Tools" is programming jargon that is not easily understood by users, especially novice users. See Finding 2 below regarding issues with terminology and labeling. By changing the button label to

a more readily understood instruction, the button will provide direct guidance on what the user needs to do to modify the table.

Many participants referenced their experience with Microsoft Excel while attempting to answer the questions. Some participants said they wanted to left-click directly on the column headers to manipulate them, and a few said they wanted to right-click on the headers to access the settings or options of the table. Users seemed to expect their knowledge of how other Web sites and applications work to be applicable to the AFF Web site. In addition, users expected to be able to interact with the data tables by clicking directly on the area they wanted to change. They did not want to hunt around the page to find options or settings that were separated from the table element(s). Thus, users wanted and expected the maps and tables to be fully interactive.

Team Response: Wording will be changed and the button will be moved closer to the table.

B1. Making a Map: Users did not understand that they could not parse data-table information before making a map. Task 9 asked participants to make a map of males born in their state of residence, specifically in Florida. Two novice users and three expert users clicked on the Enable Table Tools button and expected to find a way to narrow the information in the data table down to “males born in the state of Florida” before making a map of the information. One novice user tried to use the Back to Search Results button to get a simpler data table to work with. 43% of the participants tried to select the data value(s) to map *before* clicking on the Map View tab. When participants were told they could not map only one geographic area, they often responded with comments or behaviors indicating frustration. It is not intuitively logical that there should be such a restriction. Participants said they would add the other states (Alabama, Georgia, and South Carolina) back into the data table or that they would find data on the counties in Florida.

Explicit instructions above the table to users on what they can do with the data table and any mapping restrictions would help users. Once preliminary instructions have been added, the Usability Lab can provide feedback on whether instructions are usable.

Team Response: Some possibilities were discussed, but no final decision was made. One possibility to address this issue is to include the Select a Data Value to Map function on the Table View page so that clicking it will bring users to the same page they would reach if they clicked on the Map View tab on the Table View page. Another possibility is to add explicit instructions to users to “click on the Map View tab” on the Table View page. The Design Team will further discuss ways to make it clear to users how to convert a table to a map.

B2. Making a Map: Users did not use the Map View tab, which is required to make a map. Since the Map View tab (and Chart View tab) were gray, participants said that they thought the tabs were not functioning, and thus there was no guidance or indication that these functions were available to use. Participants expressed that they did not expect active items to be gray. One novice user took a long time to find the Map View tab, and after she found it, she said she thought she could not use the function. After explanation from the TA, she remarked, “That’s terrible. It shouldn’t have been grayed out. If it’s grayed out, that means that the function is not available. If it wasn’t grayed out, it would have caught my attention faster.”

Another novice user said that he wouldn’t click on the Map View tab. He said that, “Since Map View isn’t highlighted, I’d think something is wrong with it...it looks inaccessible.” When the TA probed at the end of the session, a novice user said that she had not seen the tabs on the top of

the table and map pages. She said they needed to be more prominent such as being outlined in black instead of gray. See Figure 15 for a screenshot showing these tabs.

Table 6, which displays the time elapsed before participants looked at the Map View tab, shows that seven of 12 participants (58%) noticed the tab in the first task that involved data tables (Task 4), but the color of the tab seemed to deter some participants from clicking on it.



Figure 15. Gray tabs on the Table page.

Using another method to bring user attention to the active tab instead of graying out the other options would be helpful to users. Even the tab in front (the one in use) is currently gray. Often, to emphasize tabs in the foreground, a color different from the other tabs is used. See Figure 16 for an example of tabs on a Census Web page that are clearly functioning. In Figure 16, users can easily identify the top navigation tabs that they can use, because none of them are gray, and they can identify the page that they are currently on, because it is in a different color. By making the tabs more prominent and clearly indicating which tab is currently active, users can easily see what options are available to them.

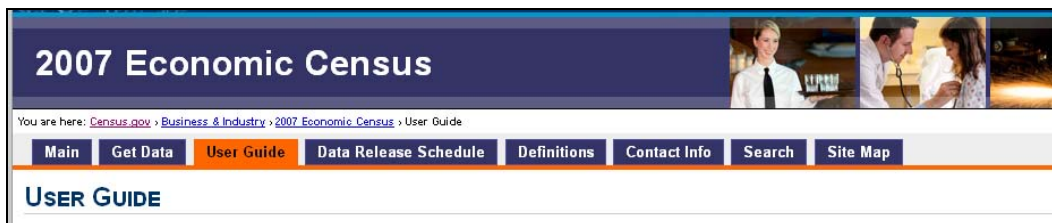


Figure 16. Example of emphasized tabs that are clearly functioning.

Team Response: The tabs will not be gray; they will be different colors and more prominent.

C. Making a Map: Novice users had difficulty selecting a data value to map. Of the three novice users who correctly navigated to the Map View tab *first* (in Task 9), none correctly selected a data value to map by clicking on the desired data cell value in the table. All three of these participants seemed distracted by the map underneath the data table, as noticed by their tendency to move the cursor repeatedly to the map. Two of the participants said that they expected the map to be interactive. They clicked on the state of Florida on the map, expecting the contents of the data table to be mapped to Florida. Of the four expert users who navigated to the Map View tab first, all of them correctly selected a data value to map on the table.

As demonstrated by the heat maps in Section 3.3.3 of this report, both novice and expert users rarely looked at the line of instruction on the Map View page. When they did, it is likely because

they were undecided about how to progress forward in their task. Compared to expert users, novice users were less likely to read the line of instruction as shown in Figures 10 and 11. As shown by the heat maps in Figure 17, both expert users (Figure 17A) and novice users (Figure 17B) were drawn to look at the state of Florida on the map underneath the data table.

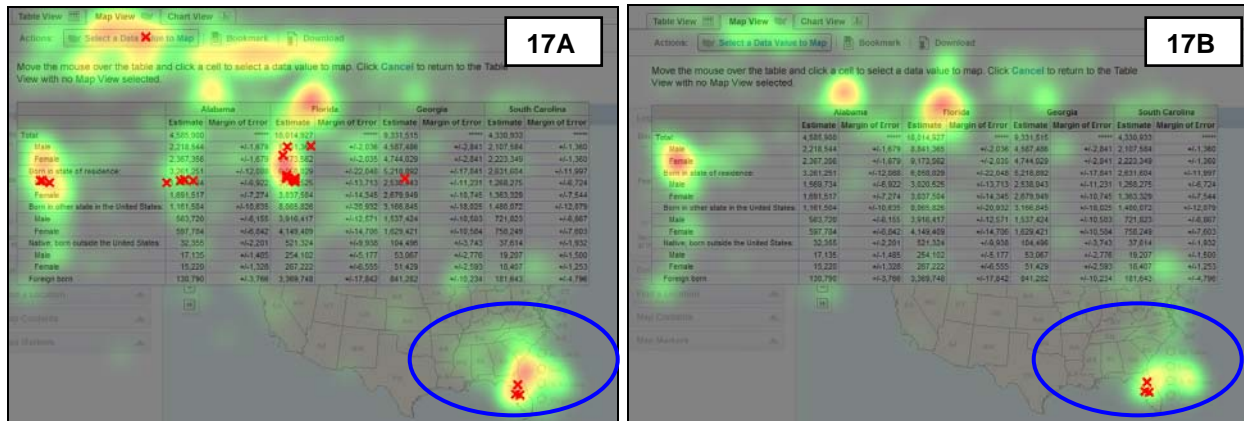


Figure 17. Relative-fixation duration heat maps showing that expert users (Fig 17A) and novice users (Fig 17B) looked at Florida on the map during Task 9.

Devoting more screen real estate to the table will enhance usability of the Web site. The U.S. map is unnecessary at this step and can be eliminated. See Medium-Priority Finding 2 for further discussion on screen real estate.

When navigating users to the Map View page, it may be helpful to provide an overlay similar to the one shown in Figure 18 below. The overlay should provide the instruction “Move mouse over the table, and click a data value to map” so that users will be forced to pay attention to the instruction.

Team Response: Data-value cells will highlight as the user moves the cursor over the table. It is expected that this cue will lead users to perceive the data table as interactive. The design team is considering removing the map from under the table. It was noted that depending on the size of the table, the map may not even be visible.

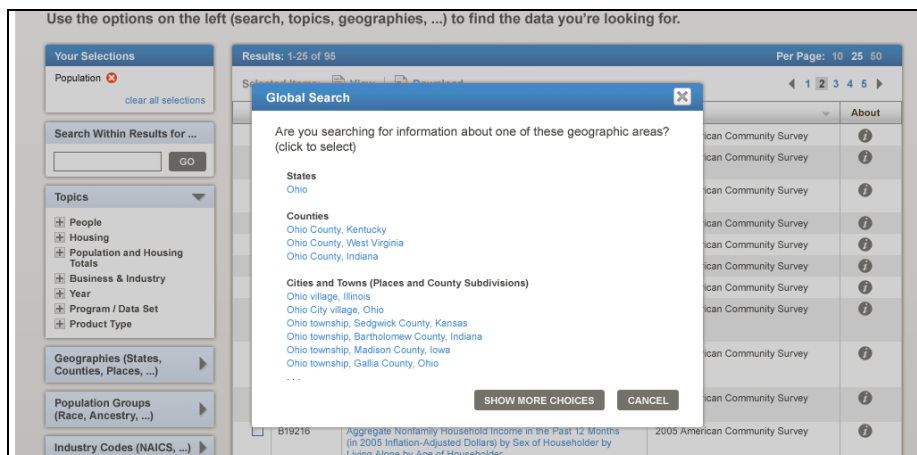


Figure 18. A similar overlay could be used to instruct users about mapping options when they first navigate to the Map View tab.

Finding 2. Labels, icons, and terminology throughout the Web site were confusing for users.

A. Labels in Map View were unclear and confusing. Participants were confused by many of the labels in Map View. Many participants in this study chose unsuitable options to manipulate maps, and sometimes this was due to the way that options were labeled. Tasks 10, 11, 12, 13, and 14 required map manipulation, and as reported in [Section 3.1](#) of this report, accuracy was low for half of these tasks. Only three of 14 participants were able to successfully complete Task 10, and no one was able to successfully complete Tasks 12 and 14. In Task 10, participants were supposed to click on the Data Classes tab in the left navigation to change the colors on the map. Only three participants (one novice and two expert users) successfully chose this option. One novice and two expert users said that they thought the option might be in the Map Contents tab, while one novice and two expert users guessed the option to change the colors on the map might be under the Map Markers tab. See Figure 19 for a screenshot of the Map View page and the left-hand navigation tabs. Users expressed uncertainty when the TA asked about the kind of content they expected under the Data Classes, Map Contents, and Map Markers tabs. Four participants (two novice and two expert users) said that they believed the Data Classes tab would allow users to change the type of data that would be shown on the map (e.g., females born in state of residence instead of males). Issues related to the other map-manipulation tasks with low accuracy are discussed below.

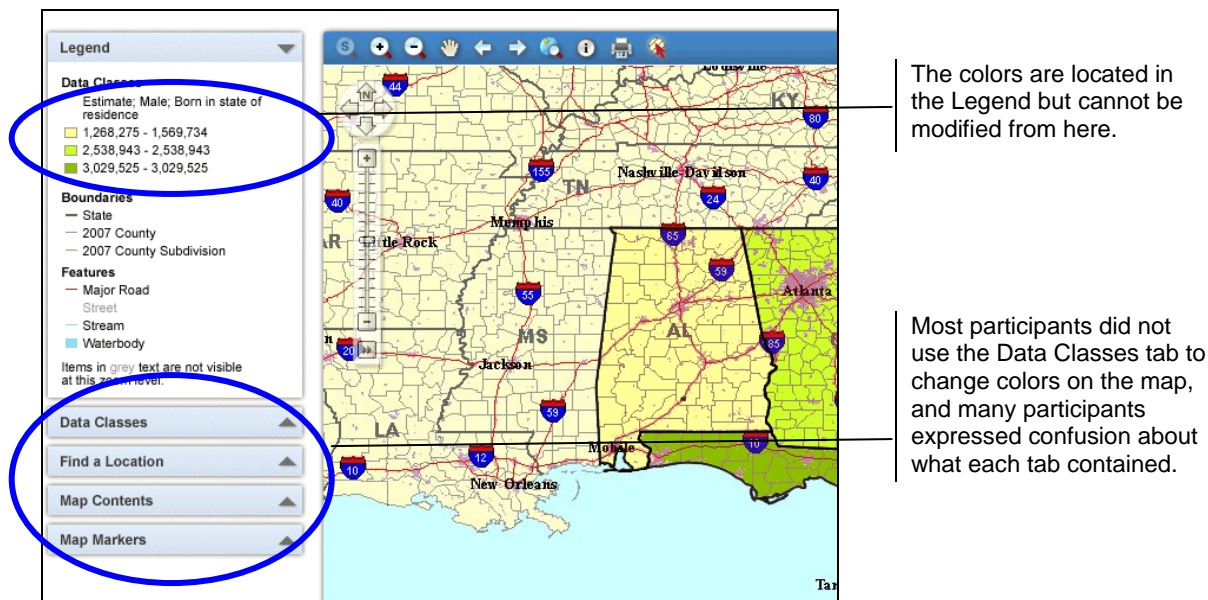
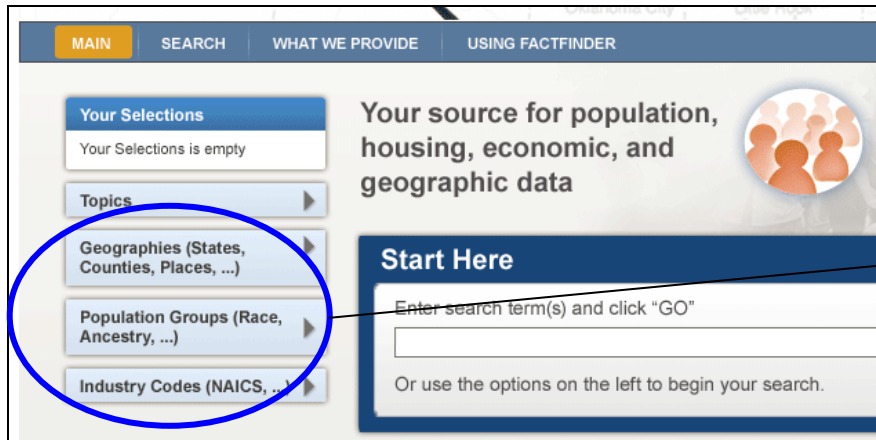


Figure 19. Left-hand navigation tabs on Map View page.

Using different labels for the Data Classes, Map Contents, and Map Markers tabs, that better match users' expectations, could help users on this Web site. A card-sorting study could be conducted to identify what labels make sense to users. Examples of the types of functions that are available under each option could be provided in the heading and could be modeled after the design of the left-hand navigation on the main page of the tested AFF Web site. See Figure 20 for the main page left-hand navigation labels.



Tab headings on the Map View page can be modeled after the left-hand navigation on the Main page. Headings can contain words that guide the user to select them based on function, and headings can be clicked to view contents.

Figure 20. Left navigation on the main page.

Team Response: Some possibilities were discussed to fix the label issue, but a final decision was not made. One such possibility is to add verbs to the tabs that instruct users on what to do, such as “Place Map Markers,” rather than simply “Map Markers.” Another possibility is to further alter the wording of the labels. For example, changing the Data Classes tab to “Data Classes and Colors,” as the color function is the most used function contained in the tab, and changing “Map Contents” to “Boundaries and Features,” as this label is a clearer definition of what it contains, would be helpful for users. Other possibilities include making the legend more interactive and allowing users to modify colors directly from there, and adding instructions, such as “Change your map with the options below,” to the area between the legend and the other tabs. Hover tool tips or mouse-overs will also be a feature of the labels.

B1. Icons: The meanings of several map icons were unclear. During debriefing², when the TA asked participants what they expected from each of the map icons located at the top of the map, most participants did not know what most of the icons would be used for. Usability findings for each of the icons are explained below. See Figure 21 for a screenshot of the Map View page and the map icons.

- **State Zoom (first icon from left):** None of the participants said that they understood what the function of this icon was. Participants said that they believed the icon would edit the map, change the color of the map, zoom into a particular spot on the map, or tell the map where to focus.
- **Next and Previous Views (fifth and sixth icons from the left):** Eight of the 14 participants said that they believed these icons would scroll the map left and right.
- **Full Extent (fourth icon from right):** Five participants said that they thought the Full Extent icon was a search function.
- **Information (third icon from right):** Although all participants identified it as an “Information icon,” when the TA probed further, many were not sure what kind of information would be given if they selected this icon. Some participants said that they

² Note: We obtained this data during debriefing, not from observed behavior. Often, participants make assertions about what interfaces do, but in order to accurately assess what participants do and think, we must observe behavior.

thought it would provide help for using the map, and one participant said that he thought it would bring up the source data for the map.

- **Statistical Significance (first icon from right):** Ten of the 14 participants said that they did not know what the function of this icon was.
- **Manual Zoom (lower left icon):** Participants either did not mention the Manual Zoom button or questioned its function. One participant referred to it as a “fast forward” button. According to eye-tracking data, none of the participants ever looked at the Manual Zoom button during Task 14, which entailed specifying a particular map zoom scale.

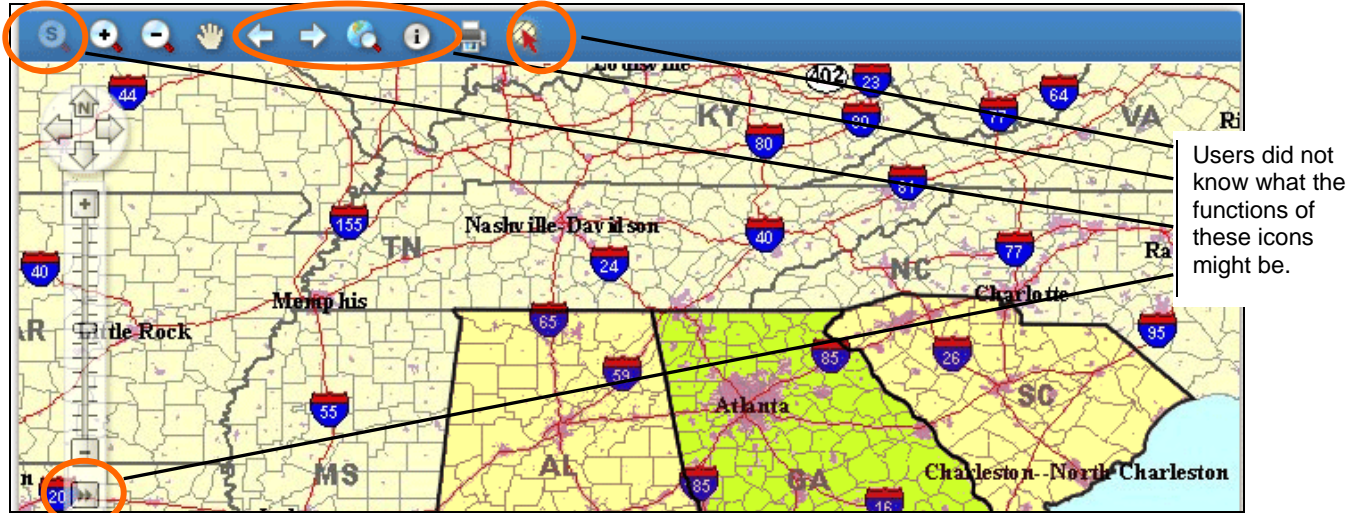


Figure 21. Map View icons to manipulate maps.

A hover tool tip (mouse-over tag) that appears when the cursor is placed over an icon would help users when they cannot identify icons. The ambiguous icons could be changed to images that are more meaningful to users. For example, the State Zoom icon could be changed to an image of the 50 states³. See an example mock up of the map icons in Figure 22. It is unlikely that people without statistical backgrounds will use the Statistical Significance function; therefore the icon image could explicitly reference statistics with a symbol that is well-known to statistics users. Since the State Zoom function is grayed-out and cannot be used except during Full Extent View, only including the State Zoom function when the user is in Full Extent View would help. In Full Extent View, explicit instructions to users that they can zoom in to a particular state by clicking on the desired state would increase usability. Consistent with what users are used to, the Next and Previous icons could become the left-most icon and the right-most icon, flush with the edges of the map, respectively, as shown in Figure 22. Figure 22 displays an example mock up.



Figure 22. Example mock up map icons for the Map View page. The Previous and Next icons have been moved to the edges; the icons stretch across the entire map; the State View and Statistical Significance icons have changed to icons that are likely to be more meaningful to the user.

³ Source: Microsoft Office Online Clip Art. <http://office.microsoft.com/en-us/clipart/results.aspx?qu=us-map&sc=20>

Team Response: The mapping software is limited in the degree to which the position of the icons in the map toolbar can be changed, so the positions likely will not change. However, all icons will have hover tool tips, and changing some of the icons to be more meaningful will be considered. For example, a country icon may replace the globe icon for country view, and a country icon with a magnifier glass may replace the S icon, for state view. The Manual Zoom icon will be made more prominent in appearance and/or location. It may change to text, such as “Expert Map Tool,” that indicates its function. Team members did not want to have icons disappear and reappear, so the graying out function, to indicate the icon is not available, will remain.

B2. Icons: The meanings of some of the data table icons were unclear. One expert user remarked that the “filter symbol looks strange...it looks like the symbol on a cell phone that tells you how strong the signal is.” Two of eight participants that were asked about the filter icon were uncertain of its functionality. An expert user remarked that the filter symbol was “peculiar” and that she did not know “what ‘filter rows’ means.” Other participants either said that the filter option made sense or that it was “not as intuitive as the other [Table Tool icons].”

In Task 5, participants were asked to sort items in a data table in ascending order. Of the eight participants that selected the Enable Table Tools button, only half of them correctly picked the up arrow (ascending order), while the other participants picked the down arrow (descending order). It appears that participants are unclear which arrow icon sorts in ascending order. See Figure 23.

Microsoft Office also uses a picture of a funnel to depict the action of filtering as shown in Figure 24. Interpretation of these symbols is likely aided by the larger icon size and the use of color gradients. The use of tool tips in the live version of AFF should increase the usability of these icons.

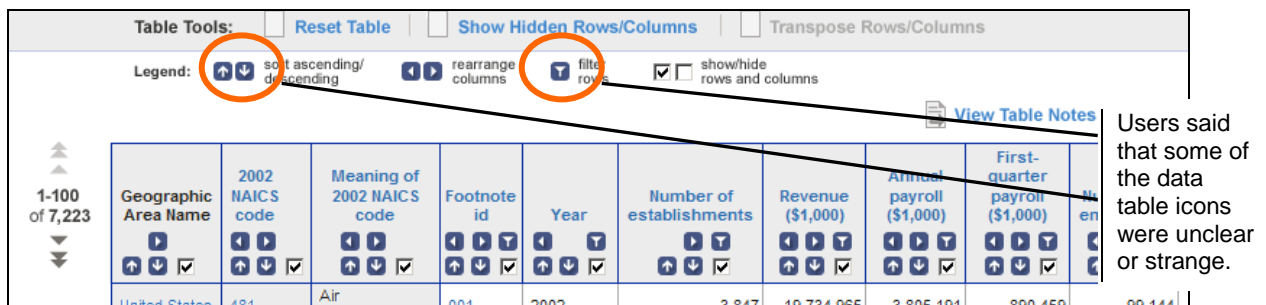


Figure 23. Data table icons.

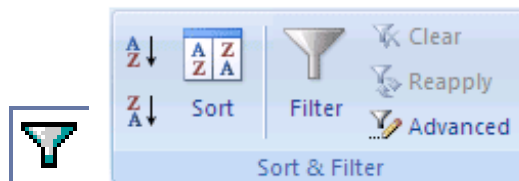


Figure 24. Filter icons from Microsoft Office Access 2002 and Microsoft Office Excel 2007.⁴

⁴ Source: <http://office.microsoft.com/en-us/excel/HP100739411033.aspx>. Microsoft Office Online. “Filter data in a range or table.”

Adding context to the ascending and descending icons by providing a sample numerical order next to the arrows as shown in Figure 25 may provide context to the user to help them understand the icons.



Figure 25. Sample ascending and descending icons with added numerical context.

C. Terminology: Terminology was unclear and confusing. Participants were confused by terminology in Table View. Task 4 asked participants to manipulate the table so that the results were narrowed to “1500 or more stores,” and Task 5 asked participants to display results so that the “company with the smallest number of stores” was at the top of the table. Three novice and three expert users did not know the difference between “Number of Establishments” and “Number of Firms” on the table. Even expert users familiar with AFF were uncertain about the distinction between establishments and firms. One expert user remarked that the difference “doesn’t come naturally to [her],” and another expert user said that she always forgets what the difference is.

The Geography filter options under the Geography tab were confusing to users. One novice user said that the geography filter options under the Geography tab shown in Figure 26 were confusing. He remarked that there are not 57 states. He asked, “What is ‘place’? Do you mean neighborhood?” He also said that the term *county subdivision* “doesn’t ring a bell” and is “not what people normally think of” when thinking about geographic areas.

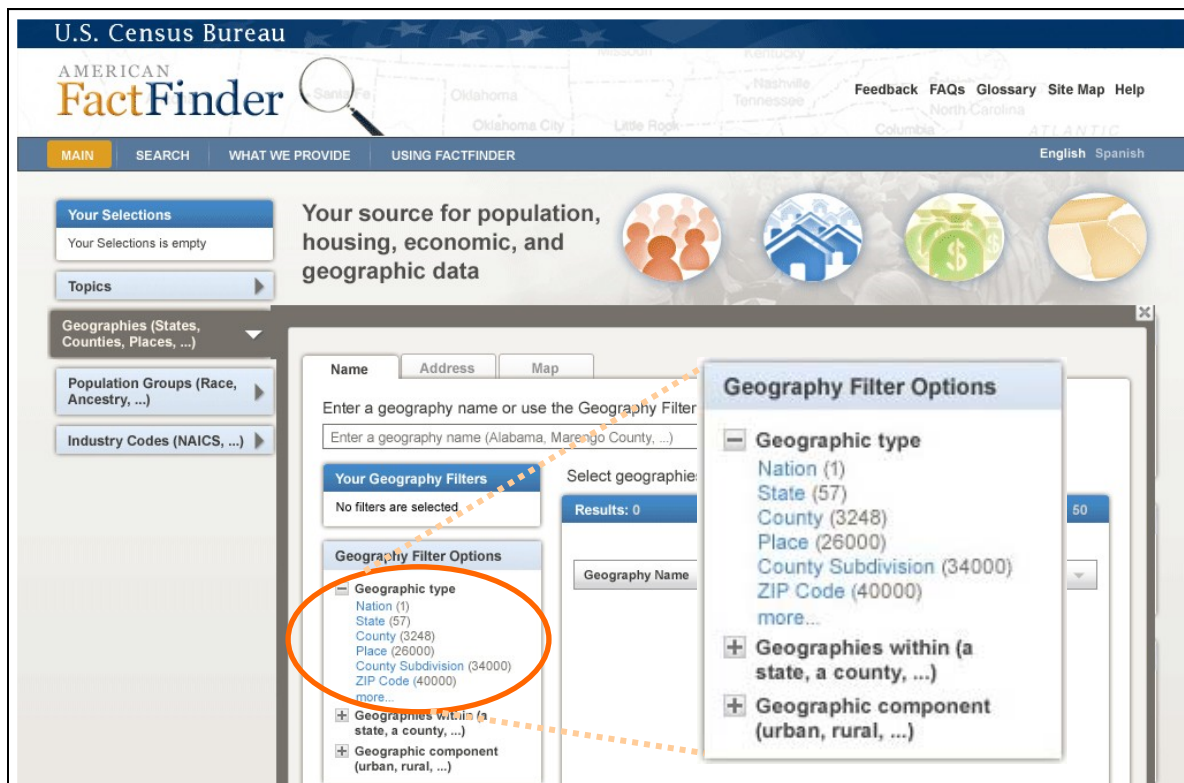


Figure 25. Geography filter options to narrow down to a specific geography.

Team Response: Terminology, such as “establishments” and “firms,” are used Census Bureau-wide and by AFF’s data providers. These terms cannot be changed. Hover tool tips containing definitions for the column headers will be provided whenever possible. A discussion on getting data providers to identify synonyms for their terminology occurred and both the design team and usability team agreed that this will be necessary to make the new AFF most effective for novice users.

3.5.2. Medium-Priority Usability Problems

Testing identified five medium-priority issues listed below. Medium-priority issues caused participants to have some difficulties or confusion, but overall, they were able to complete the tasks.

Finding 3. There is no scale on the maps. A graphic map scale is missing from the map mock ups that were tested in this low-fidelity usability test.



Figure 26. Example of a map scale included on the lower left corner of the map.

Team Response: The omission of a graphic map scale was an oversight during the development of the prototype and will be included in the next iteration. It will be located in the lower left corner of the map.

Finding 4. Participants clicked on the legend in Table View. Two expert users and one novice user who clicked on the legend said that they believed the legend items in Table View were clickable. Two of these participants said that they believed clicking on the “show/hide rows and columns” item on the legend itself would show or hide columns on the data table. Two other expert users first tried to click on the legend items but later realized they were part of a static legend. See Figure 27 for the legend on the Table View page. Participants may have become confused because static items were next to clickable items in the Table Tools and Actions rows, which are just above the legend. Due to the resolution of the page and the desktop environment participants were tested on, participants often only saw part of the column header buttons available to them, and the rest were hidden below the fold of the page. Thus, visual prominence was given to the legend items instead of the column header buttons.

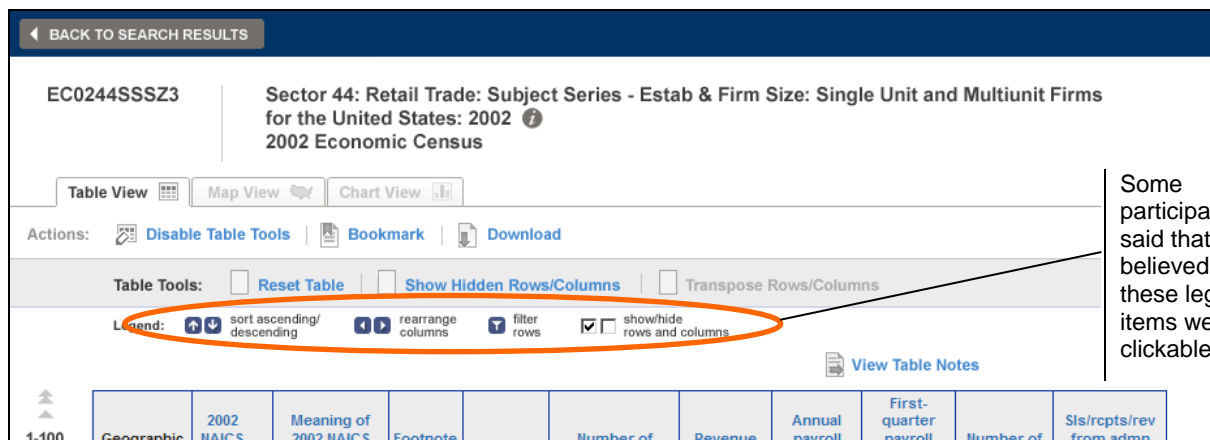


Figure 27. The Table Tools legend on the Table View page when Table Tools are enabled.

In Task 6, the ideal action to complete the task was to uncheck the checkbox in the payroll column headers. As shown in the heat map in Figure 28, much attention was given to the *legend* item “show/hide rows and columns.” There are several left-clicks on legend items (represented by red X’s) as well as on “Show Hidden Rows/Columns” in the Table Tools above the legend.

In Task 7, the ideal action to complete the task was to click on “Show Hidden Rows/Columns” in the Table Tools to display hidden columns. Participants again looked at and clicked on the legend itself, particularly on “show/hide rows and columns” as shown in the heat map in Figure 29.



Figure 28. Relative-fixation duration heat map for 12 participants for Task 6. As shown by the red X’s, participants clicked on static legend items.

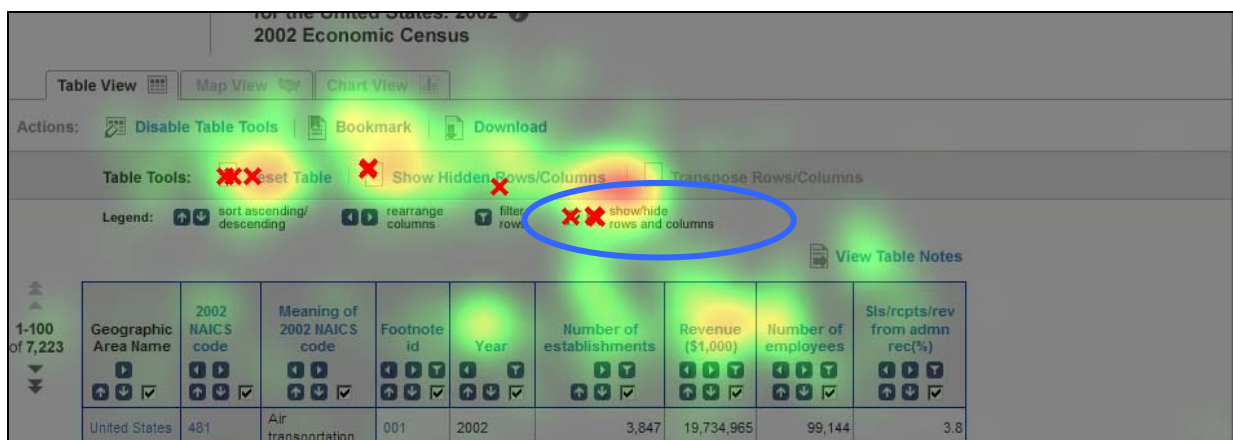


Figure 29. Relative-fixation duration heat map for 12 participants for Task 7. As shown by the red X’s, participants clicked on static legend items.

Visually separating the static legend from the clickable Actions and Table Tools, and making the title “Legend” larger and easier to read would help users on this Web site. Legends are typically seen in maps and charts and are often arranged vertically. Figure 30 shows an example mock up of a vertically-arranged legend.

EC0244SSSZ3 | Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multiunit Firms for the United States: 2002 2002 Economic Census

Table View | Map View | Chart View

Actions: Disable Table Tools | Bookmark | Download | View Table Notes

Table Tools: Reset Table | Show Hidden Rows/Columns | Transpose Rows/Columns

Legend:

- sort ascending/descending
- rearrange columns
- filter rows
- showhide rows and columns

Geographic Area Name	2002 NAICS code	Meaning of 2002 NAICS code	Footnote id	Year	Number of establishments	Revenue (\$1,000)	Annual payroll (\$1,000)	First-quarter payroll (\$1,000)	Number of employees	Sls/rcpts/rev from admn rec(%)
United States	481	Air transportation	001	2002	3,847	19,734,965	3,805,191	890,459	99,144	3.8
United States	483	Water transportation		2002	1,890	23,331,333	3,194,391	785,824	66,153	1.3
United States	484	Truck transportation		2002	112,642	164,218,769	47,750,111	11,251,748	1,435,210	17.1

The legend items have been vertically grouped together. This layout is typical for map and chart legends.

Figure 30. An example mock up for the Table View page, when Table Tools are enabled.

Finding 5. The AFF Banner and page header take up too much screen real estate.

Roughly half of the screen real estate is used by the combination of the AFF banner and the page header. The testing computer’s monitor was set at a screen resolution of 1024 x 768 for all participants (except for the visually-impaired participant, discussed later in Section 3.6 of this report). One expert user remarked, “It’s a shame to have to cursor down so much. The header is taking up way too much space,” and that “a lot of space [is] wasted on top.” Figure 31 shows where on the page participants said they thought the content started.

U.S. Census Bureau
AMERICAN FactFinder

MAIN | SEARCH | WHAT WE PROVIDE | USING FACTFINDER

Results
Click 'Back to Search Results' to select other tables or products.

EC0244SSSZ3 | Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multiunit Firms for the United States: 2002 2002 Economic Census

Table View | Map View | Chart View

Actions: Disable Table Tools | Bookmark | Download

Table Tools: Reset Table | Show Hidden Rows/Columns | Transpose Rows/Columns

Legend:

- sort ascending/descending
- rearrange columns
- filter rows
- showhide rows and columns

Geographic Area Name	2002 NAICS code	Meaning of 2002 NAICS code	Footnote id	Year	Number of establishments	Revenue (\$1,000)	Annual payroll (\$1,000)	First-quarter payroll (\$1,000)	Number of employees	Sls/rcpts/rev from admn rec(%)
United States	481	Air transportation	001	2002	3,847	19,734,965	3,805,191	890,459	99,144	3.8
United States	483	Water transportation		2002	1,890	23,331,333	3,194,391	785,824	66,153	1.3
United States	484	Truck transportation		2002	112,642	164,218,769	47,750,111	11,251,748	1,435,210	17.1

The main content of the page does not start until this point.

Participants rarely read the table title, and thus, the page content starts at this point for these participants.

Some participants scrolled to this point and never scrolled back up.

Figure 31. The combined presence of the banner and page header took up a large portion of the screen real estate.

Finding 6. There was limited filtering ability when Table Tools were enabled. An expert user (of AFF and economics data) mentioned that he would want to be able to filter on 'NAICS codes' and Geographies with Table Tools enabled. He said that, "Filtering on these others is good, but only a tiny fraction [of people] want to compare to NAICS and Geographies." He found it "very strange" that the ability to filter by NAICS codes and Geographies was not available and it was "not clear why filter options are on some places and not on others."

Finding 7. Participants did not understand when Table Tools or the Select a Data Value to Map function were enabled. Participants were unsure when Table Tools or Select a Data Value to Map functions were activated. After enabling Table Tools, one participant questioned whether or not Table Tools were enabled.

Similarly, when participants navigated to the Map View page from the Table View page, many of them did not know that the Select a Data Value to Map function was activated. Some participants clicked on 'Select a Data Value to Map' either before or after clicking on a data table cell value. Users frequently did not read the line of instruction at the top of the page until they came to the point at which they could not decide how to progress forward in the task.

3.5.3. Low-Priority Usability Problems

Testing identified two low-priority usability issues. Low-priority issues caused minor annoyances, but generally they did not interfere with task completion. These issues were not discussed with the Design Team prior to this report.

Finding 8. Participants expressed concern over search engine power and functionality. When an expert user was shown the results list from conducting a search on the main page, he expressed concern over the long list of detailed results. He said, "This list could go on and on forever. My reaction is that...I need to see simpler results." In particular, he said that he wanted to see DP-3 general profiles. He said he knew that he could use the 'Search Within Results' function to find more general profiles using the search term 'DP-3' but that this knowledge would be "more than the typical user would know." He continued to say, "Ideally from a general profile I could get to more detailed information." During debriefing he said that he was "most concerned about...the initial selection of tables" displayed in the search results and would need to see if the search function was powerful enough to present results in an understandable way. Another expert user said that she "just want[ed] a quick fact sheet or quick access" when deciding how to start searching for information.

Novice users also expressed concern about the power of the search engine. One novice user asked "who's powering" the search engine, and he expressed doubt over how good the search results would be. During debriefing, another novice user had questions such as "How well does [the search] work?" and "How far does [the search] break...down [the results]?"

As 36% (5 of 14) of the users chose to get started by running a search in Task 1, and 57% (8 of 14) used search to get started in Task 2, the results of the search will be important in leading these users to a successful task completion. As well, this is the time to work with the data providers on how to appropriately tag their tables so that the search engine will pick up the best match for the search query.

Finding 9. Participants believed the four circular graphics on the main page were clickable. Two people said that they expected the four circular graphics on the front page to be hyperlinked as shown in Figure 32. One expert user expected that the "red symbol with people on it" would bring her to population data. When asked by the TA to say more about that, she

said that the title of the page says “Your source for population, housing, economic, and geographic data,” so she knew the first symbol would lead to data about people, the second symbol would lead to data about housing, etc. One novice user said that she thought that clicking on the map graphic (far right) would open up a United States map. From there, she said that she would be able to select Nevada and access a way to filter her search further.



Figure 32. Some users thought the four circular graphics on the main page were clickable.

3.6. Results and Recommendations from a Visually-Impaired User: Iteration 2.0

One visually-impaired user participated in the study. He was recruited as a “typical” novice user, and it was not until he was in the lab participating in the study that we were aware of his disability. He used a magnifier to read text both on paper and on the computer screen. After the usability session, he mentioned that he was considered legally blind and used screen magnifying software at home.

To more closely mimic the computing environment that the visually-impaired participant (Novice 6) uses at home, the desktop resolution was set to 800 x 600 pixels. All other participants worked with the desktop resolution set to 1024 x 768 pixels.

This participant completed 64% of the tasks successfully which is higher than the 56% aggregate mean for all participants. He gave the Web site prototype a mean satisfaction rating of 6.2 out of 9, and compared to other participants, this score indicates a moderately-high satisfaction with the prototype. This participant performed well on the table-manipulation tasks. Similar to the other novice users, he did not use the Manual Zoom or the *i* icon in Map View. While on the main page, he commented that navigation is located appropriately at the top and left-hand side of the page. He commented that as a visually-impaired Internet user, it is especially important for such conventions to be followed so that he can quickly find material that he is looking for. Like a few other users, he wondered if de-selecting the checkbox in the table column header when Table Tools were enabled would automatically hide columns upon clicking or if there was a refresh button he needed to click. He noted that he expected the columns to automatically hide after clicking on the checkbox in the column header.

After hiding the payroll information in Task 6, he remarked that there was no indication on the page that information is missing from the page. He expected to see a list of columns that are hidden to be shown on the screen or a footnote indicating that not all information on the data table was being displayed. He asked, “If there’s no disclosure, what if someone prints a hard copy? People can easily get the wrong picture.” He mentioned that the Show Hidden Rows/Columns function appeared to not have any “granularity” so that he could not choose to un-hide only one of two hidden columns.

Like other novice users, the map underlying the data table in Map View for Task 9 distracted him. He wondered why the “map is grayed out” when the “map is where the action is.” He said that he particularly did not like that the data table overlaid the map and he could not see the entire U.S. He pointed out that Alaska could not be seen but Hawaii could and wondered whether such a display would offend people. He said he wanted to drag the map down so that he could see the whole map. In addition, he said that he expected checkboxes to “appear everywhere on rows and columns” of the data table so that users could select the information they wanted to be mapped.

He said that he thought the map tools represented by icons (e.g., Print) were “where they’re supposed to be.”

Overall, the visually-impaired user performed well with this medium-fidelity prototype. Future rounds of iterative testing should aim to include visually-impaired participants to ensure that as the Web site increases in usability, it increases in accessibility too.

4.0. Iteration 1 Compared to Iteration 2.0

In Iteration 1, the overall accuracy score was 40% for novice users (the only group tested), while in Iteration 2.0, the overall accuracy score for novice users was 55%, and for expert users, it was 56%. Users were more accurate with the new AFF design (Iteration 2) than with the conceptual design (Iteration 1). The new AFF design interface, while not reaching the 80% accuracy goal, did show improvement from Iteration 1.

In Iteration 1, the average satisfaction score for all tasks across all participants on the Satisfaction Questionnaire was 4.79 out of 9, which is below the midpoint of the scale. Satisfaction improved somewhat with Iteration 2, where the average satisfaction score for all tasks across all participants was 5.69 out of 9, slightly above the mid-point of the scale. In Iteration 1, none of the satisfaction question means achieved a score higher than 5.57, but in Iteration 2, the lowest rating was 6.43. Again, this demonstrates that users were slightly more satisfied with the new AFF design than with Iteration 1.

In Iteration 1, there were six high-priority problems; in Iteration 2, there were two high-priority problems. This shows that the number of “show-stoppers” in Iteration 1 was considerably more than currently exist in the new AFF design. However, it is important to note that the two high-priority problems found in Iteration 2 continue to deal with high-priority problems found in Iteration 1 testing (though somewhat more nuanced): lack of direct guidance, and confusing terminology, labels, and icons.

One major difference when comparing user performance in Iteration 1 to this round of testing was in the way that users got started on the site. In Iteration 1, users struggled with this crucial beginning step. While both iterations of usability testing showed that there is a need for guided help, in Iteration 2.0, in the areas where the prototype provides guidance (e.g., the first page), users more easily knew how to begin to find the information they were looking for. Thus, we can see from Iteration 1 to Iteration 2.0, the new AFF design addresses the issue that users did not know how to get started.

Users in Iteration 1 were overwhelmed with the results display. This page was not tested in Iteration 2.0, though it is recommended that it be tested in the near future. In Iteration 1, on the results display page, users did not know where to look or what to do because of the overwhelming amount of information, lack of white space which made for a cluttered feel, and

the confusing icons and terminology all over the screen. In Iteration 2.0, on the data table pages, there was white space and less clutter on the screen so users focused on the table displayed. However, they missed or did not use key elements, such as the Enable Table Tools button and encountered problems when attempting to map a data element from a table.

In both rounds of testing, terminology has been a major issue. In Iteration 1, there was tremendous confusion, with terminology on the initial getting started pages such as “primary properties for your collection,” “properties,” and “attributes,” all of which reflect the developer’s terminology rather than that of the users. In Iteration 2.0, terminology problems still existed; however, a number of terminology issues were cleared up, particularly on the initial getting started page. In Iteration 2.0, terminology that confused users was primarily located on the data tables and maps (e.g., “Enable Table Tools”, “Data classes,” “Map markers,” “Map contents”). For the results display table, in Iteration 1, confusing terminology included the name of the data table itself (e.g., “Nativity...”) as well as the use of ID numbers in a prominent position on the table. In Iteration 2.0, confusing terminology existed on the table display, such that users did not understand the difference between “establishments” and “firms,” or what NAICS meant (for novice users).

Confusing icons in Iteration 1, such as the action icons: view, save, xls, and csv, as well as the red X with a circle around it, were located on the results display. By Iteration 2.0 many of these issues were cleared up, and confusing icons were more often found on the mapping pages (a section not tested in Iteration 1).

5.0. Iteration 2.5 Usability Testing

The Design Team implemented modifications to the design of AFF based on the results of Iteration 2.0 usability testing. In Iteration 2.5, we wanted to see whether the modifications to the design worked or whether any new usability issues were created. We conducted medium-fidelity usability testing (i.e., the prototypes were clickable, but not fully functioning) on Iteration 2.5 of the new American FactFinder (AFF) Web site in two parts. First, we tested with six novice users and three expert users from September 9 to September 17, 2009. Eight participants were recruited externally through a database maintained by the Usability Lab, and one participant was an internal Census Bureau employee from the Economic Division. We had difficulties recruiting expert users but wanted to conduct this round of testing quickly. Once testing was complete, we emailed a quick report to the Design Team and met with them to discuss findings. Coincidentally, a three-day conference took place at the Census Bureau one week after that meeting, in which conference attendees were avid AFF users (and thus the expert users we were seeking). We recruited four additional expert users to take part in Iteration 2.5 testing, and they were tested in one day.

In Iteration 2.5, the mean age for novice users was 42.33 years (range 25-60), and the mean age for expert users was 38.43 years (range 27-51). Participants’ education levels ranged from high school education to doctoral degrees. See Table 7 for participants’ demographic characteristics. All novice users were unfamiliar with the AFF Web site, and all expert users were familiar with the current, live AFF Web site, used it regularly, and were comfortable in analyzing and working with statistical data. One of the expert users was an internal staff member from the Economic directorate, two expert users were graduate students that met the expert requirements (see Appendix G for AFF expert requirements), and four were State Data Center staff who had attended the Census conference. See Table 12 in Appendix K for participants’ self-reported computer and Internet experience.

This study tested a medium-fidelity prototype (Iteration 2.5) of the AFF Web site. Iteration 2.5 was a semi-functional prototype using modified screenshots from Iteration 2.0. As the Web site is currently being developed, some of the links and buttons did not work; however, participants were asked to treat the screenshots as a fully functional Web site. Participants attempted to find information to complete tasks that were given to them by the Test Administrator (TA). In cases when participants clicked on links and buttons that did not work, the TA asked the participant what he or she would expect to happen. See Appendix H for screenshots used in this study.

Prior to beginning the tasks, participants were briefly informed about the purpose of the study and the uses of data that were to be collected. The participants performed six pre-determined tasks using the Web site prototype. See Appendix H for the tasks with the corresponding ideal actions for successful completion and the screenshots that were displayed for each task. The tasks were developed to determine whether users understood the Web site's search and navigation capabilities and some table and map functions. In particular, this usability study sought to examine if changes made to the Web site design following Iteration 2.0 improved user performance and if a more fully-functional Web site prototype improved user performance.

Table 7. Participant Demographics

Gender		Age range		Education		Race	
Novice users							
Male	3	25-26	2	HS, GED	1	African American	3
Female	3	33	1	Vocational beyond HS	1	West Indian	1
		45	1	Bachelor's	3	White	2
		60-65	2	Master's	3		
Mean across novice users		42.33 years					
Expert users							
Male	4	27-29	2	Associate's	1	White	7
Female	3	36-40	2	Bachelor's	2		
		42-44	2	Master's	3		
		51	1	Doctoral	1		
Mean across expert users		38.43 years					
Mean across all participants		40.23 years					

5.1. Iteration 2.5 Results

5.1.1. User Accuracy

The overall accuracy score for novice users was 71%, and for expert users, it was 84%. Accuracy scores ranged from 25% to 100% across both novice and expert users. It appears that novice users, in particular, struggled with Task 3, which asked participants to add Alaska and Hawaii to an existing data table. All users performed well on Task 7, which asked them to change the colors of an existing map. See Table 8 for user accuracy scores and Appendix H for the complete tasks. See Appendix I for recaps of each participant's performance during the usability sessions.

Table 8. User Accuracy Scores for Usability Testing of the American FactFinder Iteration 2.5 Web Site.

Participant	Task							Average success by participant
	1	2	3	4	5	6	7	
Novice 1	0.5	N/A	0	1	N/A	1	1	70%
Novice 2	1	1	0	0	0	1	0	43%
Novice 3	1	0	0	1*	1*	1	1	71%
Novice 4	1	1*	1	1	1	1**	1	100%
Novice 5	0.5	1	0.5*	1	1	1	1	86%
Novice 6	1	1	0	0	1	0	1	57%
Average success by task across novice users								
	83%	80%	25%	67%	80%	83%	83%	71%
Expert 1	0.5	0.5*	1	1	1	1	1	86%
Expert 2	1	1	0	0	0	0.5	1	50%
Expert 3	1	1	1	1	1	1	1	100%
Expert 4	1	1	1	0	1	1	1	86%
Expert 5	1	0	0	1	1	1	1	71%
Expert 6	1	1	1	1	1	1	1	100%
Expert 7	0	1	1	1	0	1	1	71%
Average success by task across expert users								
	79%	86%	71%	79%	79%	93%	100%	84%
Average success by task across all participants								
	77%	83%	58%	79%	75%	94%	92%	80%

Note: Tasks labeled N/A means that the task was skipped and was not factored into the averages.

1 = Success; 0.5 = Partial Success; 0 = Failure. A task was considered a success when a user was able to complete it as far as allowed by the prototype.

*Participant succeeded, but needed prompting from test administrator.

**Participant succeeded, but used the back button rather than 'Create a Different Thematic Map.'

5.1.2. User Satisfaction

The average satisfaction score across all participants was 6.66 out of 9 (compared to 5.69 in Iteration 2), which is slightly above the mid-point of the scale. For novice users, the average satisfaction score was 6.51 (compared to 5.49 in Iteration 2.0), and for expert users, the average score was 6.51 (compared to 5.89 in Iteration 2.0). None of the satisfaction question means achieved a score higher than 7.00. Individual ratings ranged from 2 to 9. One novice user scored most of the items rather low with an average rating of 3.50. On average, the individual items were rated similarly across all participants. See Table 9 for participants' satisfaction scores for various attributes of the Web site. Generally, novice users were slightly more satisfied with the new Web site than expert users, especially regarding forward navigation.

Table 9. User Satisfaction for the American FactFinder Iteration 2.5 Web site (1 = low, 9 = high).

Participant	Satisfaction questionnaire items										Mean rating by participant
	Overall reaction to site: terrible - wonderful	Screen layouts: confusing - clear	Use of terminology throughout site: inconsistent - consistent	Information displayed on the screens: inadequate - adequate	Arrangement of information on the screens: logical - illogical	Tasks can be performed in a straight-forward manner: never - always	Organization of information on the site: confusing - clear	Forward navigation: impossible - easy	Overall experience of finding information: difficult - easy	Census Bureau specific terminology: too frequent - appropriate	
Novice 1	7	5	5	8	9	8	6	9	7	7	7.10
Novice 2	4	4	3	3	2	2	2	6	2	7	3.50
Novice 3	7	8	8	9	9	8	8	8	8	8	8.10
Novice 4	7	9	5	9	9	9	9	9	9	7	8.20
Novice 5	6	7	N/A	6	8	7	8	9	7	9	7.44
Novice 6	4	5	5	6	5	2	6	5	6	4	4.80
Mean rating by question across novice users	5.83	6.33	5.20	6.83	7.00	6.00	6.50	7.67	6.50	7.00	6.51
Expert 1	4	3	4	5	4	4	3	4	4	6	4.10
Expert 2	9	8	9	8	9	4	9	4	8	9	7.70
Expert 3	7	7	6	6	7	6	5	*	5	8	6.33
Expert 4	8	7	7	7	6	6	7	7	6	8	6.90
Expert 5	8	9	8	9	9	7	8	8	9	8	8.30
Expert 6	7	6	6	8	6	6	5	7	7	6	6.40
Expert 7	8	8	7	7	8	8	7	8	8	8	7.70
Mean rating by question across expert users	7.29	6.86	6.71	7.14	7.00	5.86	6.29	6.33	6.71	7.57	6.78
Mean rating by question across all participants	6.62	6.62	6.08	7.00	7.00	5.92	6.38	7.00	6.62	7.31	6.66

Note: * Participant did not answer item.

5.1.3. Positive Findings

- There were higher overall success scores for all three tasks that were repeated from Iteration 2.0. See Table 10 for details. Two of the four new tasks had a success rate of over 80%.
- The label change from “Data Classes” to “Colors & Data Classes” appeared to work for users. This is reflected in Task 7 where participants were asked to change the color of the existing map. The overall success score was 89%. In Iteration 2.0, the overall success score for this question was 21%.
- Participants more readily clicked on the button “Modify Table” when asked to manipulate the data table contents than when the function was called “Enable Table Tools.” Participants were quick to click on the button “Modify Table” to begin the task. This is reflected in Task 5 which asked participants to delete the margin of error. The overall success score was 75%.
- It appears that the highlighting of the table is a useful visual cue for users that the table is interactive. If participants hovered over the data table in Map View, most clicked on a data cell value to bring up a map containing data from the table.
- Unlike in Iteration 2.0 where participants tried to parse data before mapping, in this study, most participants clicked on Map View first.
- One novice user effectively used the *i* icon under the word “about” because, they said, they wanted “information *about* the table.”

Table 10. Overall Participant Success Scores for Tasks That Were Tested In Iterations 2.0 and 2.5.

Task question	Overall success score	
	Iteration 2.0	Iteration 2.5
Task #4: You’ve already done a search on place of birth by sex in the United States. You are now looking at a table of your results. You would like to see a map of all males by birth location, specifically in Florida. What would you do?	46%	67%
Task #6: You are currently looking at a map of males born in state of residence by state. How would you view a map of the same information but for females?	43%	75%
Task #7: You want to change the colors on the map to fit better with the presentation you will be giving. How would you do this?	21%	89%

5.1.4. Iteration 2.5 High-Priority Usability Problems

Testing identified three high-priority usability issues. High-priority issues have the potential to interfere with user success by bringing the user to a standstill from which they are unable to recover. The high-priority items, as well as the Design Team’s responses, are listed below.

1. Modifying search results was not obvious.

Most of the participants did not know how to add Hawaii and Alaska to the data table. Eight out of nine users initially went to the Modify Table button thinking they could add these geographies to the table. One user said “I’ll go to Modify Table because modify means to change.” While the change from Iteration 2.0 of “Enable Table Tools” to “Modify Table” worked for some user actions (e.g., getting rid of the margin of error column), it caused new problems, specifically with adding data to the table. It does not appear to be intuitive for users to return to the search results in order to add geographies to a result. As shown in Figure 33, the instruction for the

Back to Search button is disconnected from the button because it is on another line and is located outside of the box encapsulating the data table. The task related to this issue was Task 3, which had the lowest success score across all users at 39%. This was a considerably lower score than for the other tasks.

During Task 3, one novice user looked for a box that would “give [her] the option to select a state or a comparison box.” She said she wanted to find “a tab that would allow [her] to formulate a comparison to this table such as ‘Select states for comparison’ or ‘Add data by states’ and that would “allow [her] to pick states to add.” She never clicked on the Back to Search button. One expert user recommended having two buttons, one labeled “Modify Table View” and one labeled “Modify Selections.”



Figure 33. The instructions to the Back to Search function are not located next to the button.

Team Response: The Design Team will analyze some design alternatives of the Result Page header to solve the problem with the visibility of the “Back to Search” button. “Back to Search” may change to “Change Geographies or Industries,” and an “Add Data to Table” (or similar) button will be added to the Modify Table call-out bubble. The button will be aligned with the other buttons in the call-out bubble.

2. Some users did not hover over the data table in Map View and consequently did not map a data item.

Three of the users failed to complete this task and all of these users did not hover over the cells with data values. One novice user clicked on the Florida column header. Clicking on the column and row headers does not cause the table to highlight. One expert user did not hover over the table, instead she clicked on the Create a Thematic Map button. Another novice user attempted to modify the table before mapping and struggled overall with this task.

While most participants seemed to understand the table was clickable when the table became highlighted, this was not intuitive for all users. As seen in Iteration 2.0 testing, participants did not read the instructions unless they could not figure out what to do on their own. During Iteration 2.5 testing, one participant remarked that the Map View page with the data table “has an awful lot to read,” and another participant said, “I don’t like to read things like this.” A screenshot of the instructions is shown in Figure 34.

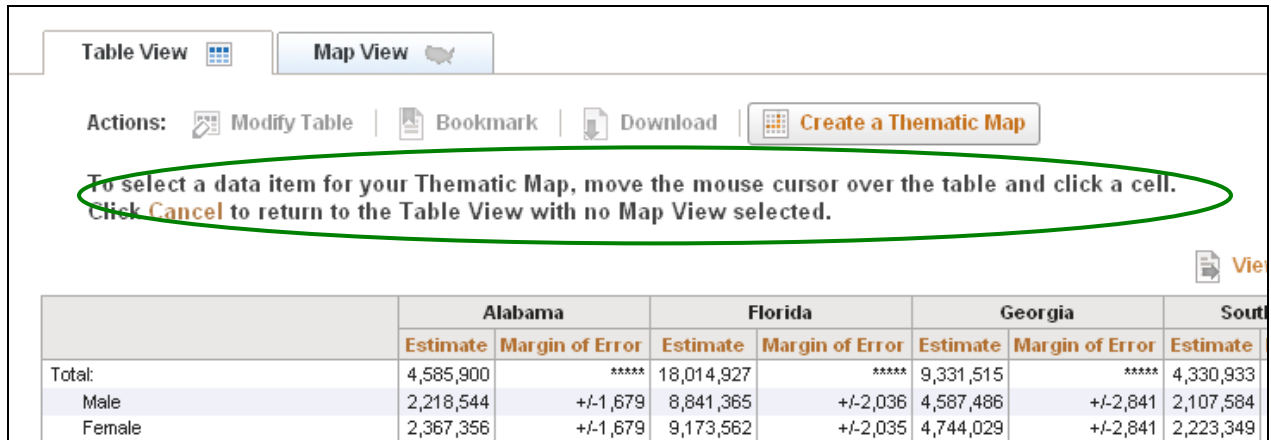


Figure 34. Users seem to not read the instructions for selecting a data table value to map.

Team Response: The sentence structure will be re-ordered so that the action is first and the result is second, e.g., “Move the mouse cursor over the table and click a cell to select a data item to map.” The second line will be removed, and a call-out bubble will be used to draw a connection between the instruction and the data table, as shown in Figure 35. Other cues will be identified that might draw users to hover over the table.



Figure 35. A call-out bubble is used effectively on this page. It emphasizes the functions within and visually associates the functions with another element on the page—in this case, Table Tools.

3. The minimal visual changes that occur when a user navigates from Table View to Map View is confusing for participants.

After clicking on the Map View tab from the Table View tab, the Map View tab does not highlight and the Table View tab stays highlighted. This caused some confusion for users. A frequent comment made by users after they clicked on Map View from Table View was that “nothing happened/changed.”

One participant remarked, “It’s not doing anything right now. The tab Table View stays highlighted and nothing happens when I click on Create a Thematic Map.” One expert user, who performed very well, also said that he thought the page had not changed.

Team Response: The Map View tab will highlight when the Map View tab or the Create a Thematic Map button is clicked. A call-out bubble will surround the instructions for selecting a data value to map, to provide additional visual contrast. The Map View tab will be hidden, by default. The only way a user will be able to create a map will be to select the ‘Create a Map’ button. The Map View tab will appear once the user has selected the button.

Medium-Priority Usability Problems

Medium-priority usability problems caused the user to struggle and led to an increase in task completion time.

4. Viewing search results was not immediately intuitive, but most users did it.

Two participants did not know how to view result 2 of 3. Generally, it took participants some time to understand or see this navigation option. A few participants noticed it right away. Some of the confusion was likely due to the low-fidelity nature of the study where a participant might have only clicked on one or two tables (even though the scenario said to select the first three), but the prototype would automatically display all three results.

Result navigation is located in a blue bar above the table as shown in Figure 33. As one expert user pointed out, the blue bar looks like a header. Users typically ignore information that appears to be part of a header.

Team Response: The Design Team will analyze some design alternatives of the Result Page header to increase the visibility of the product pagination.

5. One participant believed the data table in Table View was interactive when Modify Table was not selected.

One participant thought she could directly click on the data table in Table View because rows highlight as the cursor moves over the table.

Team Response: The highlighting in Table View will not be present when no actions can be done directly on the rows in Table View (i.e., when Modify Table is not selected).

6. Participants did not understand that the Create a Thematic Map button is not clickable when it is active.

Participants did not understand that Create a Thematic Map was activated after they clicked on the Map View tab from the Table View tab. Some participants said that they thought that they needed to click on it to activate it. It is likely that the color of the text in the button led to users thinking that it is a link and is clickable. See Figure 36 for a screenshot of the Create a Thematic Map button that is already active and not clickable.



Figure 36. The visual focus, particularly the color, of the Create a Thematic Map button likely caused users to click on it.

Team Response: This will not be an issue since the Map View tab will be removed, by default.

7. The term “thematic map” is jargon and difficult to understand.

The term “thematic map” was difficult for some participants to understand. When a novice user was asked during debriefing what “thematic map” meant, he said that he “had no idea.” During Task 4, a different novice user remarked that she did not understand what “Create a Thematic Map” meant. One expert user said he would prefer to see “Map this data” or “See this data on a map” rather than “Thematic Map.”

Team Response: Jargon will be eliminated, and the word “thematic” will be removed from the label “Create a Thematic Map.”

8. When participants selected a data item to map, their expectations were not met.

Two participants questioned why all four states were mapped from the data table when they had only selected one geography (Florida) for Task 4. One of these participants said she thought it should be apparent what geographies would be mapped.

Team Response: The wording of the question may have led to confusion. In future iterations, this question will be re-worded.

9. Participants did not use the reset table button to update the table after un-checking the margin of error column.

Task 5 asked users what they would do if they wanted to get rid of the margin of error column. A success was marked when users clicked on the “Modify Table” button and unchecked the column labeled “margin of error.” Most users then said they were looking for a way to save the changes to the table. Only a few users said they would (or tried to) click on the (grayed out) reset button. In this version of the prototype, the reset button was grayed out—consequently it is difficult to say whether more users would have used the button if it had not been grayed out. However some users said that they wanted a button either right above or right below the table where they could save their changes and update the table.

Team Response: Once the system has been fully implemented, any changes to the table will appear in real-time (e.g., the Margin of Error column will disappear as soon as the user un-checks its checkbox). The function of the “Reset Table” button is to revert the table back to its original (prior to manipulation) presentation.

5.2. Iteration 2.5 Discussion

Usability testing of the clickable medium-fidelity version of AFF Iteration 2.5 shows significant improvement from Iteration 2.0 and demonstrates the importance of iterative usability testing. The biggest issue in this iteration is that by changing the “Enable Table Tools” to “Modify Table,” a new problem was created. The solution to this and other issues identified by users will be tested in the next round of usability testing, with an even higher-fidelity working prototype.

6.0. Limitations of Iterations 2.0 and 2.5

The presentation and navigation of the static Web site prototype was designed to mimic a live Web site as much as possible. However, there are limitations inherent to testing a medium-fidelity Web site. Participants sometimes explicitly mentioned that there were multiple actions they would try on a Web page that they could not try with the prototypes. This exploration could not be carried out on the limited set of mock ups that were used for this usability study. If the tested site was live, it is possible that task accuracy may have increased because participants would be able to explore the site and would have gotten feedback from the Web site about some of their actions. It is also possible that participants could go further down an incorrect path and get more lost on the site. Testing of a higher fidelity prototype is essential in order to evaluate user performance on the emerging design.

The amount and type of feedback given by participants was limited because participants often did not have a sense of whether or not they had successfully completed a task. During debriefing, when asked by the TA whether the tasks were easy or difficult to complete, most

participants said they could not tell because they could not carry tasks to completion and felt there was little feedback given in response to their actions.

Asking participants to think aloud may have affected their performance (Olmsted-Hawala et al., 2010). For some people, thinking aloud is an easy process; for others, they have to be constantly reminded to express their thoughts. Due to the medium-fidelity nature of the study, it was important to gather information about how participants would expect to interact with the Web site since the existing interaction is limited. Information regarding whether or not the prototype fit the users' expectations was elicited by the TA by using probes such as, "What would you expect if you did x?" Using more intrusive probes requires participants to engage in mental processing that may influence their focus of attention and can possibly lead to increased task completion times (not measured in Iteration 2) but should not affect task performance (Hertzum, Hansen, & Andersen, 2006; Olmsted-Hawala et al., 2010).

Eye tracking can yield voluminous results that could not be garnered otherwise, but the technology has limitations. Some people's eyes can be harder to track due to their physical idiosyncrasies and the eye tracker's limited capabilities. Since the eye-tracking equipment is built into the computer monitor, it allows people to freely and naturally use the computer. However, poor-quality data can be collected when the participant moves out of range of the eye-tracking equipment by leaning in toward the monitor. Due to these limitations, limited eye-tracking data were gathered for two expert users and one novice user in Iteration 2.0.

7.0. Conclusion

In conclusion, while there is still more work to be done, substantial progress has been made towards designing a user-centered interface for the new AFF. As new designs emerge, the Usability Lab recommends continuing iterative usability testing to refine the design and to minimize user obstacles when finding and understanding Census data. As shown in this report, developing the new AFF with the aid of iterative usability testing has been a positive and productive effort. Users in later rounds of testing were more successful and more satisfied with the product than those in the first round of testing. As changes are implemented and new studies are conducted on the emerging design, the Usability Lab strives to incrementally improve the usability of AFF.

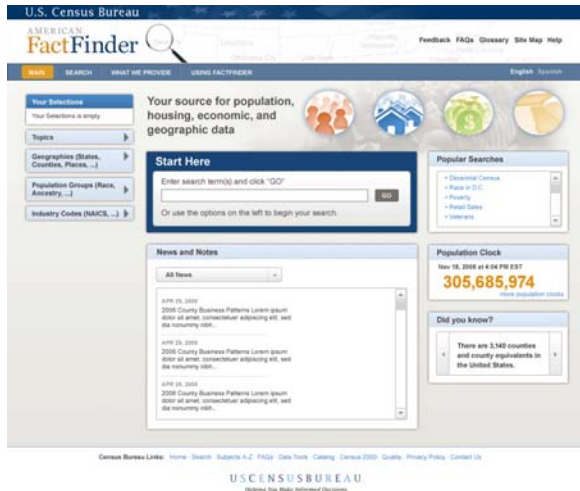
8.0. References

- Chin, J.P, Diehl, V.A., and Norman, K.L. (1988). Development of an Instrument Measuring User Satisfaction of the Human-Computer Interface. *Proceedings of SIGCHI '88* (pp. 213-218), New York, NY: ACM/SIGCHI.
- Ericsson, K., & Simon, H. (1980). Verbal reports as data. *Psychological Review*, 87, 215–251.
- Fleming, J. (1998). *Web navigation: Designing the user-experience*. Sebastopol, CA: O'Reilly & Associates.
- Hertzum, M., Hansen, K., and Andersen, H.H.K. (2009). Scrutinising usability evaluation: does thinking aloud affect behaviour and mental workload? *Behaviour & Information Technology* 28(2): 165-181.
- Olmsted-Hawala, E., Murphy, E., Hawala, S., & Ashenfelter, K. (2010). Think-aloud protocols: A comparison of three think-aloud protocols for use in testing data-dissemination Web sites for usability. Proceedings of CHI 2010, ACM Conference on Human Factors in Computing Systems.
- Poole, A. and Ball, L. J. (2005). Eye Tracking in Human-Computer Interaction and Usability Research: Current Status and Future Prospects. In Ghaoui, Claude (Ed.). *Encyclopedia of Human Computer Interaction* (pp. 211-219). Hershey, PA: Idea Group.
- Romano, J. C., Olmsted-Hawala, E. L., & Murphy, E. D. (2009). A Usability Evaluation of Iteration 1 of the New American FactFinder Web site: Conceptual Design (*Statistical Research Division Study Series SSM2009-05*). U.S. Census Bureau.
<http://www.census.gov/srd/papers/pdf/ssm2009-05.pdf>.

Appendix A. Task Questions with Screenshots Used in Iteration 2

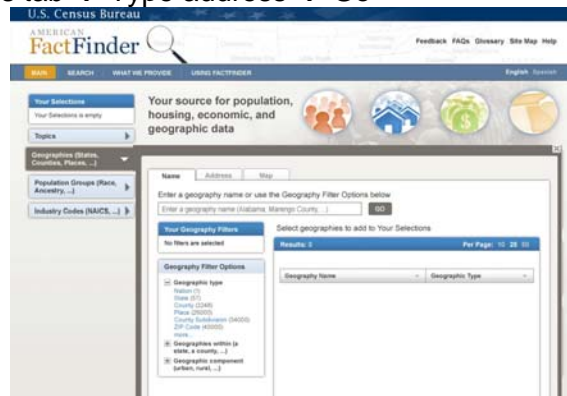
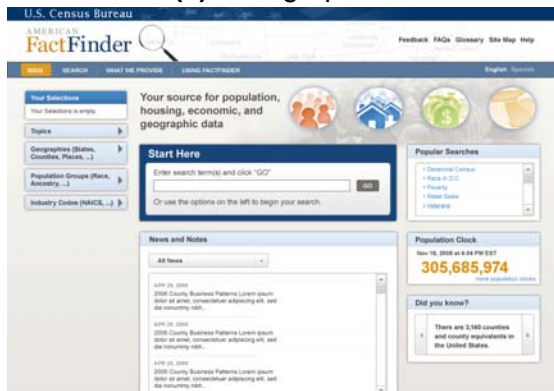
1. Imagine that you are thinking about moving to Virginia and you want to do extensive research on that area before moving. A friend has recommended this American FactFinder site to you. Here is the Main page. How would you start your search?

Ideal Action(s): Geographies tab OR enter search in Start Here box



2. You are interested in finding information about a neighborhood that your sister used to live in. You want to get as much information as you can about the area where she lived in 2005. At that time, she lived at 4237 Peapod Lane, Norfolk City, VA, 23501. How would you find all the available information about that neighborhood?

Ideal Action(s): Geographies tab → Address tab → Type address → Go



3. You are doing a report on education in the United States and want to know what percent of the men in Nevada were White and college educated in 2006.
Ideal Action(s): Topics tab OR Geographies tab OR Population tab OR use Start Here search

The screenshot shows the American FactFinder website. At the top, it says "U.S. Census Bureau" and "AMERICAN FactFinder". There is a search bar with a magnifying glass icon and a "GO" button. Below the search bar are navigation tabs: "MAIN", "SEARCH", "WHAT WE PROVIDE", and "USING FACTFINDER". On the right side of the top navigation bar, there are links for "Feedback", "FAQs", "Glossary", "Site Map", and "Help". Below the navigation bar, there are four circular icons representing different data categories: people, housing, economic, and geographic data. On the left side, there are four dropdown menus: "Your Selections" (empty), "Topics", "Geographies (States, Counties, Places, ...)", "Population Groups (Race, Ancestry, ...)", and "Industry Codes (NAICS, ...)". In the center, there is a "Start Here" section with a search input field and a "GO" button. To the right of the "Start Here" section, there is a "Popular Searches" list with items like "Decennial Census", "Race in D.C.", "Poverty", "Retail Sales", and "Veterans". Below the "Start Here" section, there is a "News and Notes" section with a dropdown menu set to "All News" and a list of news items dated "APR 29, 2008". To the right of the "News and Notes" section, there is a "Population Clock" showing "Nov 18, 2008 at 4:04 PM EST" and a large number "305,685,974" with a link to "more population clocks". Below the "Population Clock" section, there is a "Did you know?" section with a fact: "There are 3,140 counties and county equivalents in the United States." At the bottom of the page, there is a "Census Bureau Links" section with links to Home, Search, Subjects A-Z, FAQs, Data Tools, Catalog, Census 2000, Quality, Privacy Policy, and Contact Us. The footer of the page says "U.S. CENSUS BUREAU" and "Helping You Make Informed Decisions".

- For a project you are working on, you have done a search on retail stores in the United States in 2002 and the results are on the computer screen.
 - You decide that there is too much information here, and you want to narrow your results to retail stores that have 1500 or more stores. What would you do?

Ideal Action(s): Enable Table Tools → Filter icon

U.S. Census Bureau FactFinder

Results

Click "Back to Search Results" to select other tables or products.

EC024455Z3 Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multiunit Firms for the United States: 2002

Table View | Map View | Chart View

Actions: Enable Table Tools | Bookmark | Download

Geographic Area Name	2002 BACS code	Description of 2002 BACS code	Footnote	Year	Number of establishments	Revenue (\$1,000)	Annual payroll (\$1,000)	First-quarter payroll (\$1,000)	Number of employees	
United States	44	Retail Trade		2002	12,242	184,218,798	47,750,111	11,291,748	1,428,219	
Alabama	44	Retail Trade		2002	3,847	19,734,985	3,885,191	890,459	89,144	
Alabama	441	Food and kindred products stores		2002	1,896	23,331,333	3,194,391	789,824	66,193	
Alabama	442	Meat and poultry stores		2002	2,170	1,424,444	1,744,407	47,154,981	1,934,474	
Alabama	443	Beer, wine, and liquor stores		2002	1,821	889,698,916	5,173,334	1,389,191	190,017	
Alabama	444	Retail Trade	Private with 1-99 establishments	2002	18,123	31,291	1,671,799	12,794,194	3,123,161	497,162
Alabama	445	Retail Trade	Private with 100+ establishments	2002	9,917	23,421	162,993,129	79,732,379	2,999,973	421,249
Alabama	446	Retail Trade	Private with 10-99 establishments	2002	4,392	21,209	1,224,817	11,922,293	2,929,494	428,249
Alabama	447	Retail Trade	Private with 10-99 establishments	2002	2,210	39,247	1,471,031	10,368,932	2,592,978	429,831
Alabama	448	Retail Trade	Private with 25 to 49 establishments	2002	409	19,199	14,748,941	7,139,149	1,719,247	144,794
Alabama	449	Retail Trade	Private with 50 to 99 establishments	2002	31	22,053	65,151,031	7,902,412	1,910,160	104,007
Alabama	450	Retail Trade	Private with 100+ establishments	2002	407	202,113	1,372,700,201	120,209,202	31,240,701	7,253,052
Alabama	441	Retail Trade	All firms	2002	20,770	122,123	981,748,102	64,549,713	15,143,103	1,948,402
Alabama	441	Retail Trade	Single unit firms	2002	20,770	30,709	541,170,312	41,027,412	9,707,200	1,170,205
Alabama	441	Retail Trade	Multiunit firms	2002	2,000	34,24	200,200,200	22,011,201	2,370,202	107,441
Alabama	441	Retail Trade	Private with 1 establishments	2002	1,747	1,747	1,747,174	1,747,174	1,747,174	1,747,174
Alabama	441	Retail Trade	Private with 2 establishments	2002	1,253	1,253	1,253,125	1,253,125	1,253,125	1,253,125
Alabama	441	Retail Trade	Private with 3 establishments	2002	1,000	1,000	1,000,100	1,000,100	1,000,100	1,000,100
Alabama	441	Retail Trade	Private with 4 establishments	2002	750	750	750,750	750,750	750,750	750,750
Alabama	441	Retail Trade	Private with 5 establishments	2002	500	500	500,500	500,500	500,500	500,500
Alabama	441	Retail Trade	Private with 6 establishments	2002	375	375	375,375	375,375	375,375	375,375
Alabama	441	Retail Trade	Private with 7 establishments	2002	250	250	250,250	250,250	250,250	250,250
Alabama	441	Retail Trade	Private with 8 establishments	2002	188	188	188,188	188,188	188,188	188,188
Alabama	441	Retail Trade	Private with 9 establishments	2002	125	125	125,125	125,125	125,125	125,125

U.S. Census Bureau FactFinder

Results

Click "Back to Search Results" to select other tables or products.

EC024455Z3 Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multiunit Firms for the United States: 2002

Table View | Map View | Chart View

Actions: Enable Table Tools | Bookmark | Download

Table Tools: Reset Table | Show Hidden Rows/Columns | Transpose Rows/Columns

Legend: Not meaningful | Change column | Show data | Show/Hide data and notes

Geographic Area Name	2002 BACS code	Description of 2002 BACS code	Footnote	Year	Number of establishments	Revenue (\$1,000)	Annual payroll (\$1,000)	First-quarter payroll (\$1,000)	Number of employees	Sharechange from previous year (%)
United States	44	Retail Trade		2002	12,242	184,218,798	47,750,111	11,291,748	1,428,219	17.1
United States	441	Food and kindred products stores		2002	3,847	19,734,985	3,885,191	890,459	89,144	3.3
United States	442	Meat and poultry stores		2002	1,896	23,331,333	3,194,391	789,824	66,193	1.3
United States	443	Beer, wine, and liquor stores		2002	1,821	889,698,916	5,173,334	1,389,191	190,017	17.1
United States	444	Retail Trade	Private with 1-99 establishments	2002	18,123	31,291	1,671,799	12,794,194	3,123,161	15.4
United States	445	Retail Trade	Private with 100+ establishments	2002	9,917	23,421	162,993,129	79,732,379	2,999,973	11.4
United States	446	Retail Trade	Private with 10-99 establishments	2002	4,392	21,209	1,224,817	11,922,293	2,929,494	9.1
United States	447	Retail Trade	Private with 10-99 establishments	2002	2,210	39,247	1,471,031	10,368,932	2,592,978	11.7
United States	448	Retail Trade	Private with 25 to 49 establishments	2002	409	19,199	14,748,941	7,139,149	1,719,247	14.7
United States	449	Retail Trade	Private with 50 to 99 establishments	2002	31	22,053	65,151,031	7,902,412	1,910,160	104,007
United States	450	Retail Trade	Private with 100+ establishments	2002	407	202,113	1,372,700,201	120,209,202	31,240,701	7,253,052
Alabama	44	Retail Trade	All firms	2002	20,770	122,123	981,748,102	64,549,713	15,143,103	1,948,402
Alabama	441	Retail Trade	Single unit firms	2002	20,770	30,709	541,170,312	41,027,412	9,707,200	1,170,205
Alabama	441	Retail Trade	Multiunit firms	2002	2,000	34,24	200,200,200	22,011,201	2,370,202	107,441
Alabama	441	Retail Trade	Private with 1 establishments	2002	1,747	1,747	1,747,174	1,747,174	1,747,174	1,747,174
Alabama	441	Retail Trade	Private with 2 establishments	2002	1,253	1,253	1,253,125	1,253,125	1,253,125	1,253,125
Alabama	441	Retail Trade	Private with 3 establishments	2002	1,000	1,000	1,000,100	1,000,100	1,000,100	1,000,100
Alabama	441	Retail Trade	Private with 4 establishments	2002	750	750	750,750	750,750	750,750	750,750
Alabama	441	Retail Trade	Private with 5 establishments	2002	500	500	500,500	500,500	500,500	500,500
Alabama	441	Retail Trade	Private with 6 establishments	2002	375	375	375,375	375,375	375,375	375,375
Alabama	441	Retail Trade	Private with 7 establishments	2002	250	250	250,250	250,250	250,250	250,250
Alabama	441	Retail Trade	Private with 8 establishments	2002	188	188	188,188	188,188	188,188	188,188
Alabama	441	Retail Trade	Private with 9 establishments	2002	125	125	125,125	125,125	125,125	125,125

- Now you want to display your results so that the company with the smallest number of stores is at the top of the list and the company with the largest number of stores is at the bottom of the list. What would you do?

Ideal Action(s): Enable Table Tools → Sort ascending icon

U.S. Census Bureau
AMERICAN FactFinder

Results
Click 'Back to Search Results' to select other tables or products.

EC0244SS523 Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multiunit Firms for the United States: 2002
2002 Economic Census

Table View | Map View | Chart View

Actions: Enable Table Tools | Bookmark | Download

2002 NAICS code	Meaning of 2002 NAICS code	Meaning of Single/multi-unit firm	Footnote	Year	Total number of firms	Number of establishments	Revenue (\$1,000)	Annual payroll (\$1,000)	First-quarter payroll (\$1,000)	Number of employees
44-45	Retail trade	All firms		2002	702,568	1,111,237	3,052,479,887	302,117,526	77,444,877	4,647,025
44-45	Retail trade	Single unit firms		2002	502,644	682,841	1,877,877,236	187,853,736	27,265,617	3,051,888
44-45	Retail trade	Multiunit firms		2002	200,000	428,396	1,174,602,651	114,263,790	49,179,260	1,595,137
44-45	Retail trade	Firms with 1 establishment		2002	16,371	68,416,470	5,743,358	1,300,543	160,674	
44-45	Retail trade	Firms with 2 establishments		2002	15,176	38,708	110,717,702	17,744,154	3,371,800	407,883
44-45	Retail trade	Firms with 3 or 4 establishments		2002	8,817	28,420	102,070,119	18,723,579	2,395,672	421,240
44-45	Retail trade	Firms with 5 establishments		2002	4,373	27,380	112,946,197	11,023,393	2,679,494	420,249
44-45	Retail trade	Firms with 10 to 24 establishments		2002	7,876	38,741	114,118,051	15,508,533	3,527,616	482,451
44-45	Retail trade	Firms with 25 to 49 establishments		2002	822	21,199	48,224,981	7,110,849	1,721,497	249,324
44-45	Retail trade	Firms with 50 to 99 establishments		2002	321	22,873	59,191,824	7,289,473	1,248,108	204,887
44-45	Retail trade	Firms with 100 establishments or more		2002	497	291,113	1,372,428,229	128,200,302	31,243,781	1,793,852
441	Retail vehicle & parts dealers	All firms		2002	80,788	135,138	601,746,167	64,748,763	15,143,102	1,047,480
441	Retail vehicle & parts dealers	Single unit firms		2002	100,770	107,700	241,170,202	41,207,482	1,787,300	1,110,029
441	Retail vehicle & parts dealers	Multiunit firms		2002	6,655	31,541	360,576,965	23,541,281	6,355,802	607,441
441	Retail vehicle & parts dealers	Firms with 1 establishment		2002	1,727	1,737	28,274,702	2,201,931	921,731	59,940
441	Retail vehicle & parts dealers	Single unit firms		2002	80,790	81,790	211,170,202	41,207,482	6,707,300	1,170,029
441	Retail vehicle & parts dealers	Multiunit firms		2002	6,655	31,541	360,576,965	23,541,281	6,355,802	607,441
441	Retail vehicle & parts dealers	Firms with 1 establishment		2002	1,787	1,787	28,874,702	2,201,931	921,731	60,548
441	Retail vehicle & parts dealers	Firms with 2 establishments		2002	2,424	4,080	98,070,302	4,318,100	1,021,840	120,121

Source: U.S. Census Bureau, 2002 Economic Census

U.S. Census Bureau
AMERICAN FactFinder

Results
Click 'Back to Search Results' to select other tables or products.

EC0244SS523 Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multiunit Firms for the United States: 2002
2002 Economic Census

Table View | Map View | Chart View

Actions: Enable Table Tools | Bookmark | Download

Table Tools: Reset Table | Show Hidden Rows/Columns | Transpose Rows/Columns

Legend: Sort ascending | Sort descending | Hide columns | Show columns | Hide rows | Show rows | Hide first and last columns

Geographic Area Name	2002 NAICS code	Meaning of 2002 NAICS code	Footnote	Year	Number of establishments	Revenue (\$1,000)	Annual payroll (\$1,000)	First-quarter payroll (\$1,000)	Number of employees	Wages/premium from adverb (%)
United States	481	Auto transportation	001	2002	3,847	19,724,969	3,805,191	896,459	98,144	3.8
United States	481	Water transportation		2002	1,890	23,231,233	3,194,391	736,824	88,183	1.3
United States	484	Truck transportation		2002	112,842	184,218,769	47,793,111	11,281,748	1,426,210	17.1
United States	482	Tram & ground passenger transportation		2002	17,286	18,848,918	7,876,316	1,886,429	268,383	11.4
United States	488	Railroad transportation		2002	2,188	22,021,418	2,478,838	707,619	38,790	8.1
United States	487	Scenic & sightseeing transportation		2002	2,523	1,858,979	526,363	134,949	22,616	11.7
United States	483	Support activities for transportation		2002	33,842	37,414,131	16,282,843	3,963,347	485,816	11.0
United States	485	Couriers & messengers		2002	12,859	58,164,869	17,175,481	3,865,836	581,814	3.3
United States	480	Warehousing & storage		2002	12,871	16,947,887	17,183,289	4,223,032	588,533	8.2
Alabama	481	Auto transportation	001	2002	71	38,877	7,218	1,785	174	13.9
Alabama	481	Water transportation		2002	26	85,444	23,483	4,805	415	8.9
Alabama	484	Truck transportation		2002	2,121	3,194,477	846,441	222,177	38,719	18.6
Alabama	481	Auto transportation		2002	871	38,877	7,218	1,785	174	13.9
Alabama	481	Water transportation		2002	26	85,444	23,483	4,805	415	8.9
Alabama	484	Truck transportation		2002	2,121	3,194,477	846,441	222,177	38,719	18.6

6. You don't want to see the payroll information -- what would you do to simplify these results?

Ideal Action(s): Enable Table Tools → Uncheck checkboxes for Annual Payroll and First-quarter Payroll columns

U.S. Census Bureau
AMERICAN FactFinder

Results
Click 'Back to Search Results' to select other tables or products.

EC0244SSZ3 Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multiunit Firms for the United States: 2002
2002 Economic Census

Table View | Map View | Chart View

Actions: Enable Table Tools | Bookmark | Download

2002 SIC code	Meaning of 2002 SIC code	Meaning of Supplemental code	Footnote id	Year	Total number of firms	Number of establishments	Sales (\$1,000)	Annual payroll (\$1,000)	First quarter payroll (\$1,000)	Number of employees
44-40	Retail trade	All firms		2002	728,200	1,114,427	3,099,421,227	202,113,537	(2,444,917)	14,941,473
44-41	Retail trade	Single-unit firms		2002	605,944	800,614	1,979,977,736	187,823,798	(2,305,627)	14,651,860
44-42	Retail trade	Multiunit firms		2002	122,256	313,813	1,119,443,491	114,289,739	(138,290)	2,289,613
44-43	Retail trade	Firms with 1 establishment		2002	15,371	15,371	55,415,475	5,743,308	(1,300,543)	180,074
44-44	Retail trade	Firms with 2 establishments		2002	15,123	30,233	110,737,702	12,754,154	(1,622,350)	407,332
44-45	Retail trade	Firms with 3 or 4 establishments		2002	8,571	26,435	167,858,185	18,753,515	(2,522,073)	471,340
44-46	Retail trade	Firms with 5 to 9 establishments		2002	4,237	27,399	132,949,737	11,022,993	(1,479,454)	426,349
44-47	Retail trade	Firms with 10 to 24 establishments		2002	3,055	20,741	114,110,831	10,558,533	(1,357,815)	485,051
44-48	Retail trade	Firms with 25 to 49 establishments		2002	952	21,770	142,224,891	11,103,939	(1,371,457)	349,334
44-49	Retail trade	Firms with 50 to 99 establishments		2002	101	37,401	36,141,914	2,986,471	(1,748,734)	104,403
44-50	Retail trade	Firms with 100 establishments or more		2002	497	230,173	1,312,120,229	128,200,202	(13,493,781)	1,232,892
44-99	Retail trade & parts dealers	All firms		2002	80,760	135,138	661,710,163	64,518,763	(5,143,168)	1,615,480
44-1	Retail vehicle & parts dealer	Single-unit firms		2002	50,726	50,726	343,110,232	41,807,462	(3,781,266)	1,116,933
44-2	Retail vehicle & parts dealer	Multiunit firms		2002	2,500	34,341	300,599,931	37,051,361	(5,397,903)	627,441
44-3	Retail vehicle & parts dealer	Firms with 1 establishment		2002	1,797	1,797	36,854,783	3,761,051	(571,751)	55,548
44-4	Retail vehicle & parts dealer	Single-unit firms		2002	80,760	80,760	541,170,350	41,687,463	(3,727,308)	1,170,000
44-5	Retail vehicle & parts dealer	Multiunit firms		2002	9,000	34,341	299,350,200	22,911,201	(3,371,892)	697,441
44-6	Retail vehicle & parts dealer	Firms with 1 establishment		2002	1,797	1,797	36,854,783	3,761,051	(571,751)	55,548
44-7	Retail vehicle & parts dealer	Firms with 2 establishments		2002	2,434	4,099	39,003,202	4,318,193	(1,022,940)	120,121

Source: U.S. Census Bureau, 2002 Economic Census

U.S. Census Bureau
AMERICAN FactFinder

Results
Click 'Back to Search Results' to select other tables or products.

EC0244SSZ3 Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multiunit Firms for the United States: 2002
2002 Economic Census

Table View | Map View | Chart View

Actions: Disable Table Tools | Bookmark | Download

Table Tools: Reset Table | Show Hidden Rows/Columns | Transpose Rows/Columns

Legend: sort ascending | sort descending | rearrange columns | filter rows | show/hide rows and columns

Geographic Area Name	2002 SIC code	Meaning of 2002 SIC code	Footnote id	Year	Number of establishments	Revenue (\$1,000)	Annual payroll (\$1,000)	First-quarter payroll (\$1,000)	Number of employees	Shipments from admin. (%)
United States	441	All transportation	001	2002	3,847	19,734,965	3,800,191	890,459	99,144	3.9
United States	443	Water transportation		2002	1,880	23,331,333	3,194,361	788,824	68,153	1.3
United States	444	Truck transportation		2002	112,642	164,216,789	47,750,111	11,251,748	1,425,210	17.1
United States	445	Travel & ground passenger transportation		2002	17,260	18,849,918	7,675,316	1,898,429	398,383	11.4
United States	446	Pipeline transportation		2002	2,188	22,921,419	2,476,636	797,819	39,790	8.1
United States	447	Electric, gas, steam, and sanitary transportation		2002	2,523	1,658,979	626,353	154,949	22,516	11.7
United States	448	Equipment activities for transportation		2002	33,942	87,414,131	16,202,843	3,903,947	485,818	11.0
United States	449	Couriers and messengers		2002	12,654	18,164,869	17,178,401	3,965,936	561,514	3.8
United States	452	Warehousing and storage		2002	12,671	16,547,657	17,163,209	4,223,032	565,520	6.2
Alabama	441	All transportation	001	2002	71	30,677	7,218	1,765	174	13.9
Alabama	443	Water transportation		2002	28	85,444	23,483	4,908	415	0.9
Alabama	444	Truck transportation		2002	2,121	3,194,477	946,441	222,177	30,719	18.6
Alabama	445	Travel & ground passenger transportation		2002	671	30,677	7,218	1,765	174	13.9

7. Now you decide that payroll is important for your project. How would you get that information back on the screen?

Ideal Action(s): Show Hidden Rows/Columns

Results

Click 'Back to Search Results' to select other tables or products.

EC0244SSSZ3 | Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multiunit Firms for the United States: 2002 2002 Economic Census

Table View | Map View | Chart View

Actions: Disable Table Tools | Bookmark | Download

Table Tools: Reset Table | Show Hidden Rows/Columns | Transpose Rows/Columns

Legend: sort ascending/descending | rearrange columns | filter rows | show/hide rows and columns

Geographic Area Name	2002 NAICS code	Meaning of 2002 NAICS code	Footnote id	Year	Number of establishments	Revenue (\$1,000)	Number of employees	Sls/rcpts/rev from admn rec(%)
United States	481	Air transportation	001	2002	3,847	19,734,965	99,144	3.8
United States	483	Water		2002	1,890	23,331,333	66,153	1.3

8. Now you would like to map these results on a U.S. map for your presentation. How would you make a map with your results?

Ideal Action(s): Map View tab

EC0244SSSZ3 | Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multiunit Firms for the United States: 2002 2002 Economic Census

Table View | Map View | Chart View

Actions: Enable Table Tools | Bookmark | Download

2002 NAICS code	Meaning of 2002 NAICS code	Meaning of Single/multi-unit firm code	Footnote id	Year	Total number of firms	Number of establishments	Sales (\$1,000)	Annual payroll (\$1,000)	First-quarter payroll (\$1,000)	Number of employees
44-45	Retail trade	All firms		2002	726,888	1,114,637	3,056,421,997	302,113,581	72,444,977	14,647,675
44-45	Retail trade	Single unit firms		2002	685,044	685,044	1,077,977,238	107,853,759	25,260,617	4,651,860
44-45	Retail trade	Multiunit firms		2002	41,844	429,593	1,978,444,759	194,259,822	47,184,360	9,995,815
44-45	Retail trade	Firms with 1 establishment		2002	10,371	10,371	60,416,470	5,743,358	1,386,043	196,674

9. You've already done a search on place of birth by sex in the United States.
 - Now you are in Table View and you would like to view a map of all males by birth location, specifically in Florida. What would you do?

Ideal Action(s): Map View tab → Click on data value on table → Click Show Map

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MAIN SEARCH WHAT WE PROVIDE USING FACTFINDER English Spanish

Results

Click 'Back to Search Results' to select other tables or products.

← BACK TO SEARCH RESULTS RESULT 1 OF 3 VIEW ALL

C06003 Place of Birth by Sex in the United States - Universe: Total Population in the United States
 2005-2007 American Community Survey 3-Year Estimates

Table View Map View Chart View

Actions: Enable Table Tools Bookmark Download

	Alabama		Florida		Georgia		South Carolina	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total:	4,585,900	*****	18,014,927	*****	9,331,515	*****	4,330,933	*****
Male	2,218,544	+/-1,679	8,841,365	+/-2,036	4,587,486	+/-2,841	2,107,584	+/-1,360
Female	2,367,356	+/-1,679	9,173,562	+/-2,035	4,744,029	+/-2,841	2,223,349	+/-1,360
Born in state of residence:	3,261,251	+/-12,088	6,058,029	+/-22,048	5,218,892	+/-17,841	2,631,604	+/-11,997
Male	1,569,734	+/-6,922	3,020,525	+/-13,713	2,538,943	+/-11,231	1,268,275	+/-6,724
Female	1,691,517	+/-7,274	3,037,504	+/-14,345	2,679,949	+/-10,745	1,363,329	+/-7,544
Born in other state in the United States:	1,161,504	+/-10,635	8,065,826	+/-20,932	3,166,845	+/-18,025	1,480,072	+/-12,079
Male	563,720	+/-6,155	3,916,417	+/-12,571	1,537,424	+/-10,503	721,823	+/-6,867
Female	597,784	+/-6,842	4,149,409	+/-14,706	1,629,421	+/-10,584	758,249	+/-7,603
Native, born outside the United States:	32,355	+/-2,201	521,324	+/-9,938	104,496	+/-3,743	37,614	+/-1,932
Male	17,135	+/-1,485	254,102	+/-5,177	53,067	+/-2,776	19,207	+/-1,500
Female	15,220	+/-1,328	267,222	+/-6,555	51,429	+/-2,593	18,407	+/-1,253
Foreign born	130,790	+/-3,766	3,369,748	+/-17,842	841,282	+/-10,234	181,643	+/-4,796

Results

Click 'Back to Search Results' to select other tables or products.

← BACK TO SEARCH RESULTS RESULT 1 OF 3 VIEW ALL

C06003 Place of Birth by Sex in the United States - Universe: Total Population in the United States
 2005-2007 American Community Survey 3-Year Estimates

Table View Map View Chart View

Actions: Select a Data Value to Map Bookmark Download

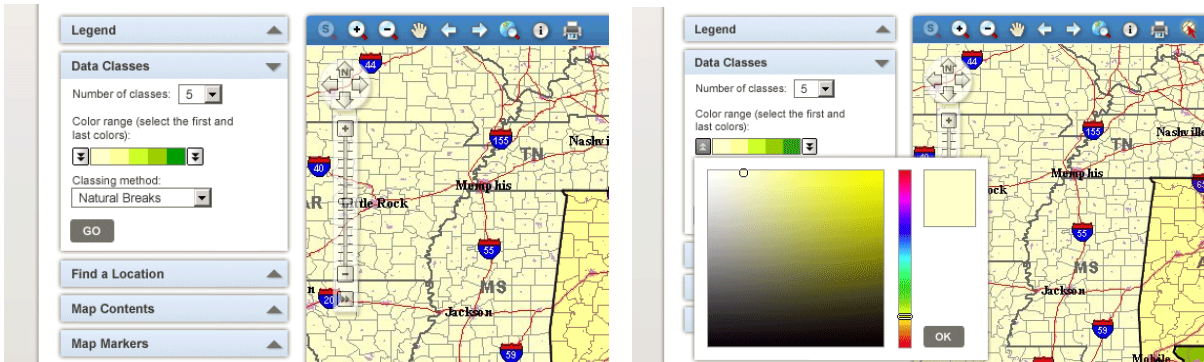
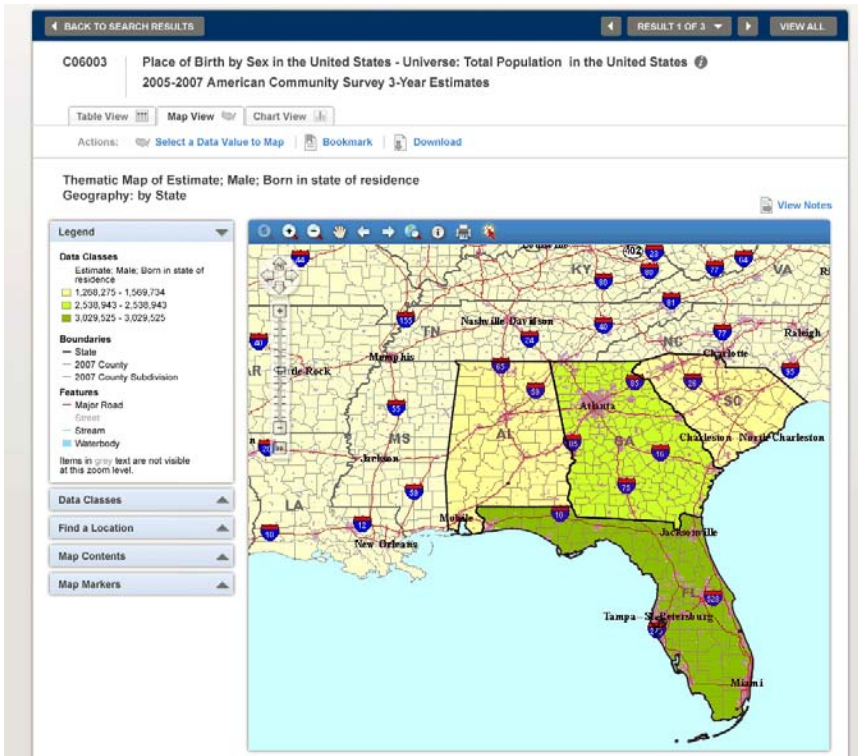
Move the mouse over the table and click a cell to select a data value to map. Click Cancel to return to the Table View with no Map View selected.

	Alabama		Florida		Georgia		South Carolina	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total:	4,585,900	*****	18,014,927	*****	9,331,515	*****	4,330,933	*****
Male	2,218,544	+/-1,679	8,841,365	+/-2,036	4,587,486	+/-2,841	2,107,584	+/-1,360
Female	2,367,356	+/-1,679	9,173,562	+/-2,035	4,744,029	+/-2,841	2,223,349	+/-1,360
Born in state of residence:	3,261,251	+/-12,088	6,058,029	+/-22,048	5,218,892	+/-17,841	2,631,604	+/-11,997
Male	1,569,734	+/-6,922	3,020,525	+/-13,713	2,538,943	+/-11,231	1,268,275	+/-6,724
Female	1,691,517	+/-7,274	3,037,504	+/-14,345	2,679,949	+/-10,745	1,363,329	+/-7,544
Born in other state in the United States:	1,161,504	+/-10,635	8,065,826	+/-20,932	3,166,845	+/-18,025	1,480,072	+/-12,079
Male	563,720	+/-6,155	3,916,417	+/-12,571	1,537,424	+/-10,503	721,823	+/-6,867
Female	597,784	+/-6,842	4,149,409	+/-14,706	1,629,421	+/-10,584	758,249	+/-7,603
Native, born outside the United States:	32,355	+/-2,201	521,324	+/-9,938	104,496	+/-3,743	37,614	+/-1,932
Male	17,135	+/-1,485	254,102	+/-5,177	53,067	+/-2,776	19,207	+/-1,500
Female	15,220	+/-1,328	267,222	+/-6,555	51,429	+/-2,593	18,407	+/-1,253
Foreign born	130,790	+/-3,766	3,369,748	+/-17,842	841,282	+/-10,234	181,643	+/-4,796

Find a Location Map Contents Map Markers

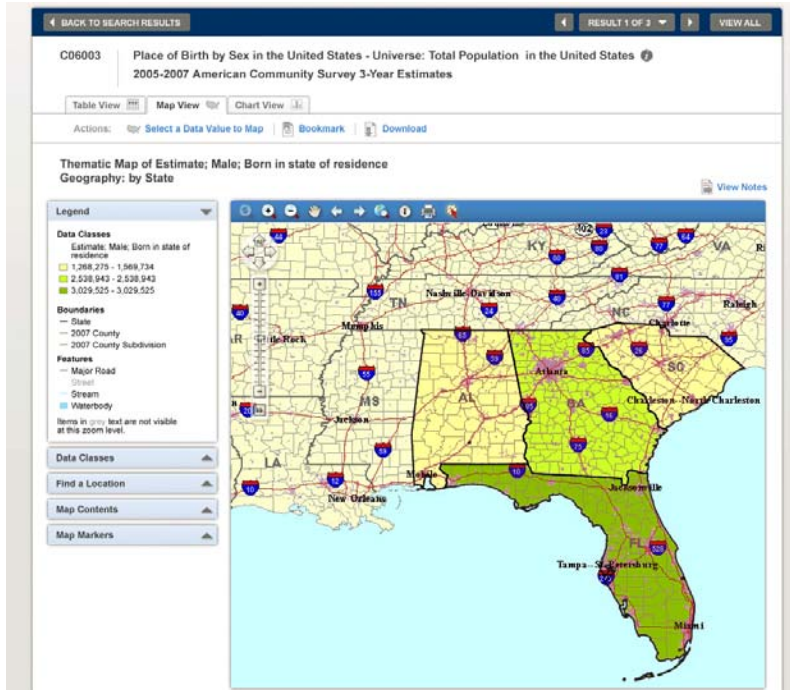
10. You want to change the colors on the map to fit better with the presentation you will be giving. How would you do this?

Ideal Action(s): Data Classes tab → Click on Color Picker → Select color range → Press OK



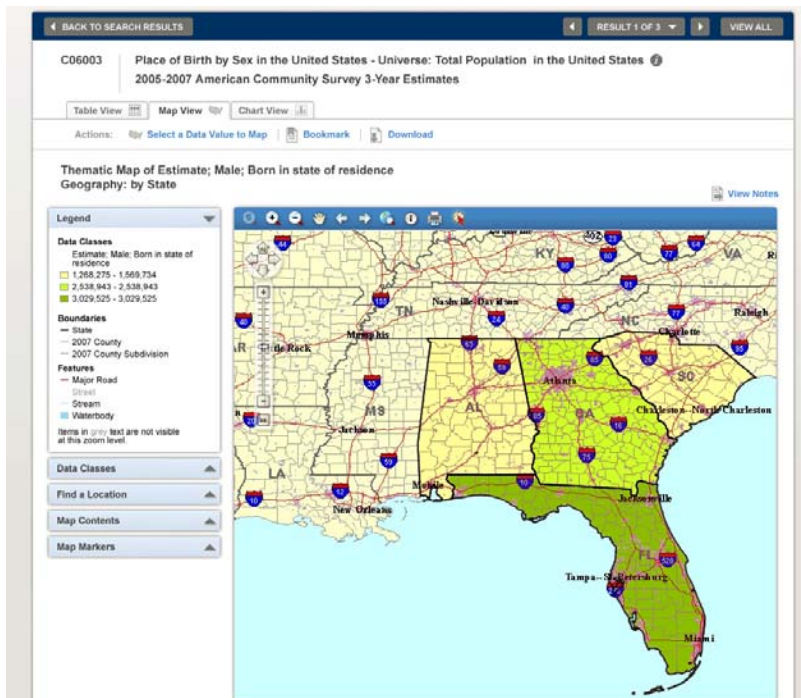
11. How would you zoom in to include only Florida on your map?

Ideal Action(s): Use the zoom in magnifying glass icon OR zoom in using the map slider AND clicking and dragging the map using the hand tool



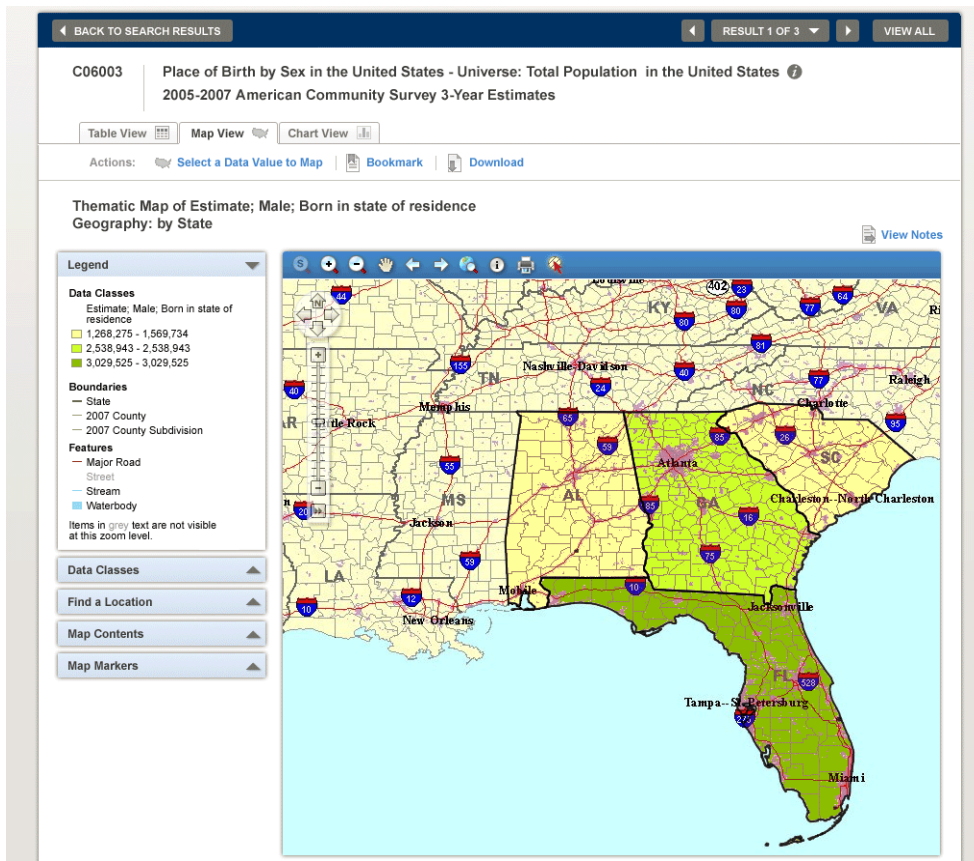
12. You would like to see what county in Alabama is at the intersection of Interstate 65 and 59. How would you find out?

Ideal Action(s): Click on the *i* icon → Click on the map



13. You want to see a map of Sarasota, FL, but you don't know where it is. How would you find Sarasota?

Ideal Action(s): Selecting Find a Location → Entering Sarasota in the search box



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Search

Use the options on the left (search, topics, geographies, ...) to find the data you're looking for.

Your Selections

- 2006
- Education
- Nevada

clear all selections

Search Within Results for ...

Topics

Geographies (States, Counties, Places, ...)

Population Groups (Race, Ancestry, ...)

Industry Codes (NAICS, ...)

Results: 26-50 of 622 | Per Page: 10 25 50

Selected Items: View | Download

ID	Title	Data Set	About
DP-3	Selected Economic Characteristics: 2005	2005 American Community Survey	

Name | Address | Map

Select Geographies

Legend

Find a Location

Find by: place name

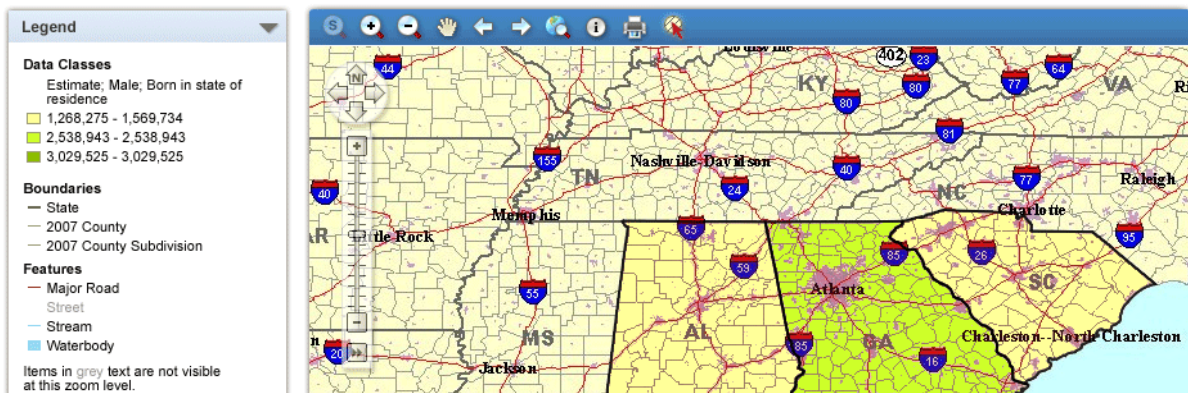
Search for a geographic area:

Map Contents

Map Markers

14. You are going on vacation and want to print out a map of Atlanta, Georgia so that every inch on the map equals 500 feet. How would you do this?

Ideal Action(s): Manual Zoom button



Appendix B. General Introduction

Thank you for your time today. My name is Jennifer, and I will be working with you today. We will be evaluating a new design of the American FactFinder Web site by having you work on several tasks. Your experience with the site is an essential part of our work. We are going to use your comments to give feedback to the developers of the site. Your comments and thoughts will help the developers make changes to improve the site. I did not create the site, so please do not feel like you have to hold back on your thoughts to be polite. Please share both your positive and negative reactions to the site. We are not evaluating you or your skills, but rather you are helping us see how well the site works.

First, I would like to ask you to read and sign this consent form. It explains the purpose of the session and informs you that we would like to videotape the session, with your permission. Only those of us connected with the project will review the tape. We will use it mainly as a memory aid. We may also use quotations from the tape to illustrate key points about the design of the Web pages.

[Hand consent form; give time to read and sign; sign own name and date.]

[Start the tape when the participant signs the form.]

So today, you will be helping us test the usability of the American FactFinder Web site prototype. Your feedback is valuable, and we appreciate your help. We are going to do some eye-tracking as well as have you work on some task scenarios that I will give you.

Before we get started, please take a moment to complete this computer usage and internet experience questionnaire. As you work through the tasks today I am going to be in the other room, but we will still be able to communicate through the microphones and speakers. This is your microphone. Do you have any questions?

[Hand computer experience form, and go into control room.]

Now I am going to calibrate your eyes for the eye tracking. I am going to have you position yourself in front of the screen so that you can see your nose in the reflection at the bottom of the monitor. To calibrate your eyes, please follow the blue dot across the screen with your eyes.

[Do Calibration]

Now that we have your eyes calibrated, we are ready to begin. For the next 60 minutes, I will ask you to work on 11 tasks. I would like you to tell me your impressions and thoughts about the Web site as you work through the tasks. I would like you to “think aloud” and talk to me about your decisions. So if you expect something to happen, tell me what you expect. If you expect to see some piece of information, tell me about what you expect. This means that as you work on a task, talk to me about what you are doing, what you are going to do, and why. Since this is an early prototype, none of the links and buttons work. Tell me what you would do and expect to happen if all the links and buttons worked. You may not be able to find a solution to every task, and during some tasks, I will stop the task you are working on and move you onto the next task. Remember, you cannot make a mistake. The tasks are not intended to grade you or access your knowledge. Rather the tasks are intended to evaluate the Web site. Where

the site works for you great, and where it doesn't work for you great. Do you have any questions? We'll do a brief practice on thinking aloud right now.

[Do Practice on Thinking Aloud]

Finally, during the session, I will remind you to think aloud if you get quiet. Please focus on verbalizing what you are thinking and expecting to happen. We are interested in the reasoning behind your actions, not just in what you are doing.

I ask that each time you start a task, please read the task out loud, and once you have found the information you are looking for please state your answer aloud. For example, say, "My answer is ---" or "This is my final answer." After each task, I will return you to the homepage where you can begin the next task.

Please remember to begin each task by reading the task question aloud as well as stating your final answer. Also, as you work, please remember to think aloud.

Appendix C. Consent Form



Consent Form For Individual Participants Usability Testing of the American FactFinder Web Site

Each year the Census Bureau conducts many different usability evaluations. For example, the Census Bureau routinely tests the wording, layout and behavior of products, such as Web sites and online surveys and questionnaires in order to obtain the best information possible.

You have volunteered to take part in a study to improve the usability of the American FactFinder Web site. In order to have a complete record of your comments, your usability session will be videotaped. We plan to use the tapes to improve the design of the product. Only staff directly involved in the research project will have access to the tapes. Your participation is voluntary and your answers will remain strictly confidential.

This usability study is being conducted under the authority of Title 13 USC. The OMB control number for this study is 0607-0725. This valid approval number legally certifies this information collection.

I have volunteered to participate in this Census Bureau usability study, and I give permission for my tapes to be used for the purposes stated above.

Participant's Name: _____

Participant's Signature: _____ Date: _____

Researcher's Name: _____

Researcher's Signature: _____ Date: _____

Appendix D. Questionnaire on Computer-and-Internet Experience and Demographics

1. Do you use a computer at home, at work **or** both?

(Check all that apply.)

Home

Work

Somewhere else, such as school, library, etc.

2. If you have a computer at home,

a. What kind of modem do you use at home?

Dial-up

Cable

DSL

Wireless (Wi-Fi)

Other _____

Don't know _____

b. Which browser do you typically use at home? Please indicate the version if you can recall it.

Internet Explorer

Firefox

Netscape

Other _____

Don't know _____

c. What operating system does your browser run in?

MAC OS

Windows 95

Windows 2000

Windows XP

Windows Vista

Other _____

Don't know _____

3a. On average, how many hours do you spend on the Internet per day?

0 1-3 4-6 7+

3b. On average, how many hours do you use the Internet per week?

0 1-3 4-6 7+

4. For how many years have you been using the Internet?

5. What do you use the Internet for more, searching/surfing the web **or** answering/sending e-mail

6. Have you ever filled out a survey on the Internet?

Yes

No

a. If yes, about how many surveys do you think you have filled out on the Internet? _____

b. If yes, have you filled out a survey on the Internet in the last two months?

Yes

No

7. Please rate your overall experience with the following:

	no experience					very experienced			
Computers	1	2	3	4	5	6	7	8	9
Internet	1	2	3	4	5	6	7	8	9

8. What computer applications do you use?

Mark (X) all that apply

- E-mail
- Internet
- Word processing (MS-Word, WordPerfect, etc.)
- Spreadsheets (*Excel, Lotus, Quattro, etc.*)
- Databases (MS-Access, etc.)
- Accounting or tax software
- Engineering, scientific or statistical software
- Other applications, please specify _____

	Not at all Comfortable			Very Comfortable	
<i>Please Circle one number for each question below</i>					
9. How <i>comfortable</i> are you in learning software applications that are new to you?	1	2	3	4	5
10. Computer windows can be minimized, resized, and scrolled through. How <i>comfortable</i> are you in manipulating a window?	1	2	3	4	5
11. How <i>comfortable</i> are you using and navigating through the Internet?	1	2	3	4	5
	Never			Very Often	
12. How <i>often</i> do you work with any type of data through a computer?	1	2	3	4	5
13. How <i>often</i> do you perform complex analyses of data through a computer?	1	2	3	4	5
14. How <i>often</i> do you use the Internet or Web sites to find information? (e.g., printed reports, news articles, data tables, blogs, etc.)	1	2	3	4	5
	Not at all familiar			Very familiar	
15. How <i>familiar</i> are you with the Census Web site (location, tools, data, etc)?	1	2	3	4	5
16. How <i>familiar</i> are you with the American FactFinder area of the Census (terms, data, etc.)	1	2	3	4	5

Appendix E. Satisfaction Questionnaire

Please circle the numbers that most appropriately reflect your impressions about using this Web-based instrument.

- | | | |
|---|-----------------------------------|-------------------------------|
| 1. Overall reaction to the Web site: | terrible
1 2 3 4 5 6 7 8 9 | wonderful
not applicable |
| 2. Screen layouts: | confusing
1 2 3 4 5 6 7 8 9 | clear
not applicable |
| 3. Use of terminology throughout the Web site: | inconsistent
1 2 3 4 5 6 7 8 9 | consistent
not applicable |
| 4. Information displayed on the screens: | inadequate
1 2 3 4 5 6 7 8 9 | adequate
not applicable |
| 5. Arrangement of information on the screen: | illogical
1 2 3 4 5 6 7 8 9 | logical
not applicable |
| 6. Tasks can be performed in a straight-forward manner: | never
1 2 3 4 5 6 7 8 9 | always
not applicable |
| 7. Organization of information on the site: | confusing
1 2 3 4 5 6 7 8 9 | clear
not applicable |
| 8. Forward navigation: | impossible
1 2 3 4 5 6 7 8 9 | easy
not applicable |
| 9. Overall experience of finding information: | difficult
1 2 3 4 5 6 7 8 9 | easy
not applicable |
| 10. Census Bureau-specific terminology: | too frequent
1 2 3 4 5 6 7 8 9 | appropriate
not applicable |

Additional Comments:

Appendix F: Debriefing Questions

(1) What do you expect when you click on each of these items:

- Top Nav:
 - Main:
 - Search:
 - What We Provide:
 - Using FactFinder:
- Left Navigation:
 - Topics:
 - Geographies:
 - Population Groups:
 - Industry Codes:
- Popular Searches Items:

(2) Let's assume that you put the search term "Ohio" in the Global Search on the main screen and pressed the Go button. This screen appears. **What do you think of this screen?**

(3) If they did not use Enable Table Tools: **What do you think the "Enable Table Tools" option when you click on it?**

(4) **What do you think each of these icons do when you click on them? Point to Table filter options**

Table View | Map View | Chart View

Actions: Disable Table Tools | Bookmark | Download

Table Tools: Reset Table | Show Hidden Rows/Columns | Transpose Rows/Columns

Legend: sort ascending/descending | rearrange columns | filter rows | showhide rows and columns

View Table Notes

1-100 of 7,223	Geographic Area Name	2002 NAICS code	Meaning of 2002 NAICS code	Footnote id	Year	Number of establishments	Revenue (\$1,000)	Annual payroll (\$1,000)	First-quarter payroll (\$1,000)	Number of employees	Sis/rcpts/rev from admn rec(%)
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

(5) **What do you think each of these icons do when you click on them? Point to map icons.**

Legend

Data Classes
Estimate; Male; Born in state of residence
1,268,275 - 1,569,734
2,538,943 - 2,538,943
3,029,525 - 3,029,525

Boundaries
— State
— 2007 County
— 2007 County Subdivision

Features
— Major Road
— Street
— Stream
— Waterbody

Items in grey text are not visible at this zoom level.

Map toolbar icons: Search, Home, Previous View, Next View, Full Screen, Print, Refresh, Close.

If they did not mention Data Classes: **What do you think Data Classes would contain?**

(6) What did you like best about the Web site?

(7) What did you like least about the Web site?

(8) Is there anything that you feel should be changed?

(9) Is there anything that you feel should stay the same?

(10) How easy or difficult do you feel it was to complete the tasks? What made a task easy or difficult?

(11) Is there anything you would like to mention that we haven't talked about?

(12) **For Expert Users:** What do you think of this new version of the American FactFinder site compared to the current version? (Did they say anything during the session?)

Appendix G: Recruiting for AFF Baseline Study: “Data Experts”

Seeking graduate students, who:

- have completed at least one year of graduate school, **AND**
- have worked with statistical data sets, **AND**
- work with statistics regularly (in projects, research, work, etc.).

AND who are enrolled in **one of the following** courses of study:

- Sociology
- Demography
- Economics
- Business
- Library Studies

AND who use **one or more of the following** data sets on a regular basis:

- American Community Survey
- Decennial Census
- Economic Census
- County Business Patterns

AND who use **one or more of the following** data tools:

- American FactFinder
- Census.gov
- Data Ferret
- CPS
- SIPP
- Other (specify) _____

Appendix H. Screenshots and Task Questions for Iteration 2.5

- (Start with “search.”) You are working on a project on the South Eastern U.S. states. You are gathering information on the people living in those states and specifically you want to know where they were born. You have already done a search on American FactFinder and here are the search results. You want to look at the first three search results on this page. How would you do that?

Ideal Action: Check first three selections → View

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Search
 Use the options on the left (search, topics, geographies, ...) to find the data you're looking for.

Your Selections
 2005
 "Place of Birth"
 Alabama
 Florida
 Georgia
 South Carolina
 clear all selections

Search within Results for...
 GO

Topics
 People
 Housing
 Population and Housing Totals
 Business and Industry
 Year
 Program
 Data Set
 Product Type

Results: 26.50 of 622 Per Page: 25 50 75

Selected Items: View Download Compare Clear All

ID	Title	Data Set	About
<input type="checkbox"/> DP-3	Selected Economic Characteristics: 2005	2005 American Community Survey	?
<input type="checkbox"/> C08003	Place of Birth by Sex in the United States Universe: Total Population in the United States	2005 American Community Survey	?
<input type="checkbox"/> EC0244SSSZ3	Sector 44: Retail Trade: Subject Series - Estab & Firm Size: Single Unit and Multunit Firms for the United States: 2002	2002 Economic Census - Subject Series	?
<input type="checkbox"/> S1902	Mean Income in the Past 12 Months (in 2005 Inflation-Adjusted Dollars)	2005 American Community Survey	?
<input type="checkbox"/> S1903	Median Income in the Past 12 Months (in 2005 Inflation-Adjusted Dollars)	2005 American Community Survey	?
<input type="checkbox"/> S2503	Financial Characteristics	2005 American Community Survey	?
<input type="checkbox"/> S1901	Income in the Past 12 Months	2005 American Community Survey	?
<input type="checkbox"/> S2506	Financial Characteristics for Housing Units With a Mortgage	2005 American Community Survey	?
<input type="checkbox"/> S2507	Financial Characteristics for Housing Units With a Mortgage	2005 American Community Survey	?

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MAIN SEARCH WHAT WE PROVIDE USING FACTFINDER

Results
 Click 'Back to Search' to select other tables or geographies.

← BACK TO SEARCH Result 1 of 3 VIEW ALL

Table ID: DP-3
Selected Economic Characteristics: 2007
 2007 American Community Survey 1-Year Estimates
 Alabama

Table View

Actions: Modify Table Bookmark Download View Table Notes

Selected Economic Characteristics	Estimate	Margin of Error	Percent	Margin of Error
EMPLOYMENT STATUS				
Population 16 years and over	3,636,020	+/-4,461	100%	(X)
In labor force	2,174,912	+/-14,633	62.6%	+/-0.4
Civilian labor force	2,140,742	+/-14,977	61.6%	+/-0.4
Employed	1,993,665	+/-16,176	57.4%	+/-0.5
Unemployed	147,077	+/-5,971	4.2%	+/-0.2
Armed Forces	34,170	+/-2,255	1.0%	+/-0.1

2. (Start with Result 1 - "result.") You decide that the first result is not what you want. How would you look at the other search results?
Arrows or View All

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MAIN SEARCH WHAT WE PROVIDE USING FACTFINDER

Results
Click 'Back to Search' to select other tables or geographies.

← BACK TO SEARCH Result 1 of 3 VIEW ALL

Table ID: DP-3
Selected Economic Characteristics: 2007
2007 American Community Survey 1-Year Estimates
Alabama

Table View

Actions: Modify Table Bookmark Download

View Table Notes

Selected Economic Characteristics	Estimate	Margin of Error	Percent	Margin of Error
EMPLOYMENT STATUS				
Population 16 years and over	3,636,020	+/-4,461	100%	(X)
In labor force	2,174,912	+/-14,633	62.6%	+/-0.4
Civilian labor force	2,140,742	+/-14,977	61.6%	+/-0.4
Employed	1,993,665	+/-16,176	57.4%	+/-0.5
Unemployed	147,077	+/-5,971	4.2%	+/-0.2
Armed Forces	34,170	+/-2,255	1.0%	+/-0.1

3. (Begin on Result 2 - "result_acs_dt.") You are looking at a table of place of birth by sex in the United States. You are interested in how the people living in Alaska and Hawaii compare to the people living in these states that are on the screen. How would you add Alaska and Hawaii to this data table?
Ideal Action: Back to Search Results

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Results
Click 'Back to Search' to select other tables or geographies.

← BACK TO SEARCH Result 2 of 3 VIEW ALL

Table ID: C06003
Place of Birth by Sex in the United States
Universe: Total Population in the United States
2005-2007 American Community Survey 3-Year Estimates

Table View Map View

Actions: Modify Table Bookmark Download Create a Thematic Map

View Table Notes

	Alabama		Florida		Georgia		South Carolina	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total:	4,585,900	*****	18,014,927	*****	9,331,515	*****	4,330,933	*****
Male	2,218,544	+/-1,679	8,841,365	+/-2,036	4,587,486	+/-2,841	2,107,594	+/-1,360
Female	2,367,356	+/-1,679	9,173,562	+/-2,035	4,744,029	+/-2,841	2,223,349	+/-1,360
Born in state of residence:	3,261,251	+/-12,088	6,058,029	+/-22,048	5,218,892	+/-17,841	2,631,604	+/-11,997
Male	1,569,734	+/-6,822	3,020,525	+/-13,713	2,538,843	+/-11,231	1,268,275	+/-6,724
Female	1,691,517	+/-7,274	3,037,504	+/-14,345	2,679,949	+/-10,745	1,363,329	+/-7,544
Born in other state in the United States:	1,161,504	+/-10,635	8,065,826	+/-20,932	3,166,845	+/-18,025	1,480,072	+/-12,079

4. (Begin on Result 2 - "result_acs_dt.") You've already done a search on place of birth by sex in the United States. You are now looking at a table of your results. You would like to see a map of all males by birth location, specifically in Florida. What would you do?

Ideal Action: Map View tab or Create a Thematic Map → Select data cell value → Show Map (on overlay screen)

Table ID: C06003
 Place of Birth by Sex in the United States
 Universe: Total Population in the United States
 2005-2007 American Community Survey 3-Year Estimates

Table View | Map View

Actions: Modify Table | Bookmark | Download | Create a Thematic Map

	Alabama		Florida		Georgia		South Carolina	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total:	4,585,900	****	18,014,927	****	9,331,515	****	4,330,933	****
Male	2,218,544	+/-1,879	8,841,365	+/-2,036	4,587,486	+/-2,841	2,107,584	+/-1,360
Female	2,367,356	+/-1,879	9,173,562	+/-2,035	4,744,029	+/-2,841	2,223,349	+/-1,360
Born in state of residence:	3,261,251	+/-12,088	6,058,029	+/-22,048	5,218,892	+/-17,841	2,631,604	+/-11,997
Male	1,589,734	+/-6,922	3,020,525	+/-13,713	2,538,943	+/-11,231	1,268,275	+/-6,724
Female	1,691,517	+/-7,274	3,037,504	+/-14,345	2,679,949	+/-10,745	1,363,329	+/-7,544
Born in other state in the United States:	1,161,504	+/-10,635	8,065,826	+/-20,932	3,166,845	+/-18,025	1,480,072	+/-12,079

Table View | Map View

Actions: Modify Table | Bookmark | Download | Create a Thematic Map

To select a data item for your Thematic Map, move the mouse cursor over the table and click a cell. Click Cancel to return to the Table View with no Map View selected.

	Alabama		Florida		Georgia		South Carolina	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total:	4,585,900	****	18,014,927	****	9,331,515	****	4,330,933	****
Male	2,218,544	+/-1,879	8,841,365	+/-2,036	4,587,486	+/-2,841	2,107,584	+/-1,360
Female	2,367,356	+/-1,879	9,173,562	+/-2,035	4,744,029	+/-2,841	2,223,349	+/-1,360
Born in state of residence:	3,261,251	+/-12,088	6,058,029	+/-22,048	5,218,892	+/-17,841	2,631,604	+/-11,997
Male	1,589,734	+/-6,922	3,020,525	+/-13,713	2,538,943	+/-11,231	1,268,275	+/-6,724
Female	1,691,517	+/-7,274	3,037,504	+/-14,345	2,679,949	+/-10,745	1,363,329	+/-7,544
Born in other state in the United States:	1,161,504	+/-10,635	8,065,826	+/-20,932	3,166,845	+/-18,025	1,480,072	+/-12,079
Male	563,720	+/-6,155	3,916,417	+/-12,571	1,537,424	+/-10,503	721,823	+/-6,867
Female	597,784	+/-6,842	4,149,409	+/-14,706	1,629,421	+/-10,584	758,249	+/-7,603
Native, born outside the United States:	32,355	+/-2,201	521,324	+/-9,938	104,496	+/-3,743	37,614	+/-1,932
Male	17,135	+/-1,485	254,102	+/-5,177	53,067	+/-2,776	19,207	+/-1,500
Female	15,220	+/-1,328	267,222	+/-6,555	51,429	+/-2,593	18,407	+/-1,253
Foreign born	130,790	+/-3,766	3,369,748	+/-17,842	841,282	+/-10,234	181,643	+/-4,796

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Table ID: C06003
 Place of Birth by Sex in the United States
 Universe: Total Population in the United States
 2005-2007 American Community Survey 3-Year Estimates

Table View | Map View

Actions: Modify Table | Bookmark | Download | Create a Thematic Map

To select a data item for your Thematic Map, move the mouse cursor over the table and click a cell. Click Cancel to return to the Table View with no Map View selected.

Select a Data Value to Map

The selected data values to map are:

Estimate: Male; Born in state of residence

Geography: by State

SHOW MAP | CANCEL

	Alabama		Florida		Georgia		South Carolina	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total:	4,585,900	****	18,014,927	****	9,331,515	****	4,330,933	****
Male	2,218,544	+/-1,879	8,841,365	+/-2,036	4,587,486	+/-2,841	2,107,584	+/-1,360
Female	2,367,356	+/-1,879	9,173,562	+/-2,035	4,744,029	+/-2,841	2,223,349	+/-1,360
Born in state of residence:	3,261,251	+/-12,088	6,058,029	+/-22,048	5,218,892	+/-17,841	2,631,604	+/-11,997
Male	1,589,734	+/-6,922	3,020,525	+/-13,713	2,538,943	+/-11,231	1,268,275	+/-6,724
Female	1,691,517	+/-7,274	3,037,504	+/-14,345	2,679,949	+/-10,745	1,363,329	+/-7,544
Born in other state in the United States:	1,161,504	+/-10,635	8,065,826	+/-20,932	3,166,845	+/-18,025	1,480,072	+/-12,079
Male	563,720	+/-6,155	3,916,417	+/-12,571	1,537,424	+/-10,503	721,823	+/-6,867
Female	597,784	+/-6,842	4,149,409	+/-14,706	1,629,421	+/-10,584	758,249	+/-7,603
Native, born outside the United States:	32,355	+/-2,201	521,324	+/-9,938	104,496	+/-3,743	37,614	+/-1,932
Male	17,135	+/-1,485	254,102	+/-5,177	53,067	+/-2,776	19,207	+/-1,500
Female	15,220	+/-1,328	267,222	+/-6,555	51,429	+/-2,593	18,407	+/-1,253
Foreign born	130,790	+/-3,766	3,369,748	+/-17,842	841,282	+/-10,234	181,643	+/-4,796

5. How would you remove all of the Margin of Errors from this table?
 Ideal Action: Modify Table → De-select all Margin of Error Columns

Table ID: C06003
 Place of Birth by Sex in the United States
 Universe: Total Population in the United States
 2005-2007 American Community Survey 3-Year Estimates

Table View | Map View

Actions: [Modify Table](#) | [Bookmark](#) | [Download](#) | [Create a Thematic Map](#)

[View Table Notes](#)

	Alabama		Florida		Georgia		South Carolina	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total:	4,585,900	*****	18,014,927	*****	9,331,515	*****	4,330,933	*****
Male	2,218,544	+/-1,679	8,841,365	+/-2,036	4,587,486	+/-2,841	2,107,584	+/-1,360
Female	2,367,356	+/-1,679	9,173,562	+/-2,035	4,744,029	+/-2,841	2,223,349	+/-1,360
Born in state of residence:	3,261,251	+/-12,088	6,058,029	+/-22,048	5,218,892	+/-17,841	2,631,604	+/-11,997
Male	1,569,734	+/-6,922	3,020,525	+/-13,713	2,538,943	+/-11,231	1,268,275	+/-6,724
Female	1,691,517	+/-7,274	3,037,504	+/-14,345	2,679,949	+/-10,745	1,363,329	+/-7,544
Born in other state in the United States:	1,161,504	+/-10,635	8,065,826	+/-20,932	3,166,845	+/-18,025	1,480,072	+/-12,079

U.S. Census Bureau
 AMERICAN FactFinder

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Results
 Click 'Back to Search' to select other tables or geographies.

Table ID: C06003
 Place of Birth by Sex in the United States
 Universe: Total Population in the United States
 2005-2007 American Community Survey 3-Year Estimates

Table View | Map View

Actions: [Hide Table Tools](#) | [Bookmark](#) | [Download](#)

Table Tools: [Reset Table](#) | [Show Hidden Rows/Columns](#) | [Transpose Rows/Columns](#)

Click 'Back to Search' to change geographies or industries.

Legend: collapse/expand data categories | show/hide rows and columns

[View Table Notes](#)

	Alabama		Florida		Georgia		South Carolina	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total:	4,585,900	*****	18,014,927	*****	9,331,515	*****	4,330,933	*****
Male	<input checked="" type="checkbox"/> 2,218,544	+/-1,679	8,841,365	+/-2,036	4,587,486	+/-2,841	2,107,584	+/-1,360
Female	<input checked="" type="checkbox"/> 2,367,356	+/-1,679	9,173,562	+/-2,035	4,744,029	+/-2,841	2,223,349	+/-1,360
Born in state of residence:	<input checked="" type="checkbox"/> 3,261,251	+/-12,088	6,058,029	+/-22,048	5,218,892	+/-17,841	2,631,604	+/-11,997
Male	<input checked="" type="checkbox"/> 1,569,734	+/-6,922	3,020,525	+/-13,713	2,538,943	+/-11,231	1,268,275	+/-6,724
Female	<input checked="" type="checkbox"/> 1,691,517	+/-7,274	3,037,504	+/-14,345	2,679,949	+/-10,745	1,363,329	+/-7,544

6. (Begin on “result_acs_dt_display_theme”) You are currently looking at a map of males born in state of residence by state. How would you view a map of the same information but for females?

Ideal Action: Create a Different Thematic Map or Table View → Create a Thematic Map

The screenshot shows the U.S. Census Bureau FactFinder interface. At the top, there is a navigation bar with "U.S. Census Bureau" and "AMERICAN FactFinder" logos. Below the navigation bar, there are links for "Feedback", "FAQs", "Glossary", "Site Map", and "Help". The main content area displays the results for a search, including the table ID "C06003" and the title "Place of Birth by Sex in the United States". The universe is defined as "Total Population in the United States" and the data is from "2005-2007 American Community Survey 3-Year Estimates". The interface offers options for "Table View" and "Map View". Below these, there are action buttons for "Bookmark", "Print / Download", "Show Statistical Significance", and "Create a Different Thematic Map". The map view shows a thematic map of the United States with states colored according to the number of males born in that state. A legend on the left side of the map view lists the data classes and their corresponding colors.

Data Classes	Color
Estimate, Male; Born in state of residence	Light Green
1,268,275 - 1,569,734	Yellow
2,538,943 - 2,538,943	Light Green
3,029,525 - 3,029,525	Dark Green

7. (Begin on “result_acs_dt_display_theme.”) You want to change the colors on the map to fit better with the presentation you will be giving. How would you do this?

Ideal Action: Colors and Data Classes

The screenshot shows the U.S. Census Bureau FactFinder interface, similar to the previous one, but with a focus on the map view. The map view shows a thematic map of the United States with states colored according to the number of males born in that state. A legend on the left side of the map view lists the data classes and their corresponding colors. Below the legend, there are buttons for "Colors and Data Classes", "Find a Location", "Boundaries and Features", and "Map Markers".

Data Classes	Color
Estimate, Male; Born in state of residence	Light Green
1,268,275 - 1,569,734	Yellow
2,538,943 - 2,538,943	Light Green
3,029,525 - 3,029,525	Dark Green

Appendix I: Recaps of Participant Performance

Novice 1

Task 1: Success--partial

Ideal Action: Check first three search results --> Click View

User action: Clicked the *i* for information (about) then when that didn't work he clicked the link (did not check the box) and said he would go back and click the next link. Did not follow the ideal path but still did get the table to display. User did not see/use the result 1 or 3 nor the View All buttons in upper right corner. Instead user navigated to all links one at a time using the browsers back button.

Note: User said he expected to see a paragraph about the link (after clicking the link). Said he was not expecting a table, user did not often work with data tables... could be potentially because the user did not do the first steps—running the initial search query—he thought he was getting documents rather than statistical data tables.

Task 2: Skipped this task as user did not do the first task in way we anticipated

Ideal Action: Click Arrows or View All on results page

User Action: User went back and forth clicking on first three links in search results and navigated using the browsers back button in top left corner

Task 3: Failure

Ideal Action: Back to Search Results

User Action: Clicked on Modify Table. Looked at the table and didn't see any way to add geography. Said he would add Hawaii and Alaska by typing in the state name and hoping it would pop up. Not clear where he would type the name.

Note: By changing terminology enable table tools to modify table, we "fixed" one problem but have created another---all users initially want to add geography by using the Modify Table button.

Task 4: Success

Ideal Action: Map View tab or Create a Thematic Map --> Select data cell value --> Show Map (on overlay screen)

User Action: Clicked on Map View and hovered over the map—chose the correct cell and was surprised that the pop up window showed up but then said "Show Map" and was satisfied.

Task 5: Did not ask this user

Ideal Action: Modify Table --> De-select check boxes on Margin of Error columns

Task 6: Success

Ideal Action: Create a Different Thematic Map or Table View --> Create a Thematic Map

User action: He clicked on Table View tab and clicked on females.

Task 7: Success

Ideal Action: Colors & Data Classes

Novice 2

Task 1: Success--(start time 0:24 – finish 2:00)

Ideal Action: Check first three search results --> Click View

User action: Looking to see if there is a numbering sequence. She said if they do, it's not obvious. (Sees all the random numbers in the id list)

Once she loaded the page she said, “How do I know that these are the 1st three results?” Says it would have been nice if it gave feedback that said “this is what I selected” once I got here...something that says the three items.

Task 2: Success (start 3:09 – stop 5:20)

Ideal Action: Click Arrows or View All on results page

User Action: Scrolled down to see what info is available on the page. She says, “I have no idea which results this refers to” and that it “needs a tab/tag” that says what it she clicked on. Later she says, “Ahh I would look at the top,” then she clicked the arrow.

Task 3: Failure (Start 6:34 – stop 8:38)

Ideal Action: Back to Search Results

User Action: Looks for a box that she says would “give me the option to select a state or a comparison box.” Would like to find “a tab that would allow me to formulate a comparison to this table such as “select states for comparison” or “Add data by states” and would allow her to pick states to add. Does not click on Back to Search.

Note: May need to add a button somewhere near the table that says “Add Data.”

Task 4: Failure (start 12:38 – stop 13:40)

Ideal Action: Map View tab or Create a Thematic Map --> Select data cell value --> Show Map (on overlay screen)

User Action: Clicked on Map View and then Clicked on the word Florida in the column header. This didn't do anything and she asked, “How do I select FL?” Wants to click on a button that says “Show Map”.

Task 5: Failure 18:08 – 19:40 (completed after task 5—TA took him back to do it)

Ideal Action: Modify Table --> De-select check boxes on Margin of Error columns

User Action: Clicked on Margin of Error column heading. Right-clicked and expected to see a way to delete. Then left-clicked and got an error message.

Note: User is acting like she is using Excel by expecting to be able to modify the table by using the column header.

Task 6: Success (start time 15:38 – 16:27)

Ideal Action: Create a Different Thematic Map or Table View --> Create a Thematic Map

User action: User is looking for a button that allows her to change gender. Says she sees no such button. Tries clicking on the word Female in the far left-hand column. Clicks on Create a Different Thematic Map button and clicks on female.

Task 7: Failure (start time 21:27 –24:14)

Ideal Action: Colors & Data Classes

User Action: User says she would immediately go to page setup in the main browser window controls. Does not look at map again and does not scroll down to view the map at all. She says, “If my memory serves me there's an option to change the background/borders...” Says Table View might allow her to change the way the table appears. Or says she may try to create a thematic map... that it might give her other options.

Novice 3

Task 1: Success

Ideal Action: Check first three search results --> Click View

Task 2: Failure

Ideal Action: Click Arrows or View All on results page

User Action: Scrolls up and down on the page. Clicked on “Back to Search” and selected the second and third option on the results page to view the second search result instead of the first search result.

Task 3: Failure

Ideal Action: Back to Search Results

User Action: Clicked on Modify Table because she said, “modify means to change.”

Clicked on Map View thinking it would show her a map of the US and she could click on Alaska and Hawaii to add those states to the table. Could not find another way to add Alaska and Hawaii to the table.

Task : Success, needed some prompting

Ideal Action: Map View tab or Create a Thematic Map --> Select data cell value --> Show Map (on overlay screen)

User Action: Clicked on cell value on data table because the cells lit up when the mouse was over the cells which means that those highlighted cells are clickable. When asked how she would create a map, she said she’d go to Map View. Did everything right after this.

Task 5: Success, needed some prompting

Ideal Action: Modify Table --> De-select check boxes on Margin of Error columns

User Action: Modify Table --> Transpose Rows/Columns. She used “process of elimination” to pick Transpose Columns because she knew that the other options (Reset Table & Show Hidden Rows/Columns) was not what she wanted. After clicking Transpose Rows/Columns she observed that the table appeared to flip around. She saw “collapse/expand data categories” in the Legend and thought maybe she could collapse the Margin of Error category to remove it. Then she de-selected the checkboxes by Margin of Error and clicked on Reset Table.

Task 6: Success

Ideal Action: Create a Different Thematic Map or Table View --> Create a Thematic Map

Task 7: Success

Ideal Action: Colors & Data Classes

Novice 4**Task 1: Success (start time 3:47)**

Ideal Action: Check first three search results --> Click View

Task 2: Success with prodding from TA (start time 4:43)

Ideal Action: Click Arrows or View All on results page

User Action: Scrolls up and down on the page. Clicked on “Back to Search” and selected the 4th and 5th option on the screen and clicks View. Then after the TA asked him how he would see the next ones that he had checked he looks around the screen and sees the arrows next to “Result 1 of 3” as well as the View All. Once he sees these elements he uses them both and tries them out with ease.

Task 3: Success (Start time 8:48 – end time 10:08)

Ideal Action: Back to Search Results

User Action: Clicked on Modify Table. Looked at the table and didn’t see any way to add geography so then read the little note... which said “click back to search to add geo’s” so that helped him and he did go back to search. At the search page he typed in Alaska in the search box and clicked go.

Task 4: Success (start time 12:18)

Ideal Action: Map View tab or Create a Thematic Map --> Select data cell value --> Show Map (on overlay screen)

User Action: Mentions and mouses over the word FL, then clicks the button Create a Thematic Map. He reads the instructions! And then Scrolls over the table and clicked (the wrong cell—born in other state in the US male) and then clicks Show Map. Thus he did understand how to do it with the clicking on the cell, etc. During debriefing he said he had no idea what Thematic meant but he did know what map means so that's why he clicked on the button. (Could do away with word thematic.)

Task 5: Partial success –asked question after testing session

Ideal Action: Modify Table --> De-select check boxes on Margin of Error columns

User Action: After session was over TA asked him what he would do if he didn't want to see the margin of error... he said he would click on Modify table—and uncheck the box—which he did. After this action he said he expected to see a way to save or reset the table. He never saw the grayed out reset button.

Task 6: Success (partial, it wasn't the ideal path but it worked) start time (15:08 – 16:40)

Ideal Action: Create a Different Thematic Map or Table View --> Create a Thematic Map

User action: He clicked the back button in the browser window (Internet Explorer's back button) and was able to scroll over the correct female born in Florida cell.

Task 7: Success (start time 17:40)

Ideal Action: Colors & Data Classes

Novice 5**Task 1: Partial Success**

Ideal Action: Check first three search results --> Click View

User Action Clicked the second link and then went to View. He didn't click all three but he honed in on the part of the task question that said "...specifically you want to know where they were born." so he read the second table title in the list and chose that one. On the results page he did see the Result 1 of 3 and clicked the forward arrow. He was confused why the table he had selected didn't show up immediately (part of the nature of the low-fi study... that all three loaded even though he didn't click on all three).

Task 2: Success

Ideal Action: Click Arrows or View All on results page

User Action: Did this with the first task—saw the button "Result 1 of 3" and clicked through to second one.

Task 3: Success partial, only with prompting by TA

Ideal Action: Back to Search Results

User Action: Went immediately to Modify Table. When the next page pulls up, he says he doesn't know how all the geographies had been accumulated so he guesses that there are other columns that have been hidden so he would unhide the columns and then show Alaska and Hawaii. When test administrator says, "If you knew they were NOT hidden what would you do...?" So then he thinks he would try the "Map View" because there might be a map that he could click on to get Hawaii or Alaska that way. He tries that and says "Map View looks exactly the same as Table View," expecting to see all the states and he says he doesn't understand what happened—because it doesn't appear to have changed. So then he says, he'd go Back to Search.

Task 4: Success (start time around 18:55 – finish 20:36)

Ideal Action: Map View tab or Create a Thematic Map --> Select data cell value --> Show Map (on overlay screen)

User Action: Clicks on Map View and then Create a Thematic Map. He says, nothing happened. (He does not read instructions). He does however hover over the table and then clicks on the cell (on totals—so slightly the wrong cell but basically got the idea). With the results thought he says “I wanted just FL but it gave me the entire S.E. region. He says he expected only FL to show up.

Task 5: (get rid of margin of error): success(see note) –(start 21:28

Ideal Action: Modify Table --> De-select check boxes on Margin of Error columns

User Action: Clicked on Modify table and unchecked the Margin of Error column but then says he would like some button that would say “re-show” or something that he could click and it would refresh the map with the margin of error hidden. Users are not seeing the grayed out button.

(Note: Users actually needed to click something else to refresh the map to see it without the margin of errors but that wasn't functioning—it was grayed out. I'm not convinced even if it wasn't grayed out that they would see it. It's too far away from the table.)

Task 6: Success (start time 23:50—finish 25:36)

Ideal Action: Create a Different Thematic Map or Table View --> Create a Thematic Map

User action: Went to Table view and clicked on the cell labeled female...

Task 7: Success (start time 27:58 pretty immediate... a few seconds at most to finish)

Ideal Action: Colors & Data Classes

User action: Immediately into colors and data classes. Left clicking on the color range clicks it to open and says he expects it to give him a color spectrum.

Novice 6

Task 1: Success

Ideal Action: Check first three search results --> Click View

User Action: Clicked on 1st three search results on page and clicked view.

Scrolled down and up on result 1 and then used arrows to click to view results 2 and 3.

Task 2: Success

Ideal Action: Click Arrows or View All on results page

User Action: Did not understand question but did the correct step in Task 1.

She (1) clicked on the state drop down on result 1, then (2) clicked on Estimate column header anticipating to see a condensed view of the table.

Task 3: Failure

Ideal Action: Back to Search Results

User Action: (1) Clicked on Modify Table to see if there was an ability to add states, (2) clicked on Map View → Create a Thematic Map. She said she didn't understand what Create a Thematic Map meant.

Task 4: Failure

Ideal Action: Map View tab or Create a Thematic Map --> Select data cell value --> Show Map (on overlay screen)

User Action: (1) Clicked on Florida column header, (2) clicked on Table View tab, (3) Clicked on Modify Table → only kept checks in checkboxes for male, born in state of residence, and Florida's margin of error, unchecked other row/column headers → click View Table Notes (she said she wasn't sure what this would be for) → clicked on Create a Thematic Map

She looked at the legend for [+]/[-] and thought she could omit states she didn't want.

When asked what she would expect on Create a Thematic Map, she said she expected to see the data mapped onto the 4 states.

Task 5: Success

Ideal Action: Modify Table → De-select all Margin of Error Columns

User Action: Verbally explained what she expected to do. Could not interact with the Web site for this task because Internet Explorer froze at this point. She said she would click on Modify Table then would expect checkboxes to appear on the table. She would de-select checkboxes for the options she didn't want, then click on a button to refresh to table.

Task 6: Failure

Ideal Action: Create a Different Thematic Map or Table View --> Create a Thematic Map

User action: Boundaries & Features. Said she would expect a way to select females and instead of males.

Task 7: Success

Ideal Action: Colors & Data Classes

Expert 1 (internal, econ area)

Task 1: Partial Success (start time 10:33)

Ideal Action: Check first three search results --> Click View

User Action: He says he would click each one individually (on the table name). When test administrator asks him how would he do it if he had to select more than one at a time (a TA assist) he clicks on **two** search results and clicks View.

Task 2: Partial success—with assist by TA (midway at 15:38 – finished at 16:28)

Ideal Action: Click Arrows or View All on results page

User Action: In the beginning he's confused because he says he doesn't know if he's looking at two publications (remember in earlier task he selected two tables to view). Then he notices the word "Result" and he sees "Result 2 of 3." He clicks through and looks at all 3 results and then he clicks View All. So he was comfortable with going through these....

Task 3: Success (start 17:33 – finish 21:00)

Ideal Action: Back to Search Results

User Action: First immediately into Modify Table. He says "it should be relevant", but after looking at that information he says "it doesn't seem to be what I need." He clicks the back button (thinking he would be taken back to the page he was just on, before he hit the modify table—instead it takes him to the search results but he wanted the table from before so TA put him on that screen. From this he goes ahead and clicks the Back to Search intentionally and then he says he would go into the geographies and expects a way to assess a state from there.

Task 4: Success (start 27:00– 31:03)

Ideal Action: Map View tab or Create a Thematic Map --> Select data cell value --> Show Map (on overlay screen)

User Action: Clicked Map View → Create a Thematic Map → says "it's not doing anything right now. The tab Table View is staying highlighted and nothing happens when I click on create a thematic map.... Then at 28:33 he reads the instructions and says "I don't like to read things like this." He then says "Okay, alright now Map View is highlighted." He says "I clicked on create a thematic map and it didn't work, I just clicked on 1 state, why are 4 states here? If it's telling you to click on a single cell why does it bring up 4 states regardless?"

Task 5: Success (Start 32:49 – 34:55)

Ideal Action: Modify Table → De-select all Margin of Error Columns

User Action: Modify Table → Unchecked the margin of error columns and then looks around for a way to update the table. Says he is looking for a refresh and doesn't see it. Hits View All and looks down rest of table, expecting to see a way to refresh at bottom of table—or just above the table. .

Task 6: Success (Start time 35:35 – 36:52)

Ideal Action: Create a Different Thematic Map or Table View --> Create a Thematic Map

User action: Clicks on create a different thematic map. Clicks on cell for total females, FL.

Task 7: Success (37:33 – 39:08)

Ideal Action: Colors & Data Classes

User Action: Clicks first into Colors and Data Classes section. Tries clicking on data classes in legend. Says it seems like the colors relate to the data. The colors and data classes doesn't appear to work so he says if it doesn't work he'd try map markers.... (The TA tells him that it would work but has not been implemented yet.)

Additional comments (mostly from debriefing):

- He thinks there should be a button that says “modify my selections.” He says Modify Table only allows you to deselect what is already selected. So there would be two buttons, 1)modify table view and 2) modify selections
- He wants something in a prominent position that shows My Selections... what you've changed added, etc. and carry this box to all subsequent selections, so that when in data you know what your selections are.
- Says it should be apparent that you will be getting all geographies on that table---When you click on the one cell he said you expect to get one geography.
- Thinks there is too much stuff on home page, that it is too busy
- Thinks the graphics should be clickable and with the words (people, economy, etc.) associated with them.
- He wonders why it says topics when other things are also topics (in initial results page—where topic selections are down left-hand side of page
- On thematic map question... he would prefer it to say “map this data” or “see this data on a map” rather than “thematic map.”
- He says clicking on Map View was confusing because nothing happens.
- He says the title is the same size and color as the source which should not be equivalent.
- He doesn't believe that the table ID should be so prominent (and he is an expert!) He says “I don't know if people need the ID.”
- He likes the alternate shading of rows... says it seems to be quite a bit better than the current version.

Expert 2

Task 1: Success

Ideal Action: Check first three search results --> Click View

User Action: First, right-clicked on the first option. Opened in new window. She selected each one separately and viewed them in separate windows. She expressed an inclination to have all tabs opened in Firefox and go back and forth between the tabs. As she was looking around, she noticed the 1 of 3 at the top. Then she went back and clicked on all 3 results and clicked on View.

Task 2: Success

Ideal Action: Click Arrows or View All on results page

Task 3: Failure

Ideal Action: Back to Search Results

User Action: (1) Modify Table (2) Map View (3) View Table (4) Notes (5) Map View (6) Create a Thematic Map...(7)

She finally said, "I can't do this task, actually. I'd expect to be able to modify the table by selecting states from a list."

-She looked in Map View to see if she could click on states to add.

-Regarding Main/Search: "It isn't going to get me closer to the task." (and yet, that is what she was supposed to do!)

Task 4: Failure

Ideal Action: Map View tab or Create a Thematic Map --> Select data cell value --> Show Map (on overlay screen)

User Action: Map View → (doesn't hover over table) "It doesn't give me anything" → Create a Thematic Map → She says that she'd "expect that something from thematic map would be there and selection boxes...I could check a box or type in what I want."

Task 5: Failure

Ideal Action: Modify Table → De-select all Margin of Error Columns

User Action: Modify Table → Unchecked all **rows** → clicked on the clear box in the legend for show/hide → clicked on the collapse icon in the legend → right clicked on margin of error text → clicked on Show Hidden Rows/Columns → left clicked on margin of error text → She said, there "should be a way to hide columns. If I leave them checked, should have a button to click that hides them."

Task 6: Partial Success

Ideal Action: Create a Different Thematic Map or Table View --> Create a Thematic Map

User action: First went to Colors and Data Classes → She said she was "looking to see if there is a way to search parameters being used" → Create a Different Thematic Map → She said she wanted "to get back to whatever let me create this map" → Finally she said this "**doesn't let me do the task.**" → **wants to check the female box and uncheck male box** → Map view

She got it, but didn't know it.

Task 7: Success

Ideal Action: Colors & Data Classes

Additional comments (mostly from debriefing):

- TA showed the process to go to Map View. She said that it wasn't clear that the screen had changed when she clicked on Map View (NOTE: The tab DOES NOT change color). She expects something to happen- there was no distinction. She felt like the same thing was popping up. Recommend changing the frame or the table so it looks different.
- TA showed Back to Search Results. She said that since she started in a few screens, the info should be on the screen. She said she didn't see the instructions. "I'm looking down here. Put it in this piece— below the blue— in the Table ID area— looks like a header."

Expert 3

Task 1: Success

Ideal Action: Check first three search results --> Click View

User Action: Immediately clicked on all 3 results and clicked on View.

Task 2: Success

Ideal Action: Click Arrows or View All on results page

Task 3: Success

Ideal Action: Back to Search Results

User Action: (1) Modify Table (2) Map View (3) Back to Search

Debriefing: Modify Table: Expected to see checkboxes by states to be able to turn on/off options

Would like to see all variables at the bottom of the table that he could click and drag in and out of the table like pivot tables in Excel. Map View: Expected to see a map of the states that he could click on the states and add them to the data table. Back to Selections: Did not see the instruction at the top of the page (Click 'Back to Search' to select other tables or geographies). He remembered seeing Your Selections on the results page and that he could add Hawaii and Alaska to those selections on that page. He also said that the current AFF works like this too. He suggests moving the instruction down closer to the table or even at the bottom of the table.

Task 4: Success

Ideal Action: Map View tab or Create a Thematic Map --> Select data cell value --> Show Map (on overlay screen)

User Action: Create a Thematic Map.

Task 5: Success

Ideal Action: Modify Table → De-select all Margin of Error Columns

User Action: He questioned how to apply changes to the table after removing the Margin of Error columns. He would either expect the changes to be "live" and automatically apply after an action or to have an Apply Changes button.

Task 6: Success

Ideal Action: Create a Different Thematic Map or Table View --> Create a Thematic Map

User action: First went to Boundaries & Features then went to Table Map → Create a Thematic Map... etc.

Task 7: Success

Ideal Action: Colors & Data Classes

Additional comments (mostly from debriefing):

- He thinks that a thematic map is a map that shows statistical information by using colors. He has used AFF, Data Ferret, and a mapping software at his lab at GMU.
- Was confused when all 4 geographies appeared after he only selected one from the data table.
- Would like to be able to convert absolute numbers to percentages.
- Would like Fact Sheets to be "front and center" on the new AFF. He has found these very useful and easy to use.
- Would like to be able to turn on/off summary statistics on data tables.
- Believes Boundaries and Features to be things like county divisions and highways.
- Map Markers: Expects to be able to drop pins into the map to show areas of interest or to contain legend information.
- When in map view and using Find a Location, he expects that when he clicks on a county or place name that the map would zoom to that location because the county/place name looks like a link. If instead, there was a checkbox next to the county/place name, he would expect that location to be added to the map but the map would not zoom to that location.
- He thought the tasks were certainly easier than using the current AFF.

Appendix J. Iteration 2.0 Participants' Computer and Internet Experience

Table 11. Iteration 2.0 Participants' Self-Reported Computer and Internet Experience

Participant	Hours per day on the Internet	Scale: 1 (no experience) – 9 (very experienced)		Scale: 1 (not comfortable) – 5 (comfortable)			Scale: 1 (never) – 5 (very often)			Scale: 1 (not familiar at all) – 5 (very familiar)	
		Overall experience with computers (1-9)	Overall experience with Internet (1-9)	Comfort in learning to new software applications (1-5)	Comfort in manipulating a window (1-5)	Comfort in using and navigating the Internet (1-5)	How often working with data through a computer (1-5)	How often working with complex analyses of data through a computer (1-5)	How often using the Internet or Web sites to find information (1-5)	How familiar with the Census Web site (location, tools, data, etc.) (1-5)	How familiar with the American FactFinder area of the Census (terms, data, etc.) (1-5)
Novice 1	4-6	7	8	4	5	4	5	2	5	3	3
Novice 2	1-3	7	7	4	5	5	5	3	5	1	1
Novice 3	4-6	9	9	5	5	5	5	5	5	3	2
Novice 4	4-6	8	8	4	4	5	5	4	4	2	2
Novice 5	1-3	8	8	5	5	5	2	1	4	2	1
Novice 6	1-3	8	9	3.5	4	5	2	1	4	1	1
Novice 7 (visually impaired)	1-3	7	6	4	4	4	2	2	3	1	1
Average across novice users		7.71	7.86	4.21	4.57	4.71	3.71	2.57	4.29	1.86	1.57
Expert 1	1-3	5	5	3	2	3	4	1	3	4	5
Expert 2	4-6	5	9	3	5	5	5	1	5	5	5
Expert 3	7+	7	9	4	5	5	5	5	5	5	5
Expert 4	7+	6	9	3	3	5	5	2	5	5	5
Expert 5	7+	8	9	5	5	5	5	5	5	5	5
Expert 6	4-6	7	7	5	5	5	5	4	5	4	3
Expert 7	1-3	7	9	4	5	5	5	4	5	3	4
Average across expert users		6.43	8.14	3.86	4.29	4.71	4.86	3.14	4.71	4.43	4.57
Average across all participants		7.07	8.00	4.04	4.43	4.71	4.29	2.86	4.50	3.14	3.07

Appendix K. Iteration 2.5 Participants' Computer and Internet Experience

Table 12. Participants' Self-reported Computer and Internet Experience

Participant	Hours per day on the Internet	Scale: 1 (no experience) – 9 (very experienced)		Scale: 1 (not comfortable) – 5 (comfortable)			Scale: 1 (never) – 5 (very often)			Scale: 1 (not familiar at all) – 5 (very familiar)
		Overall experience with computers (1-9)	Overall experience with Internet (1-9)	Comfort in learning to new software applications (1-5)	Comfort in manipulating a window (1-5)	Comfort in using and navigating the Internet (1-5)	How often working with data through a computer (1-5)	How often working with complex analyses of data through a computer (1-5)	How often using the Internet or Web sites to find information (1-5)	How familiar with the Census Web site (location, tools, data, etc.) (1-5)
Novice 1	1-3	8	9	5	5	5	3	1	4	1
Novice 2	4-6	7	8	4	4	4	3	1	5	1
Novice 3	4-6	7	7	4	4	5	5	4	5	2
Novice 4	7+	9	9	5	5	5	3	2	5	1
Novice 5	1-3	7	4	4	4	4	5	3	5	1
Novice 6	4-6	9	9	4	4	5	5	2	5	1
Average across novice participants		7.83	7.67	4.33	4.33	4.67	4.00	2.17	4.83	1.17
Expert 1	1-3	5	7	3	4	4	4	5	4	5
Expert 2	1-3	7	7	5	5	5	4	3	5	4
Expert 3	1-3	9	9	5	5	5	5	5	5	4
Average across expert participants		7.00	7.67	4.33	4.67	4.67	4.33	4.33	4.67	4.33
Average across all participants		7.56	7.67	4.33	4.44	4.67	4.11	2.89	4.78	2.22