RESEARCH REPORT SERIES
(Survey Methodology #2018-12)

Usability and Accessibility Evaluation of the 2020 Census Barriers, Attitudes and Motivators Survey (English online survey)

Brian Falcone
Rodney L. Terry
Lawrence A. Malakhoff

Center for Survey Measurement
Research and Methodology Directorate
U.S. Census Bureau
Washington, D.C. 20233

Report issued: July 9, 2018

Abstract

In an interdivisional project with the Census Bureau's Communications Research and Analytics Team, the Center for Survey Measurement conducted usability testing of the internet version of the 2020 Census Barriers, Attitudes, and Motivators Survey (CBAMS). CBAMS is a self-administered mail and internet data collection survey that covers a range of topics related to respondents' knowledge of and attitudes toward the 2020 Census. The purpose of the present study was to assess usability and cognitive problems with the English language version of the internet instrument. A separate study conducted usability testing of the CBAMS online instrument translated into Spanish (i.e., Lykke and Trejo, 2018). For usability testing with the English version, one round was conducted with 10 participants.

Overall, testing found several usability issues. Numerical fields were too long for the requested input on all mobile devices. Half of the participants appeared to not notice the PIN number and its instructions to write it down. Another half of participants did not log off the survey during a log off exercise, because it was not clear whether the survey would automatically save its progress when logging out. Cognitive findings included participant confusion about how to respond to questions that referenced situations (such as living in Washington, D.C., or participating in the U.S. election) that did not apply to the participant. However, in terms of satisfaction, participants rated their overall experience completing CBAMS as extremely positive.

Keywords: Online Surveys, Mobile Devices, Attitudes, 2020 Census

Suggested Citation: Brian Falcone, Rodney L. Terry, Lawrence A. Malakhoff**. (2018). Usability and Accessibility Evaluation of the 2020 Census Barriers, Attitudes and Motivators Survey (English online survey).** *Research and Methodology Directorate, Center for Survey Measurement Study Series (Survey Methodology #2018-12).* U.S. Census Bureau. Available online at <http://www.census.gov/content/dam/Census/library/working-papers/2018/adrm/rsm2018-12.pdf>

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Introduction

The 2020 Census Barriers, Attitudes, and Motivators Study Survey (2020 CBAMS Survey) is a self-administered mail and internet data collection survey covering a range of topics related to respondents' knowledge of and attitudes toward the 2020 Census. The design of this survey aims to understand mindsets, attitudes and barriers related to census participation. Results will compare barriers, attitudes, and motivators related to 2020 Census participation across demographic subgroups such as Asian, Black, Hispanic and White racial/ethnic groups. The survey will be conducted in English and Spanish. The survey results will be used to develop targeted messaging for the 2020 Census and as the basis of a "mindset component." Mindsets are constructed from a person's knowledge of and attitudes towards the decennial census based on their answers to the 2020 CBAMS Survey.

The 2020 CBAMS Survey follows the efforts of two previous surveys that were conducted in 2008 (CBAMS I) and 2011 (CBAMS II) as part of the research to encourage Census participation and evaluate self-response of the decennial census in 2010. The 2020 Census Integrated Partnerships and Communications (IPC) effort will include a research-based approach to empower an efficient communications campaign and to encourage self-response in the 2020 census. The Census Bureau's Communications Research and Analytics Team (CRAT) is in the process of collecting data from the 2020 CBAMS Survey from February to April 2018.

The 2020 CBAMS Survey includes 61 questions, some new and some developed from CBAMS I (2008) and II (2011) (Conrey, ZuWallack, and Locke, 2012; Bates et al. 2009) and from other national household surveys. Topics include:

- awareness and familiarity with the 2020 Census,
- intention to participate in the 2020 Census,

- media use (e.g., internet use),
- knowledge of 2020 Census uses,
- importance of public services that could be used in 2020 Census messaging,
- importance of 2020 Census uses,
- importance of potential 2020 Census messaging frames,
- trust in and attitudes toward the government,
- attitudes toward data confidentiality,
- civic participation, and
- demographic information.

The Census Bureau's Center for Survey Measurement (CSM) cognitively pretested the CBAMS instrument with ten English-speaking participants and ten Spanish-speaking participants in June and July 2017, and the CRAT incorporated comments into the instrument from this round of testing. After making changes to the questionnaire based on the cognitive pretesting conducted in summer 2017, the improved questionnaire was programmed into a web survey. CSM performed usability testing on the web version of the questionnaire with five Spanish-speaking participants and ten English-speaking participants in December 2017. This report includes the findings from the usability study conducted in English. See Lykke and Garcia Trejo (2018) for results of the usability test conducted in Spanish.

This study tested usability and cognitive problems in the English language version of the online version of the 2020 CBAMS Survey (also known as the 2020 Census Planning Survey. This is the title of the survey used for the public). The CRAT requested this testing to ensure that the survey is effective, user-friendly, and understood by English-speaking respondents. The objectives for English usability testing of the online 2020 Census Planning Survey were as follows:

1. Identify usability problems on Personal Computers (PCs) and mobile devices using qualitative data gathered from usability interviews with participants and assess satisfaction with the application, using self-reported satisfaction questionnaires.
2. Assess participants' ability to log in and out of the application.
3. Administer several debriefing questions to collect additional information about users' perceptions of the purpose of the survey and their experiences completing it.

Methodology

Participants

Ten people were recruited to participate in this study. These individuals were recruited locally in the DC area from a Census Bureau database of individuals who wished to be contacted to participate in Census research studies. Participant inclusion criteria were (1) at least 18 years of age, (2) at least one year of experience using the internet, (3) had not participated in a usability study in the past year. Participant characteristics are summarized in Table 1. All participants said they had 2 years or more of internet experience. Each participant was given a $40 honorarium for their participation.

Table 1. Participant Characteristics

Sample Size	N=10
Device Used For Testing	
PC	5
Smart Phone	5
Sex	
Female	6
Male	4
Age = Mean (SD), Range	39.6 (21.37), 18-70
Education	
Some College, No Degree	3
Associate's Degree	2
Bachelor's Degree	5
Race	
White or Caucasian	4
Black or African American	4
Multiracial	2
Hispanic Origin	
Yes	1
No	9
Internet Use Frequency	
Everyday	9
Most Days	1
Smartphone Familiarity	
Somewhat familiar	2
Moderately familiar	3
Extremely familiar	5

Online Survey

When the CBAMS was fielded in February through April 2018, in order to access the online survey, either English or bilingual mail materials were sent to randomly sampled addresses. A letter included in these materials gives background information about the survey and provides a URL to complete the survey online. It also provides an eight-digit user ID number that online respondents must enter in order to access the survey.

The online survey Welcome Page, which serves as the landing page for respondents who enter the URL into a Web browser, invites the respondent to start the survey in either English or Spanish. After the Welcome Page, the respondent is asked for their eight-digit user ID number to start the survey. This number uniquely identifies the sampled household and also allows the respondent to save their information, log out, and log back in later. A six-digit PIN is assigned by the system after the respondent enters a valid user ID number.

Throughout the survey, respondents can leave any answers blank. Answers are collected in a variety of formats, including radio buttons, checkboxes, and write-in text fields. Once the

respondent signs in with their user ID, they have the option to log out of the survey at any time by using a "logout" button in the upper right-hand corner of the screen.

Test task

Participants were asked to come to the usability lab in Suitland, MD and complete the CBAMS online survey using their real personal information to the extent that they were comfortable doing so.

Test devices

1. PC – Participants testing the online survey were provided with a Census laptop and completed the survey using either Internet Explorer or Google Chrome browsers.
2. Smartphones – Participants testing the application prototype using a smartphone were asked to bring their own phone in for testing. Both iOS and Android devices were tested using either Safari or Google Chrome.

Procedure

A protocol was written and followed by test administrators (TA) to ensure that each session was conducted in exactly the same manner over the course of the usability study. The session started with the TA reading a scripted introduction before providing the participant with a consent form to sign before they could participate in the study. Once informed consent was obtained, the audio and device screen video recording was started. This study utilized a think-aloud protocol which required the participant to continually verbalize their thoughts and feelings as they worked through the online prototype application. The TA had the participant practice thinking-aloud by having them do a small exercise of reporting how many rooms were in their home, and to think aloud as they give a response.

After this, the TA provided the participant with a mock letter, explaining that in real life, the letter would come to their house and invite them to participate in the survey. The TA instructed the participant to follow the instructions on the letter and complete the CBAMS survey on the device they were going to use (PC or Mobile) exactly how they would if they were at home and as though the interviewer were not present.

Towards the end of the survey, the TA asked the participant to pretend that they had to run an errand while in the middle of completing the online survey and asked them what they would do in this situation. If the participant did not log out of the survey at this point, the TA would explicitly tell them to do so and then to log back in. Once they completed the survey, they immediately completed a satisfaction questionnaire while the experience was still fresh in their mind, and then the TA asked them the following debriefing questions:

- In your own words, tell me the purpose (i.e., the objective) of this survey.
- As you completed the survey, did you ever find yourself wanting more information about a question or about the purpose of the survey?
- Did you run into any difficulties as you completed the survey?

Finally, the participant completed a demographic questionnaire and a questionnaire about smart phone and internet experience. Sessions were not to exceed 90 minutes.

Findings and Recommendations

The findings from the usability evaluation are presented in five sections:
1. Usability Test Findings and Recommendations,
2. Usability Inspection,
3. Cognitive Issues,
4. Bugs, and
5. Satisfaction.

Usability testing describes our evaluation of how well the participant interacts with the survey, including noticing the questions and instructions, clicking the desired answer category, and navigating the online survey in general. Usability inspection describes our assessment of the extent to which the survey follows best practices of web and mobile design features. Regarding cognitive issues, in the course of conducting usability testing, evidence of participants having trouble with the content of the questions themselves often arise. We labeled these issues 'cognitive issues,' and while the detection and diagnosis of these types of problems was not the primary aim of usability testing, we documented them when they occurred. Our discussion of bugs identifies programming errors in the survey, and finally, we discuss results of the satisfaction survey that assessed participants' satisfaction with the CBAMS.

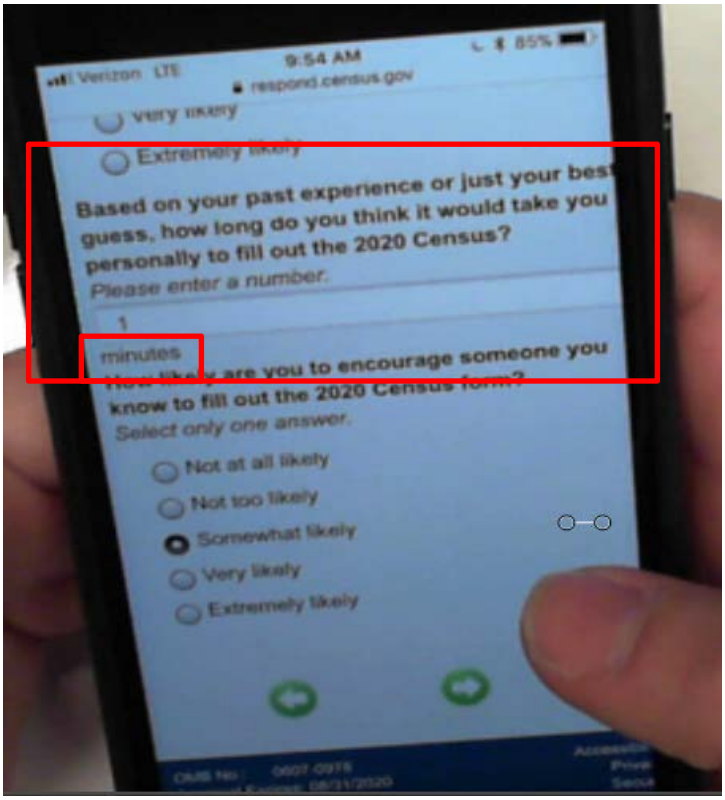
A. Usability Test Findings and Recommendations

The findings are classified into three groups: **High Priority**, **Medium Priority**, and **Low Priority**. The **High Priority** group includes issues that prevented the participant from completing tasks, required the assistance of the test administrator to continue, or resulted in response errors. The **Medium Priority** group includes issues that made it difficult for the participant to perform the tasks. The **Low Priority** group includes issues that affected the participant's satisfaction with task performance but not task completion. Issues within these classifications are listed with the number of participants that experienced a problem due to the issue and are ranked from most to least frequent. As usability testing was conducted using both PC and mobile smartphones, the devices which could be affected by the issue are indicated in parentheses being labeled as PC, Mobile, or PC and Mobile

<u>High Priority</u>

- Numerical fields were far too long for the requested input on all mobile devices. As a result, The label "minutes" appears beneath the numerical field on the time to complete Census question for mobile. One participant entered hours instead of minutes because they did not see the label which resulted in them reporting "1 minute" to complete the Census.

  Participants Affected: 1 of 5 (Mobile)

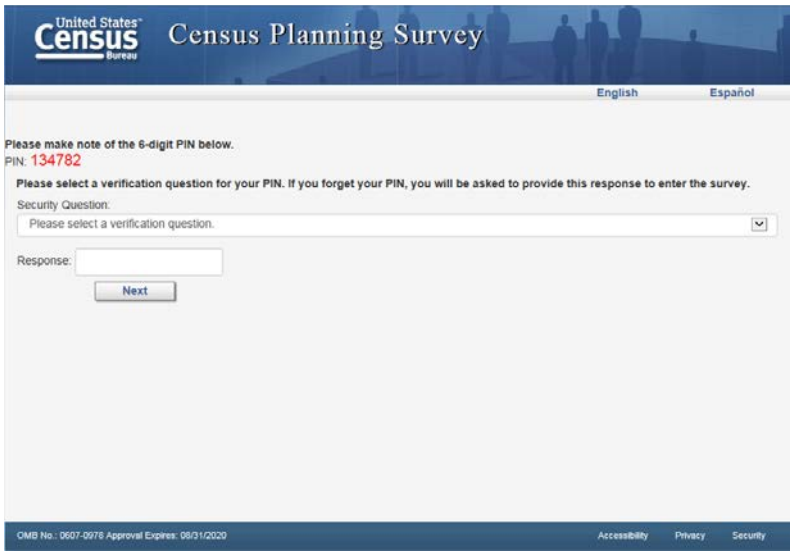


Recommendation: To make the "minutes" label more visible, reduce the length of the input field to move the "minutes" label to the right of the field (as it appears on PC) instead of below the field, and create space between this question and the next question on mobile.

Medium Priority

- Once the participant successfully logs in to the survey, the survey displays a PIN number in large, bold, and red font, and instructs the participant to write the PIN number down in case the participant forgets it. However, some participants appeared to ignore the PIN number or not see it, as many participants began answering the security questions without writing down the PIN number. In addition, the participants who did not write down the PIN number also did not discuss the PIN number or the PIN number instruction when thinking aloud.

  Participants Affected: 5 of 10 (PC and Mobile)



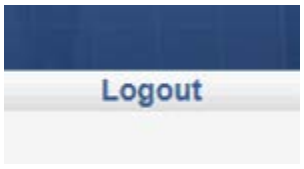
Recommendation: *Separate the PIN number and security question into two pages so that more attention can be paid to the PIN number.*

Alternatively, if separating onto separate pages is not possible, add additional space between the PIN number and security question and modify the PIN instructional text to be more specific. For example: "Please write down the 6-digit PIN number below. You will need it to access the survey if you log out."

- As previously stated, towards the end of the survey, the TA asked each participant to pretend that they had to run an errand while in the middle of completing the online survey and asked them what they would do in this situation. If the participant did not log out of the survey at this point, the TA would explicitly tell them to do so and then to log back in.

  During this exercise, five of ten participants did not use the logout button because they said they were unsure about whether the survey would be saved if they logged out. In addition, there is no notice or instruction in the survey to indicate to that their progress would be saved.

  Participants Affected: 5 of 10 (PC and Mobile)

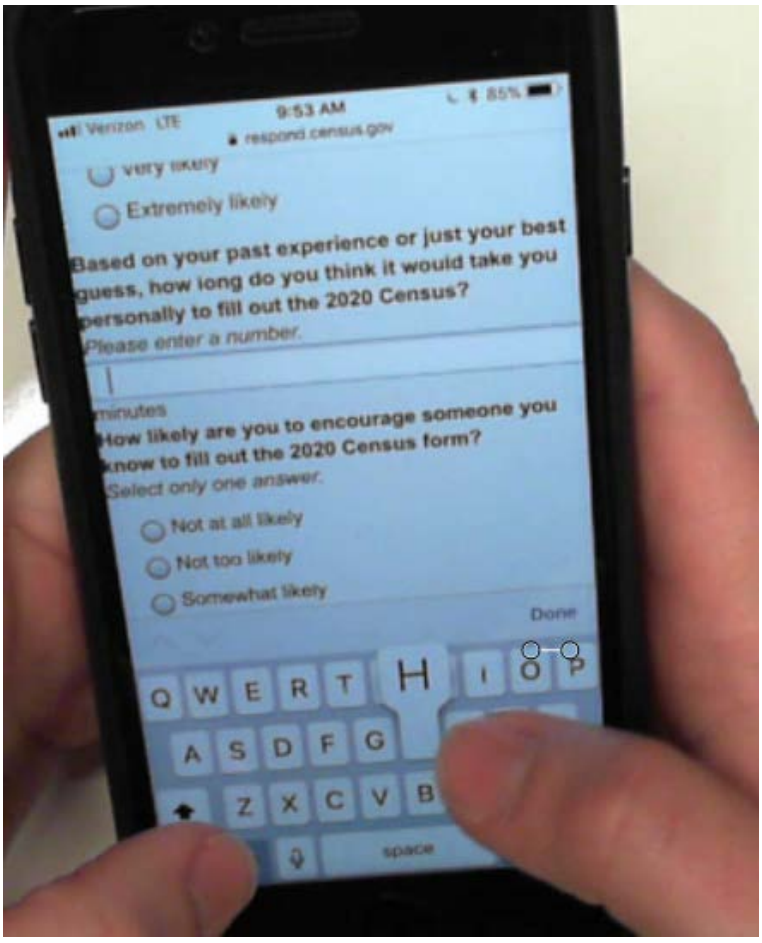


Recommendation: *Label this button as "Save and Logout" to make it clear that progress will be saved.*

- Several questions in the survey require numeric answers. However, when participants attempted to respond to these questions by clicking on the numerical field, the numeric

keypad did not come up. Instead, the QWERTY keyboard came up on mobile for all numerical fields. This required all participants to toggle into the numeric keypad each time. One participant also attempted to type the word "hour" into the numerical field, as a possible result of this UI issue.

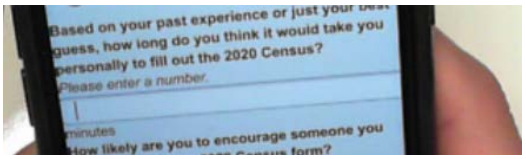
Participants Affected: 5 of 5 (Mobile)



Recommendation: *Program the online survey to bring up the numeric keypad for all numerical input fields.*

- As mentioned previously, numerical fields were far too long for the requested input on all mobile devices, which could give a false impression that it is an open-ended text field. One participant attempted to type the word "hour" into the numerical field. This issue also results in right-aligned field labels to be pushed down below the field such as was observed in Issue #1.

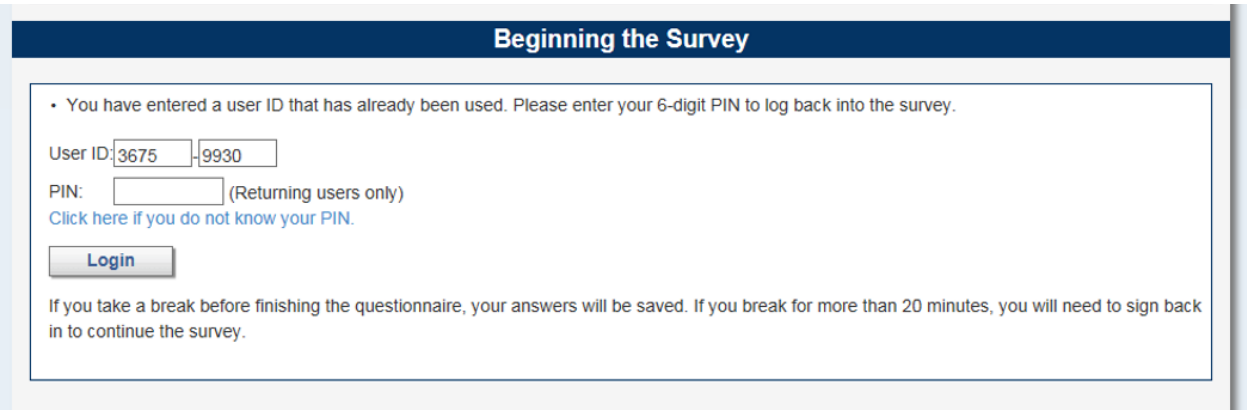
  Participants Affected: 1 of 5 (Mobile)



Recommendation: *Reduce the size of numerical input fields to match the size of the requested input.*

- The PIN recovery link labeled "Click here if you do not know your PIN" was not seen when a PIN was forgotten.

  Participants Affected: 1 of 10 (Mobile and PC)



Recommendation: *Keep this text blue but also underline it. Links are almost always blue and underlined so this modification should assist the user in recognizing the link as such.*

- The logout button on the PC was reported as being unseen when instructed to find and use it. It is possible that this was due to its close proximity and similar color to the survey banner or that the button/link does not appear to be interactive in its current design.

  Participants Affected: 1 of 5 (PC)

Recommendation: *Redesign to appear more like a button by adding a border around Logout to make it stand out and clarify that it is an interactive element.*

Low Priority

- The survey does not save data entered on the current page when logging out. One participant was bothered that the data they had already entered on the page before they logged out was not there when they logged back in.

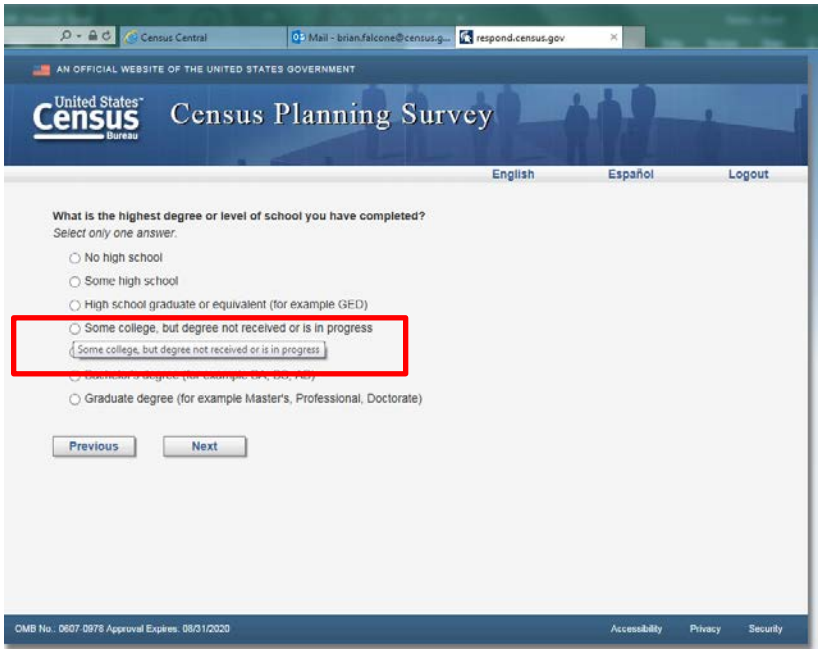
  Participants Affected: 1 of 10 (PC and Mobile)

  Recommendation: *Provide a warning message when the logout button is clicked that notifies the respondent that any information they have entered on the current page will not be saved. For example: "Your responses for all prior pages will be saved but your responses for the page that you log out on will not be saved. When you re-enter the survey, you will be taken to the question where you left off. "*

B. Usability Inspection

The recommendations reported here are from the inspection of the CBAMS online instrument by CSM usability experts and are drawn from applied cognitive psychology principles and usability best practices. These observations DID NOT result in any performance issues with the usability test participants.

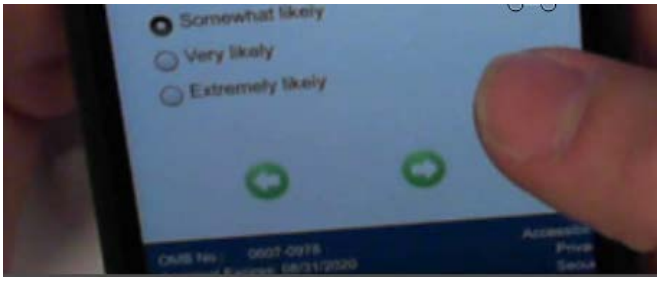
1. Tooltips are text that automatically appear when a cursor hovers over an item. In the PC version of the survey, tooltips appear when the cursor hovers over the response option. However, the text in these tooltips are simply repeats of the response option text, and can block the text of the next response option.



***Recommendation*:** Remove these tooltips.

Rationale: To reduce clutter and to assist visual processing of information by removing anything from the UI that is redundant or not serving any purpose.

2. Navigation buttons are small and are slightly off-center to the left side.



***Recommendation*:** Make these buttons slightly larger and center align them with the page.

Rationale: Between the small size and misalignment, it is possible that these buttons might not appear to be interactive. While it would be extremely unlikely that any issues would arise for most respondents, there is a small possibility that older respondents or those with less mobile internet experience might not perceive the intended purpose affordance of this UI element. Making these navigation buttons larger and centering them (aside from having a cleaner look) will make their appearance more salient and indicate a clearer intent for their presence being there.

C. Cognitive Issues (Comprehension)

1. The question on whether the participant can trust the state government to "do what is right" confused two participants because they live in Washington, D.C., which is not a state.

   Number of Participants: 2

2. The question on whether the participant voted in the 2016 presidential election confused one participant who was from a non-U.S. country. The participant wondered whether the question only referenced elections in the United States.

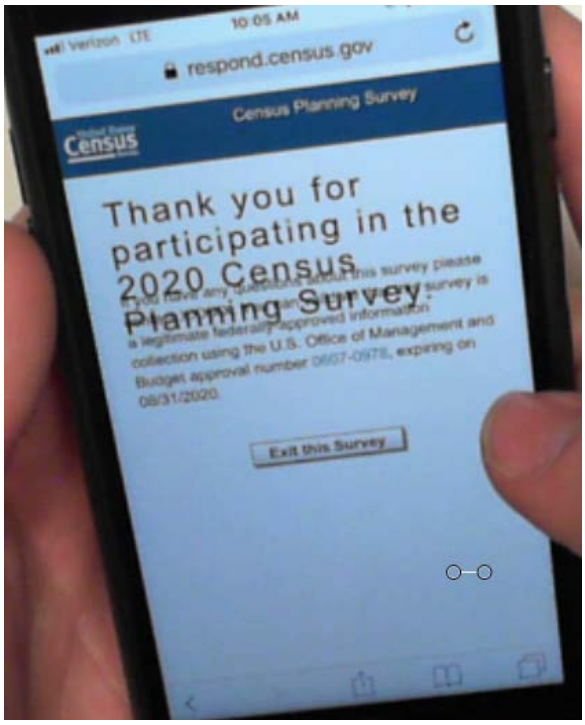
   Number of Participants: 1

3. For the question on whether the census would benefit or harm the participant's community, a participant said the proper grammar for the response option "neither benefit or harm" is "neither benefit nor harm."

   Number of Participants: 1

D. Bugs

1. Small and large text on the "thank you" page overlaps, resulting in some text being unreadable.



Devices Affected: *All Mobile Devices Tested*

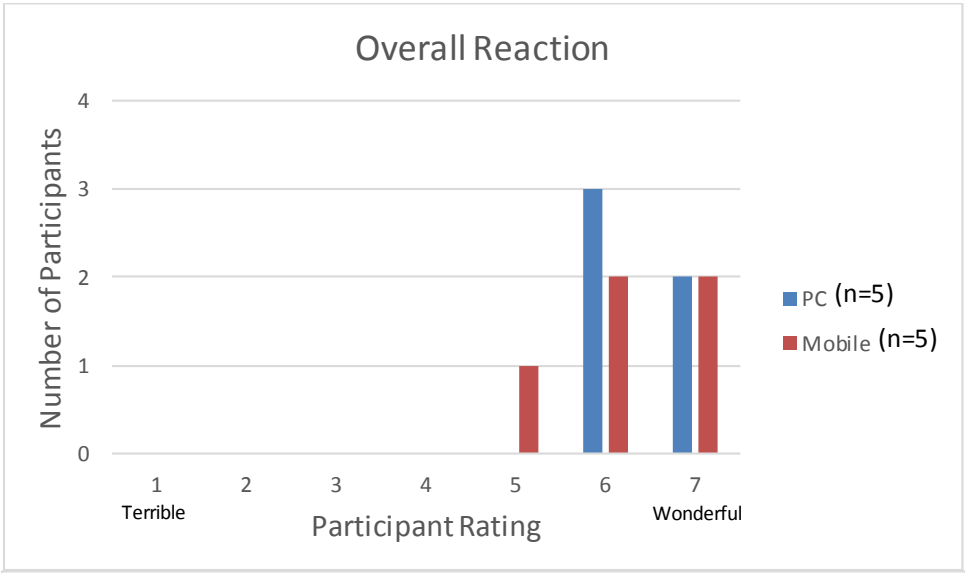
E. Satisfaction

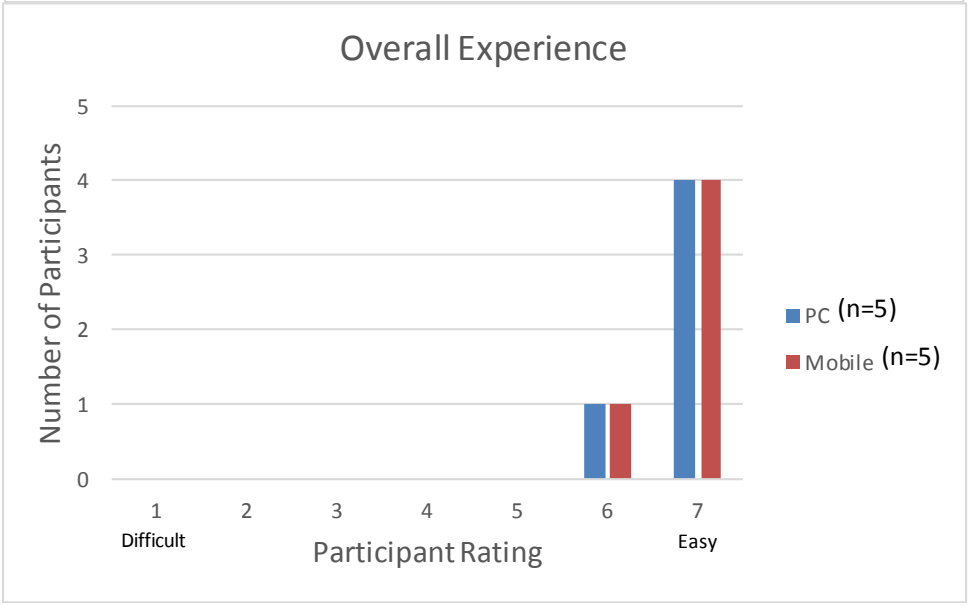
Participants rated their satisfaction with the online survey by filling out an electronic questionnaire at the end of the usability test session. This questionnaire contained 12 different measures of satisfaction for which participants rated their subjective experiences on a 7-point or 5-point rating scale. These measures assessed overall satisfaction with completing the online survey, satisfaction with the survey content itself (e.g. Instructions), and satisfaction with the user interface (e.g. screen layout). Below we present histograms for the frequency distributions of participant ratings on each satisfaction measure and split by device.

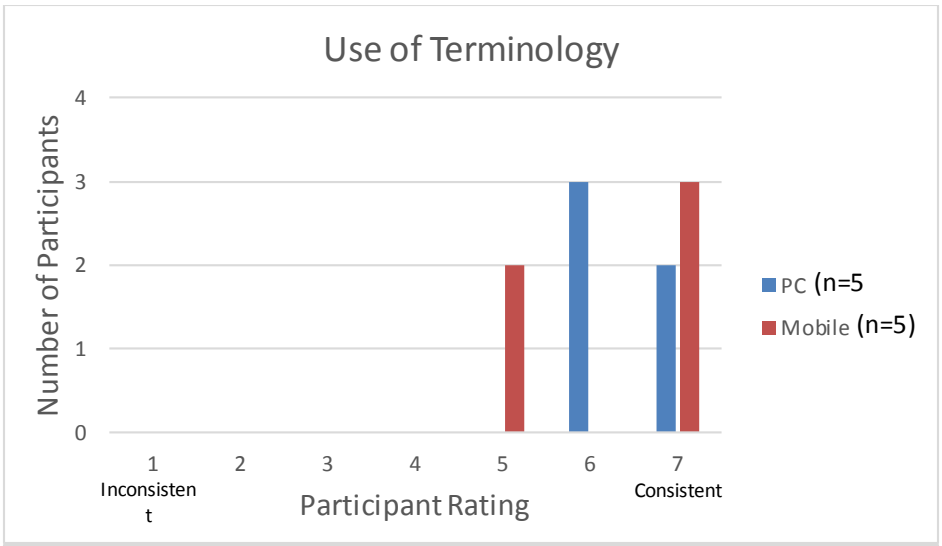
In summary, participants rated their overall reaction and overall experience as being extremely positive. Most participants across both devices reported the highest possible satisfaction ratings for both of these measures. Therefore, only measures where participants reported neutral or negative ratings will be summarized and discussed.

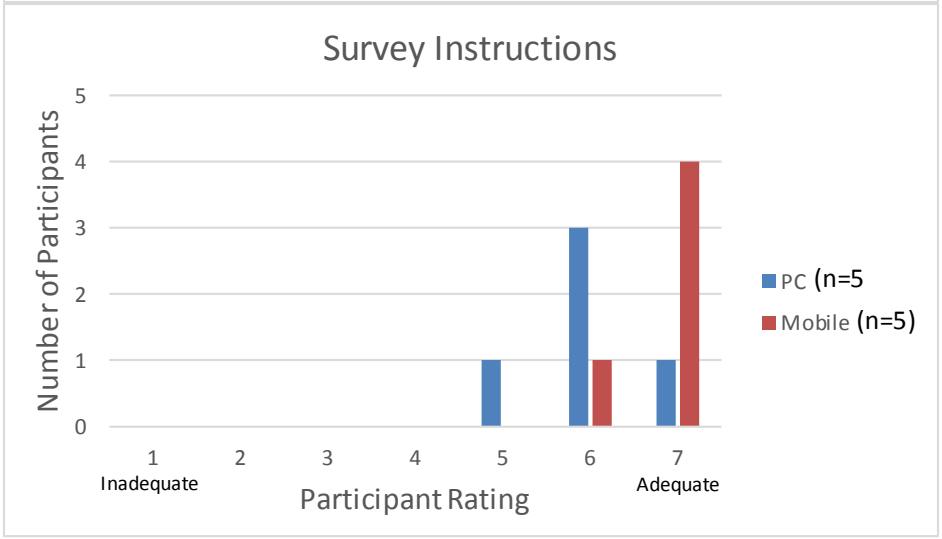
Satisfaction ratings for Question Straightforwardness were more towards the center of the scale, due to two participants reporting a neutral 4-rating and two participants reporting an only slightly positive 5-rating. While reports were still generally positive, these participants had deviated from their more positive ratings for other measures suggesting at least a slightly negative experience with how easy or difficult the questions were to answer. Notes from the sessions did not point to a specific reason for why these individuals reported a lower rating for this measure. However, from the responses to the debriefing questions (See Appendix A) it is clear that some participants struggled with coming up with answers to the questions about how the Census data is being used.

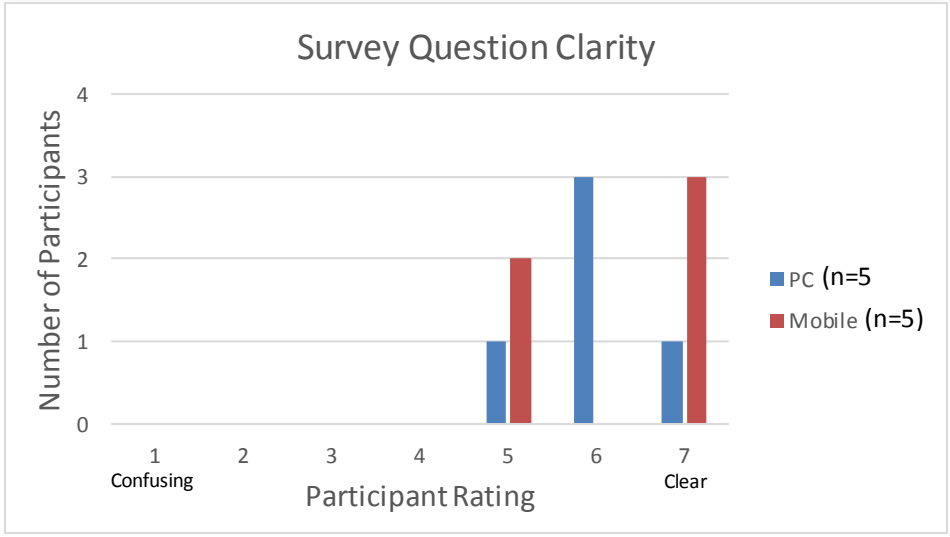
Finally, for Survey Organization there was one participant who reported a 3-rating which indicated slight confusion. Participants were continually thinking aloud while completing the satisfaction survey and the notes from the session indicate that this participant found the survey to look old and dated. He said that the survey was "Very boxy. Literally bullet points on the page. I don't think the government cares about if we like how it looks. Just that it works." This participant had completed the survey using his mobile smartphone.

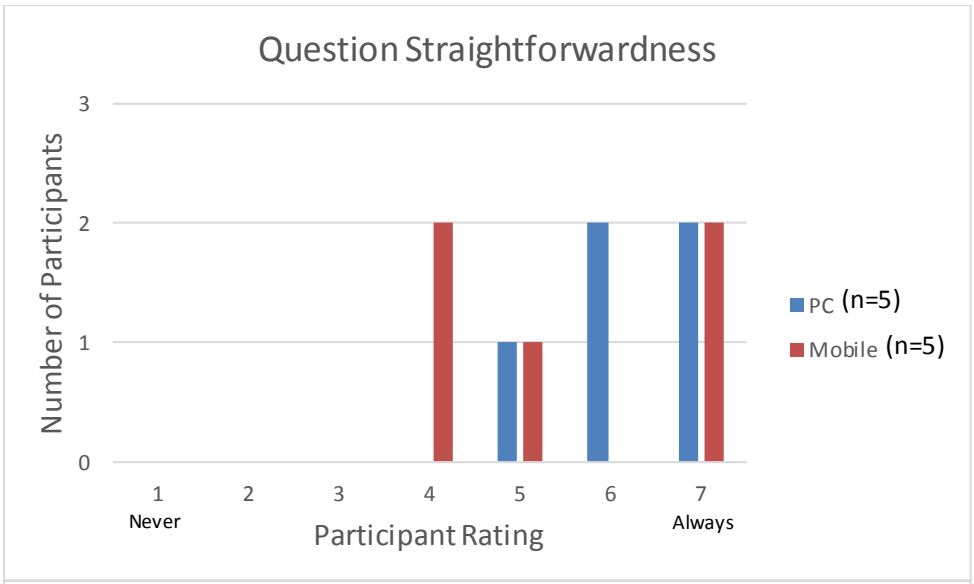


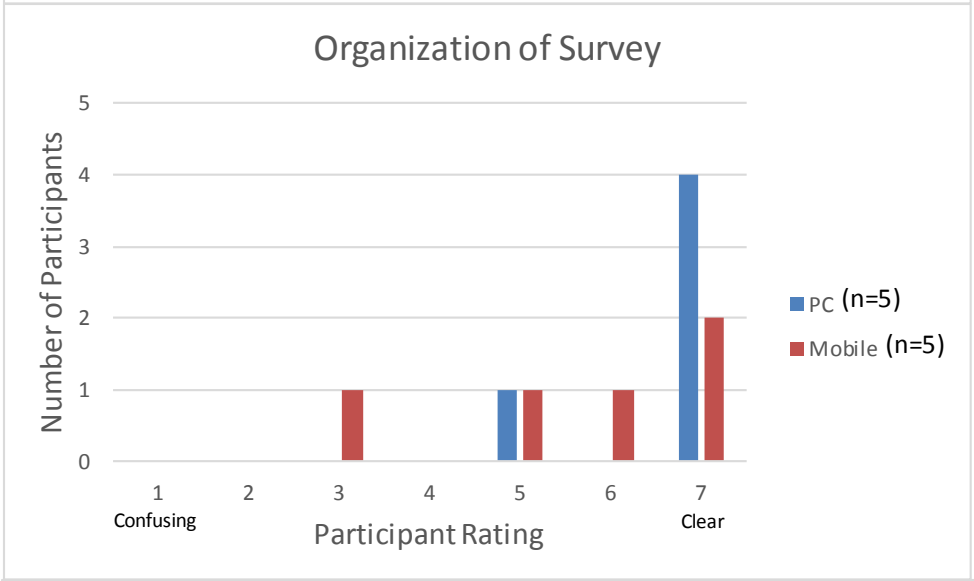


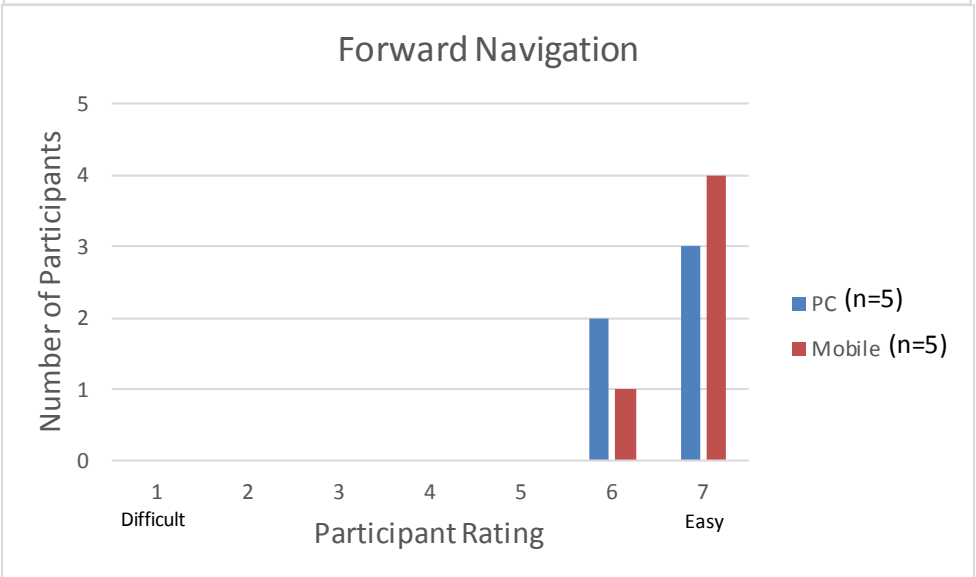

Use of Terminology
Number of Participants
0
1
2
3
4
1
Inconsisten
t
2
3
4
5
6
7
Consistent
Participant Rating
PC (n=5
Mobile (n=5)

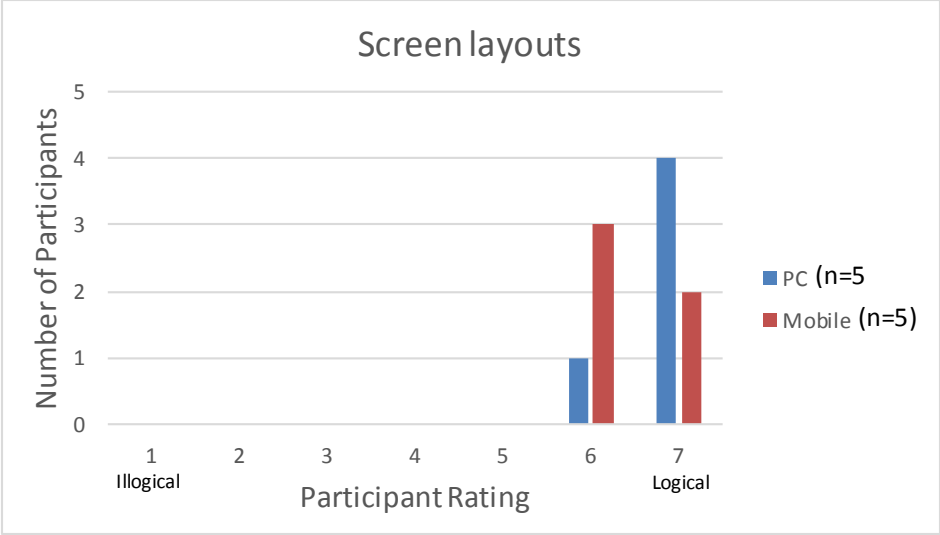

Survey Instructions
Number of Participants
0
1
2
3
4
5
1
Inadequate
2
3
4
5
6
7
Adequate
Participant Rating
PC (n=5
Mobile (n=5)

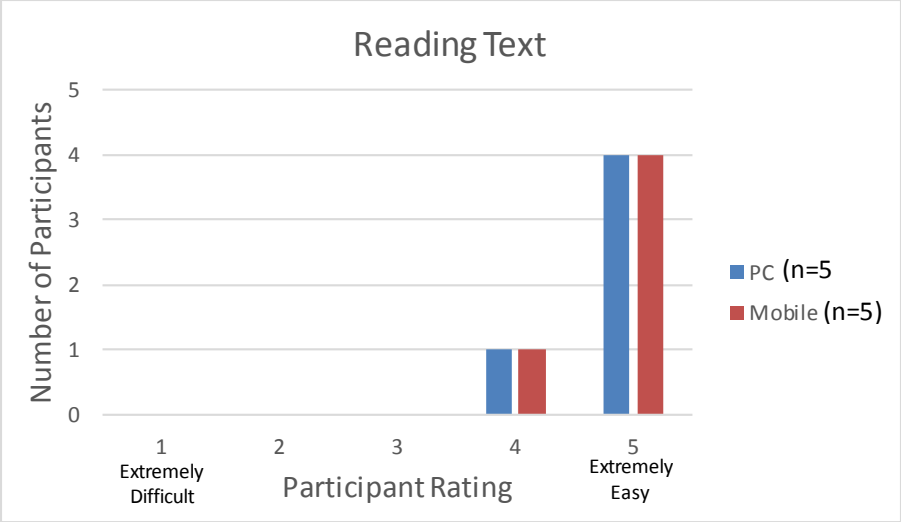

Survey Question Clarity
Number of Participants
0
1
2
3
4
1
Confusing
2
3
4
5
6
7
Clear
Participant Rating
PC (n=5
Mobile (n=5)

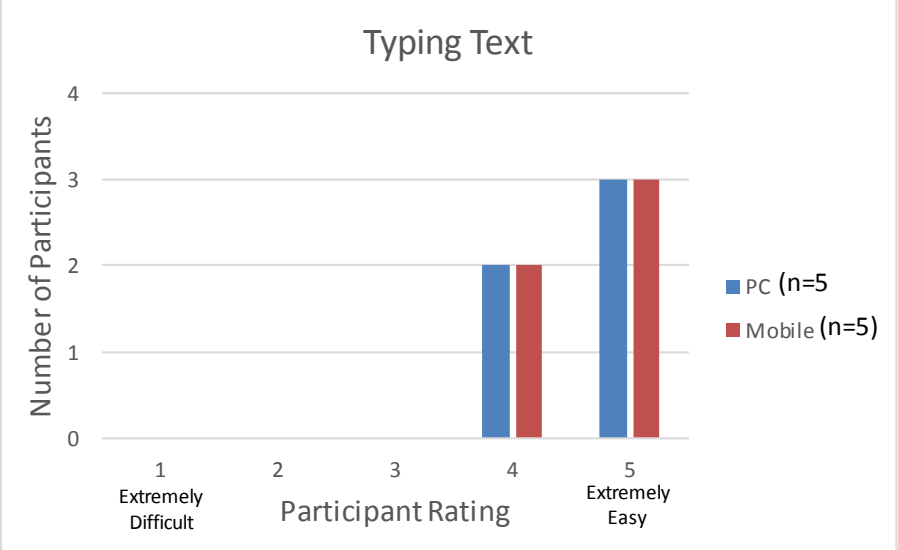

Question Straightforwardness
Number of Participants
0
1
2
3
1
Never
2
3
4
5
6
7
Always
Participant Rating
PC (n=5)
Mobile (n=5)

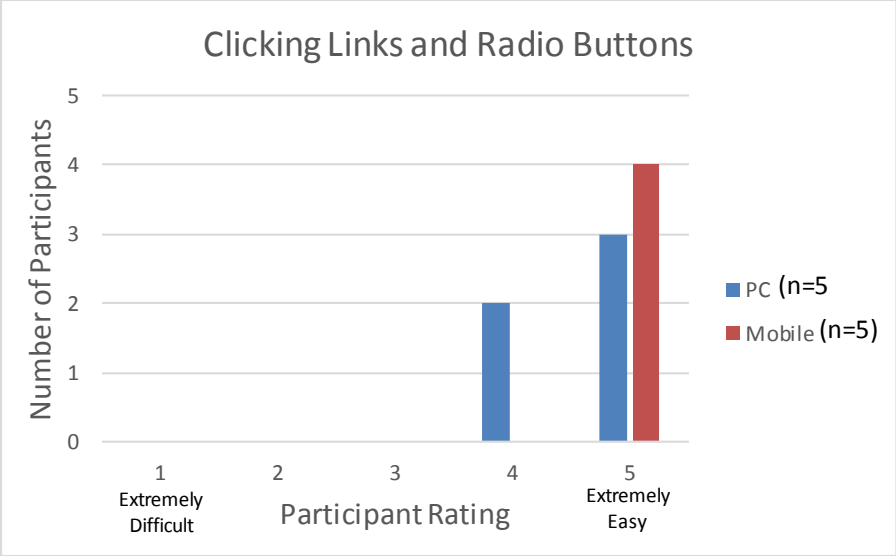

Organization of Survey
Number of Participants
0
1
2
3
4
5
1
Confusing
2
3
4
5
6
7
Clear
Participant Rating
PC (n=5)
Mobile (n=5)


Forward Navigation
Number of Participants
0
1
2
3
4
5
1
Difficult
2
3
4
5
6
7
Easy
Participant Rating
PC (n=5)
Mobile (n=5)


Screen layouts
Number of Participants
0
1
2
3
4
5
1
Illogical
2
3
4
5
6
7
Logical
Participant Rating
PC (n=5
Mobile (n=5)


Reading Text
Number of Participants
0
1
2
3
4
5
1
Extremely
Difficult
2
3
4
5
Extremely
Easy
Participant Rating
PC (n=5
Mobile (n=5)


Typing Text
Number of Participants
0
1
2
3
4
1
Extremely
Difficult
2
3
4
5
Extremely
Easy
Participant Rating
PC (n=5
Mobile (n=5)



Limitations

One limitation is that due to the artificial nature of the usability test environment, it is unclear whether the number of individuals that did not write down their PIN number is an accurate representation of how prevalent this issue would be with the public.

References

Bates, Nancy, Frederica Conrey, Randy Zuwallack, Darlene Billia, Vita Harris, Linda Jacobsen and Tanya White. 2009. Messaging to America: Results from the Census Barriers, Attitudes and Motivators Survey (CBAMS). Census Planning Memoranda Series, No. 8.

Conrey, Frederica, Randy Zuwallack ZuWallack & Robynne Locke. 2012. Census Barriers, Attitudes, and Motivators Survey II Final Report. 2010 Census Planning Memoranda Series, No. 205.

Trejo, Yazmín A. G., and Alisú Schoua-Glusberg. 2017. "Device and Internet Use among Spanish-dominant Hispanics: Implications for Web Survey Design and Testing." *Survey Practice* 10(3).

Appendix A – CBAMS Qualitative Results from Debriefing Questions

After completing the satisfaction questionnaire, participants were asked three debriefing questions (see Methods section). The first question about the purpose of the survey demonstrated that at many of the participants understood the purpose of the Census Planning Survey. One participant confused the question with the purpose of the usability test but once the question was clarified by the test administrator the participant then correctly described the purpose of the CBAMS.

The second question asked about whether participants would have wanted more information about the survey or survey questions as they completed the survey. This revealed that some participants found some of the survey questions extremely challenging and it appeared they wanted to approach the survey almost as a sort of test. Specifically, questions about the government and what the Census data is used for were perceived as being particularly difficult with some participants saying that they wish they knew more information before responding to those questions. One participant mentioned that they would probably use a Google search to find the correct answer before responding to those types of questions.

The third question simply asked if the participants ran into any difficulties as they completed the survey. The response was a resounding "No" across all 10 participants. No participants had any difficulties getting through the survey itself.

Appendix B – CBAMS Accessibility Report

<u>CBAMS Accessibility Testing</u>

The CBAMS survey was tested with the JAWS 18 screen reader using the Internet Explorer 11 browser and Windows 7 to evaluate the accessibility of the desktop mode and with the Google TalkBack 5 screen-reader using the Chrome 63 browser on the Android 7 platform to evaluate the accessibility of the mobile mode. Violations of the Section 508 guidelines and World Wide Web Consortium (W3C) rules will be detailed in the report.

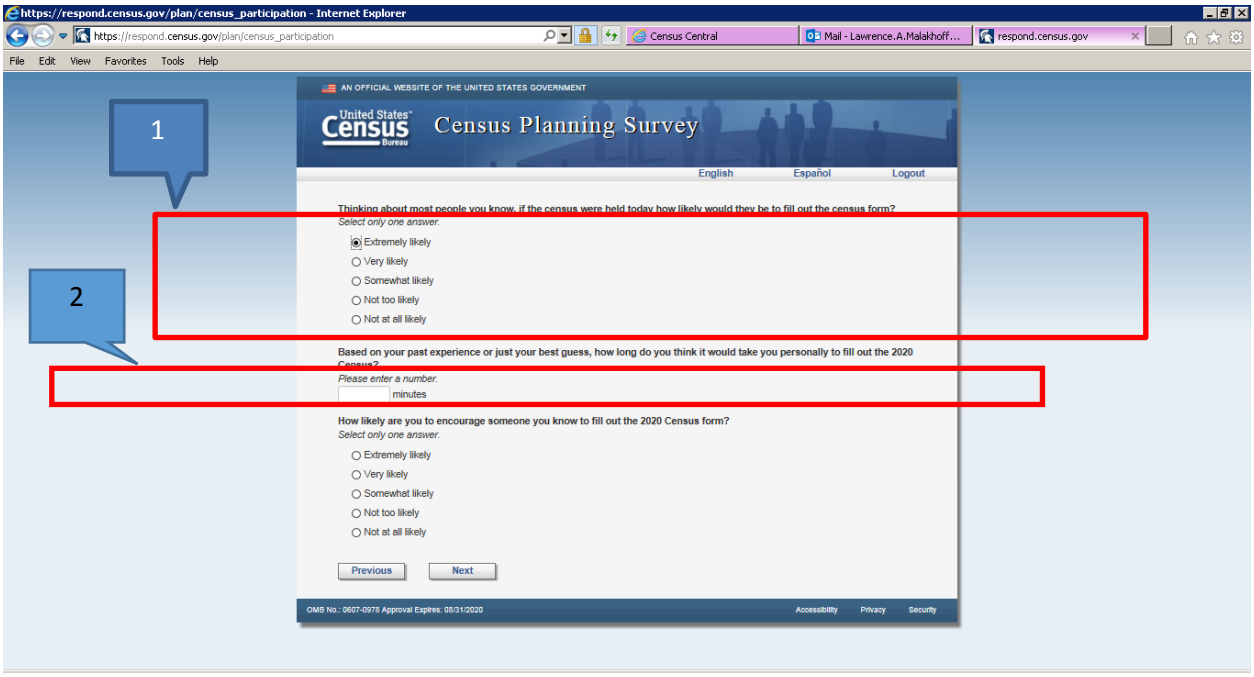


Figure 1: Color contrast is evaluated and a recommendation for the time entry is provided.

1. Italicized instructions and response options appear as gray text on an off-white background which may not have sufficient contrast to be easily readable. This issue applies to both desktop and mobile modes. From code inspection, we determined the text color to be #333 and the background color to be #F5F5F5. When these color numbers are input into a formula from WebAIM, located at https://webaim.org/resources/contrastchecker/ , it revealed that it passed both AA and AAA Web Content Accessibility Guidelines (WCAG) with a contrast ration of 7.88 to 1, exceeding the minimum AAA standard of 7 to 1 contrast ratio. There is no issue with color contrast for CBAMS content.

2. The unit of time for entering the 2020 census is vocalized after the data entry field instead of prior to the data entry field, which may cause the screen reader user in all modes to navigate back to correct their response if they entered their data in hours instead of minutes.

   Recommendation: Revise the instruction prior to the data entry field to say "Please enter the number of minutes."

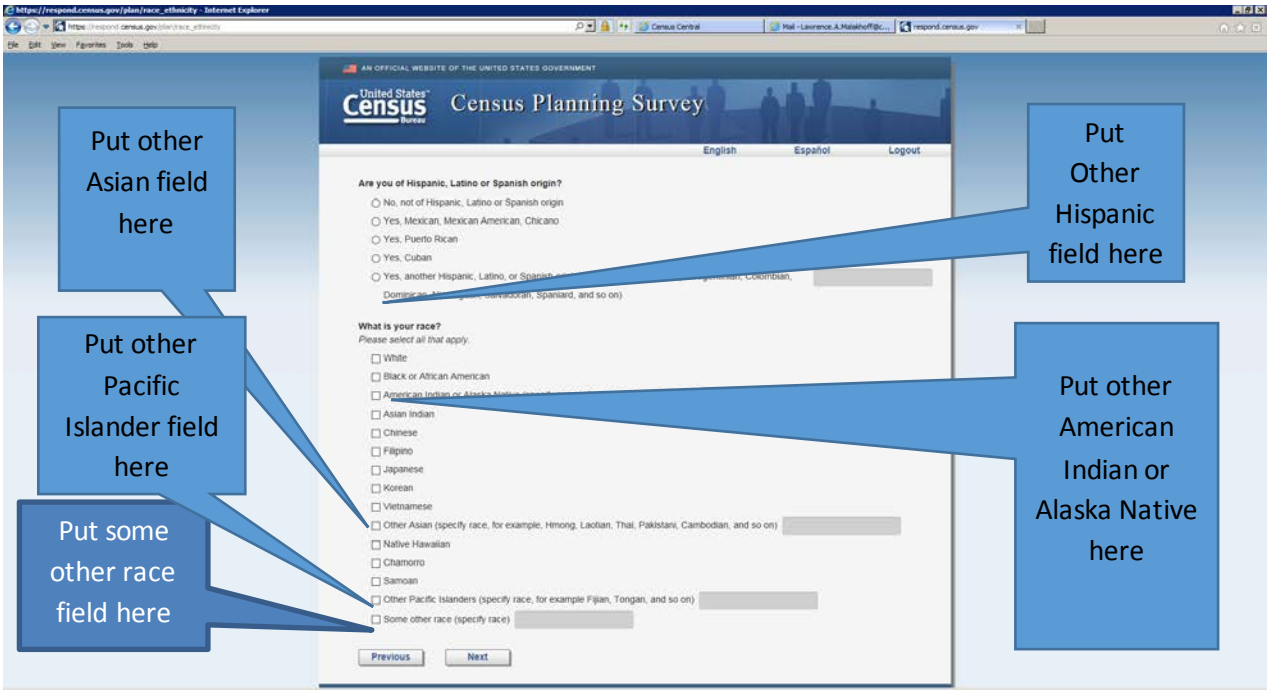


Figure 2: "Other..." data entry fields may not be wide enough to display the responses.

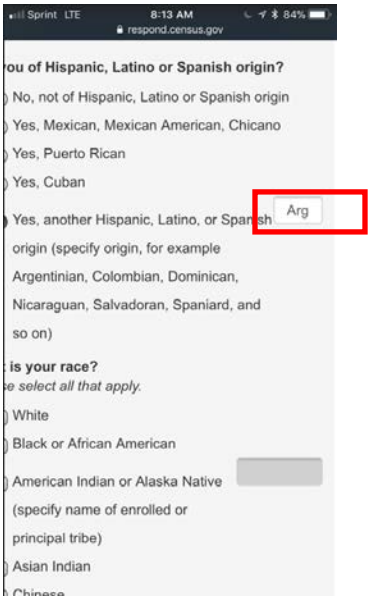


Figure 3: "Other…" data entry fields are sized to fit the mobile screen instead of allowing responses to be visible after being entered.

3. The interaction between JAWS and the "Other..." type responses are accessible, but these fields in the desktop mode may not be wide enough to display a user's full response as shown in Figure 2, especially for other American Indian/Alaska Native responses. Additionally, while the Race and Hispanic series of questions shown in Figure 3 are accessible to blind and low vision smartphone users, the space to enter "other" type responses are too narrow to show most of what the user has entered. For example, when

entering a response for Other Hispanic in mobile mode, if Castillian is entered, all the user sees is "Cast". Native American and Alaska Native names can be lengthy as well.

Recommendation: Instead of placing the "Other…" data entry fields to the right of an existing response option and sizing it to the available remaining space on the right, the "Other…" field(s) should be positioned below the text (for both mobile and desktop modes) and span the width of the longest official Census response option. This change will provide users feedback on what they have just typed for a quick review.