Usability Testing Methodology for the 2017 Economic Census Web Instrument

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Disclaimer: Any views expressed are those of the author and not necessarily those of the U.S. Census Bureau.
Outline

▪ Background of Economic Census
▪ Centurion Overview
▪ Methodology
▪ Metrics
▪ Conclusion
Economic Census

- Snapshot of the U.S. economy
  - Input to key economic reports such as the GDP
- Conducted every 5 years
- Collected from more than 4 million establishments
- Data collection across a variety of industries
- Collection of establishment level data
  - Employment and payroll
  - Sales, receipts, revenue
  - Shipments
  - Operating expenses
Centurion

- Web-based electronic reporting system that hosts surveys
- Will host the economic census
- Through the Centurion reporting system, respondents fill out and submit the data for their business
- Developed by the Census Bureau’s programmers
- Currently in use for all annual surveys that go to a sample of businesses
- Many Economic Census respondents will be seeing it for the first time, introducing them to many new features that even previous respondents will not be familiar with.
Step 1 - Report Dashboard

1. Update our record of your company’s locations by adding locations as needed using the Add Location button at the bottom of the screen. (Note: To see the list of locations of a consolidated report, click "View All" under the "Number of Establishments in Survey" column.)

2. Begin reporting using one of the following options:
   - Option 1: Start the survey for each location listed in the table below OR
   - Option 2: Download, and then Upload a completed spreadsheet template to complete the survey for many locations at once

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<table>
<thead>
<tr>
<th>Status</th>
<th>Print/Preview Survey Questions</th>
<th>Errors/Warnings</th>
<th>Number of Establishments in Survey</th>
<th>Survey</th>
<th>Title</th>
<th>CFN</th>
<th>Store/Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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- Download Spreadsheet Template
- Upload Completed Template

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Resume
Start
Preview Survey
Print Surveys to PDF
Add Location
Delete Added Location

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Overview
Step 2 - Review
Step 3 - Submit
What is usability?

- Usability is defined as “the extent to which a product can be used by specified users to **achieve specified goals**, with **effectiveness, efficiency, and satisfaction** in a specified context of use” (International Organization for Standardization, 1993c)
  - **Efficiency** (once design is learned, how quickly can they complete the tasks?)
  - **Errors** (how many errors are made when attempting a task, are the errors easily amended by user?)
  - **Satisfaction** (how pleasant is it to use the design?)
  - **Utility** (how functional is the design, does it have all the features it needs?)
  - **Learnability** (how easy is it for a novice user to accomplish tasks?)
Methodology

- Testing duration: May 22nd-June 2nd
  - Local visits (DC, MD, VA)
  - Houston, TX
  - Denver, CO
  - St. Louis, MO

- 38 participants total
  - Recruited from current surveys
  - Multi-Unit establishments (n=29)
  - Single-Unit establishments (n=9)
## Participant Characteristics

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Number of participants (n=38)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; High School</td>
<td>1</td>
</tr>
<tr>
<td>High School</td>
<td>1</td>
</tr>
<tr>
<td>Some College</td>
<td>5</td>
</tr>
<tr>
<td>Associates degree</td>
<td>1</td>
</tr>
<tr>
<td><strong>Bachelors</strong></td>
<td><strong>17</strong></td>
</tr>
<tr>
<td>Post Bachelors</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age range (in years)</th>
<th>Number of participants (n=38)</th>
</tr>
</thead>
<tbody>
<tr>
<td>26-35</td>
<td>8</td>
</tr>
<tr>
<td>36-45</td>
<td>10</td>
</tr>
<tr>
<td>46-50</td>
<td>6</td>
</tr>
<tr>
<td>51+</td>
<td>14</td>
</tr>
</tbody>
</table>
Methodology

- Testing Procedure
  - Protocol
    - Introduction
    - Consent form
    - Demographic and Computer Use/Internet Experience Questionnaire
  - User tasks
    - Think aloud
    - Probes
  - Satisfaction survey
  - Debriefing
Identification of findings

▪ Usability metrics
  ▪ Efficiency (task completion time)
  ▪ Accuracy (task success)
  ▪ User satisfaction (System Usability Scale)

▪ Observed behaviors

▪ Participant commentary
Think Aloud

- Ericsson and Simon’s (1993) method of collecting verbal feedback
- Used in this study to capture participants’ conscious thoughts, expectations and decisions as they interacted with the site
- R’s were prompted to “keep talking,” if they fell silent for more than ten seconds
- Highlighted potentially problematic areas of the site
- Allowed researchers to gain an understanding of the participants’ underlying cognitive processes.
Tasks

- Tasks were designed to reflect realistic and representative actions that respondents would have to take while reporting to the 2017 Economic Census survey.

- Tasks fell into four main categories:
  - Logging into the survey
  - Reporting Data
  - Reviewing Data
  - Submitting Data
# Tasks

<table>
<thead>
<tr>
<th>Task 1</th>
<th>Log into the survey</th>
</tr>
</thead>
</table>
| Task 2 | **MU ONLY:**  
  - Part A: Add 2 new locations  
  - Part B: Remove the locations from the listing  
  - Part C: View/arrange locations by EIN  
  **SU ONLY:**  
  - Part A: Update the company’s mailing address to 123 TEST LANE |
| Task 3 | View a copy of the survey questions |
| Task 4 | Begin reporting |
| Task 5 | **MU ONLY:**  
  - Part A: Download and save a full survey spreadsheet to the desktop  
  - Part B: Upload the saved Test spreadsheet to the instrument |
| Task 6 | Review your data  
  - Part A: Resolve any errors |
Metrics: Efficiency

- *Task completion time* is defined as the amount of time (in seconds) it takes the participant to complete a given task using the 2017 Economic Census site.

- Start time begins when the participant is done reading the task question aloud and begins to interact with the site.

- End time is when the participant states that they have completed the task or that they would like to move on to the next task.

<table>
<thead>
<tr>
<th>Task</th>
<th>Task 1</th>
<th>Task 2a</th>
<th>Task 2b</th>
<th>Task 2c</th>
<th>Task 3</th>
<th>Task 4</th>
<th>Task 5a</th>
<th>Task 5b</th>
<th>Task 6a</th>
<th>Task 6b</th>
<th>Task 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average completion time (n=20)</td>
<td>1m27s</td>
<td>1m35s</td>
<td>26s</td>
<td>37s</td>
<td>1m09s</td>
<td>54s</td>
<td>1m47s</td>
<td>55s</td>
<td>34s</td>
<td>36s</td>
<td>1m27s</td>
</tr>
</tbody>
</table>
Metrics: Effectiveness (Accuracy)

- Three categories of effectiveness:
  - **Successfully completed**: The participant was able to navigate through the instrument to complete a given task (via the optimal paths) without assistance from the test administrator.
  - **Partial success**: The participant was able to complete part of the task with no assistance from the test administrator.
  - **Failure**: The participant failed to complete the task or required assistance.
Metrics: User Satisfaction

- Satisfaction ratings were assessed based on subjective satisfaction ratings from the System Usability Scale questionnaire administered at the end of the usability session.
- Items were rated on a 5-point Likert Scale.
- Item average across participants was calculated.
| Q1 | I think that I would like to use the site to complete the Economic Census | 3.95 |
| Q2 | I found the site to be simple | 3.75 |
| Q3 | I thought the site was easy to use | 3.87 |
| Q4 | I think that I could use the site without the support of a technical person | 4.18 |
| Q5 | I found that the various functions in the site were well put together | 3.70 |
| Q6 | I thought there was a lot of consistency in the site | 3.93 |
| Q7 | I would imagine that most people would learn to use the site very quickly | 3.84 |
| Q8 | I found the site to be very intuitive | 3.58 |
| Q9 | I felt very confident using the site | 3.79 |
| Q10 | I could use the site without having to learn anything new | 4.22 |
Future Studies
Conclusion

- Multiple quantifiable metrics were used to assess the usability of the Centurion website
  - Efficiency (task completion time)
  - Accuracy (task success)
  - User satisfaction (System Usability Scale)
- Recommendations for changes to the site were prioritized and implemented by the developers
- Observed behaviors
- Participant commentary
Progress Following Study
Progress Following Study
Progress Following Study

A. Review our list of your locations below.
B. Add locations that are missing by selecting the "Add Location" button.
C. Start reporting data by:
   - Individual locations (click "Start" buttons)
   - All locations (click "Download Spreadsheet Template" button)
D. To preview or print questions and instructions, click the \( \text{icon} \) under the "Preview Questions and Instructions" column.
   - This document will contain your answers to the survey as you fill it out.
   - You can print this document to have a copy of your responses for your records.
E. To see the list of locations for a consolidated report, click "(View All)" under the "Num. Establs. in Survey" column.

Step 1 - Report Dashboard

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Thank you!

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