Design Considerations for Mobile Web Surveys

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  - research work with Lin Wang, Elizabeth Nichols, Erica Olmsted-Hawala, and others at the U.S. Census Bureau Usability Lab
  - courses taught by Fred Conrad and Mick Couper
Why are we interested in mobile surveys?

Widespread Ownership of Smartphones in U.S.

% of U.S. adults who own the following devices

Data are from the surveys conducted in January or February of each year unless marked.
PEW RESEARCH CENTER
... and around the World

% of adults who report owning a smartphone

Note: Percentages based on total sample.

Primary Means of Online Access for Some

% of U.S. adults who do not use broadband at home but own smartphones

Data for each year based on a pooled analysis of all surveys containing broadband and smartphone questions fielded during that year.
Pew Research Center
November 2020
Smartphones Commonly Used for Web Surveys

% of participants who started web survey on their phones (unofficial)

- American National Election Survey* (Internet sample, 2016): 13%
- National Survey of College Graduates (Internet sample, 2019): 15%
- American Community Survey (Internet sample, Dec 2019): 19%
- German Internet Panel (Sept 2020): 36%
- KnowledgePanel® (general population sample, 2020): 40%
- Understanding America Study Panel (2020): 45%

Sources: Personal communications with Rachel Horwitz, Arie Kapteyn; Ulrich Kreiger; and Randall Thomas. Neufelder et al. 2020; ANES 2016 User Guide Codebook *Post-election survey

Why are we interested in mobile design?
Features of Mobile Surveys: Respondents…

- …access them using (relatively) small screens, often held vertically and interacted with using the thumb of the same hand (Bröhl et al., 2017)
- …using different software
- …sometimes with a cellular Internet connection
- …in diverse contexts-of-use.


Example of Outdated Design

- Web page is the same regardless respondent’s device
  - Small buttons and fonts require zooming
  - Zoomed view requires both vertical and horizontal scrolling

The message of bad design:
“If you obviously did not put much time and effort into designing your survey, why should the respondent put time and effort into answering your survey?” Couper (2015)
Mobile Optimization

- Web page adjusts to respondent’s device, often using Responsive Web Design
- Mobile respondents see:
  - an adjusted layout and
  - content that is wrapped and resized to fit the width of their screen
- Adjustments to layout may include:
  - removing logos
  - collapsing menu into hamburger icon

Source: https://bit.ly/3nte9on

Mobile Optimization – Example

<table>
<thead>
<tr>
<th>Layout A</th>
<th>Screen width &gt; 1024 px or 10.7”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout B</td>
<td>768-1024 px 8-11.7”</td>
</tr>
<tr>
<td>Layout C</td>
<td>&lt;768 px or 8”</td>
</tr>
</tbody>
</table>

*px = design pixels
Mobile Optimization Cont’d

- **Strengths**
  - Content is visible without the “hideous horizontal scroll”
  - Page elements usually larger than in non-optimized surveys
  - Evidence that optimized surveys are easier to complete
    - E.g., McGeeney & Marlar (2013); Sarraf et al. (2015); Revilla et al. (2017)

- **Limitations**
  - Survey may appear differently to different respondents
  - Way that software makes adjustments may be unknown to the designer
  - Page elements may not be sufficiently sized

Completing a Survey on Smartphone is *Still* Harder than on a Desktop/Laptop

- ** Longer completion times **

<table>
<thead>
<tr>
<th>Study</th>
<th>Mobile</th>
<th>Desktop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burkirk &amp; Andrus ’14</td>
<td>0.67</td>
<td>1.00</td>
</tr>
<tr>
<td>Wells et al. ’14</td>
<td>0.62</td>
<td>1.00</td>
</tr>
<tr>
<td>Toepeol &amp; Lugl ’15</td>
<td>0.60</td>
<td>1.00</td>
</tr>
<tr>
<td>McGeeney &amp; Marlar ’13</td>
<td>1.15</td>
<td>1.00</td>
</tr>
<tr>
<td>Peterson et al. ’12</td>
<td>1.27</td>
<td>1.00</td>
</tr>
<tr>
<td>De Buijne &amp; Wijnant ’13</td>
<td>1.6</td>
<td>1.00</td>
</tr>
<tr>
<td>Wells et al. ’14</td>
<td>1.68</td>
<td>1.00</td>
</tr>
<tr>
<td>Antoun ’15</td>
<td>1.78</td>
<td>1.00</td>
</tr>
</tbody>
</table>
  
  Ratio of completion times in mobile vs. PC Web
  Source: Couper & Peterson (2015)

- **Increased likelihood of breakoff**

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Buskirk &amp; Andrus (2014)</td>
<td>1.1</td>
<td>2.6</td>
</tr>
<tr>
<td>Baker-Prewitt (2013)</td>
<td>3.3</td>
<td>4.0</td>
</tr>
<tr>
<td>McGeeney &amp; Marlar (2013)</td>
<td>3.7</td>
<td>4.7</td>
</tr>
<tr>
<td>Barlas et al. (2015)</td>
<td>4.0</td>
<td>5.8</td>
</tr>
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<td>4.0</td>
<td>5.8</td>
</tr>
<tr>
<td>Mavletova &amp; Couper (2013)</td>
<td>4.7</td>
<td>8.8</td>
</tr>
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</tr>
</tbody>
</table>
  
  Ratio of breakoff rates in mobile vs. PC Web
  Adapted from Couper, Antoun, & Mavletova (2017)

All surveys shown above were optimized for mobile.
How can we design better survey instruments?

Goal of Good Design:
Support the Task of the Respondent

My focus: instrument design rather than question wording

Image source: flaticon.com
Font Size

- Small text is hard to read
- As font size increases:
  - the number of characters per line decreases
  - the number of characters per screen decreases
- On the positive side: smaller text may be easier to read on smartphones than desktops/laptops because of shorter viewing distance

Source: Darroch et al. (2005)

- Little difference in reading speed above 6 or 8 point font
- 14 point or larger causes more scrolling and are not preferred
**Touch Target Size**

- Small targets are hard to select
- As target size increases:
  - the number of targets that fit the screen width decreases
  - the number of targets that fit the screen length decreases
- In addition, small targets are harder to select on smartphones than desktops/laptops because of touch input (Forlines et al. 2007)

Screen dimensions based on iPhone SE:
- 1.3mm
- 2.6mm
- 4.0mm
- 5.3mm
- 6.6mm
- 8.0mm
- 9.2mm
- 10.6mm
**Touch Target Size**

- Larger targets easier to tap accurately, with diminishing gains after 6 mm

% of accurate touches (hit rate) among adults age 60+


- Larger targets easier to tap accurately, regardless of design

### A: Completion times

- Average time per page

### B: Misses

- % screens with 1+ errant tap

Participants: adults age 59+

Source: Antoun et al. (2018)
Response Option Design Cont’d

- Preference for larger radio buttons over plain wide buttons
  - presumably familiar because widely use in surveys and forms

![Bar chart showing respondent ratings for easy to select answers and preferred design.]

Participants: adults age 59+

Source: Antoun et al. (2018)

Drop-Downs (or Drop Boxes)

- Advantage: saves space on screen
- Are rendered differently in different mobile browsers
  - iPhone *picker* wheel:
    - typically displayed at bottom of the screen
    - few items are displayed at once; many items may be initially hidden
    - one-line of text per item; text gets truncated ("Neither agree nor dis . . . ”)
  - Android *spinner*:
    - typically displayed as popover
    - items appear in list

Source: Nichols et al. (2017)
**Drop-Downs Cont’d**

- Pickers require more time...
- … and effort

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**Completion Time per Question (Seconds)**

- Blue: Radio button/text entry
- Red: Spinner List
- Green: Picker Wheel

**Screen Touches Per Question**

Participants: adults age 59+

Source: Nichols et al. (2017)

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**Design Tips: Drop-Downs**

- Appropriate when:
  - The list is too long to display on the page
  - Selecting the response is more efficient than typing and/or it is important to minimize coding problems
  - The answer is known to the respondent
  - The list is ordered in a meaningful way (alphabetic, numeric)
  - The answer is recognizable to the respondent, even when truncated

Partially adapted from Couper (2015)
Open Items – Numeric Input

- Text input field saves space on screen
- No strong evidence against use in mobile
- Different types of keyboards can appear
  - Numbers and punctuation
    - Allows for entry of special symbols
  - Number pad
    - Only numbers are shown; larger buttons
- Evidence that respondents make fewer errors when using number pad and prefer using it (Wang et al. 2018)

Open Items – Text Input

- Typing is harder on a touchscreen keyboard than physical keyboard
  - Typing speeds are about 25% slower, though typing gap may be closing over time (Palin et al. 2019)
- Evidence of slightly shorter answers and more item missing data with open formats in mobile than conventional web
  - However, several studies report no effects of device (for review see Antoun et al. 2017)
Open Items – Voice Input

- Smartphones have microphones that can be used for voice input
  - Dictation – input converted to text in real-time for respondent to view/edit
  - Voice Recording – audio file converted to text after the survey

Use of Voice Input: Faces Challenges but Shows Some Promise

- Increased item nonresponse
- Longer responses
- No effect on number of codeable answers

Source: Revilla et al. (2020)
Grids or Matrix Questions

- Table displaying set of items sharing the same response options
- In mobile, grid may not fit width of screen
- Alternative approaches
  - Banked format
  - Item-by-item
  - Accordion

Banked Format

- Item text is moved above each row to free up horizontal space
- Response option labels are repeated for each item
  - Seem to produce similar answers as conventional format (Thomas & Barlas, 2016)
- Disadvantage: still, only a small number of response options fit on the screen

Source: Thomas & Barlas (2016)
**Item-by-Item**

- Each item presented separately, usually with response options in vertical orientation
- Research (e.g., Revilla et al., 2017; Revilla & Couper, 2018) finds no effect or positive effect on response quality, though can take longer
- Potential disadvantages:
  - Increased vertical scrolling
  - Does not provide context for related items

Source: McClain & Crawford 2013

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**Accordions**

- Stacked list of items. Each one expands in place and pushes other content down. After answering, item contracts again.
  - Thomas & Barlas (2016): no effect on answers
- Advantages:
  - Compact, so little scrolling is required
  - Does provide context for related items (enables Rs to see full group of items and individual items)
- Disadvantages: May be disorienting - *More research is needed!*

Source: umdsurvey.umd.edu
Question Grouping: Scrolling vs. Paging

- Display questions together on a single long screen (scrolling) or display them on separate pages (paging)?
- Evidence that scrolling design is faster to complete in mobile, presumably because there no time spent waiting for pages to load (Mavletova & Couper, 2014; de Bruijne & Wijnant, 2014)
- Disadvantages of scrolling: skips not automated; risk of increased item nonresponse

Source: de Bruijne & Wijnant (2014)
Scrolling: Length of Page

- Other things being equal, longer pages are faster to complete...

- ...but more item nonresponse; and in a survey with skips, more errors are made following instructions

Automated Navigation

- Next question is automatically displayed after answer is selected
- Automatic paging
  - de Bruijne (2015) finds substantially more missing data: "some respondents seemed not to understand that the survey had automatically moved on to the next item"
- Auto-scrolling is more effective?
  - see video
Putting It All Together: 
To Produce a Good Mobile Survey Requires Testing

Are buttons large enough to tap accurately?
Are the response entry tools simple to use?

Does the text promote easy
reading?

Read and comprehend
question

Respond to
question

Does design allow for efficient
movement through instrument?

Navigate through
instrument

Is survey optimized for mobile?

Big Challenges and Open Questions. How to...

• …find ways to reduce the gap in completion times between devices?
• …find ways to reduce breakoffs in mobile?
• … deliver best experience for mobile users while still achieving goal of standardization across different devices?
• …promote web accessibility for respondents with disabilities?
• …incorporate innovative features such as voice input, accordions, and automated navigation. Careful testing is needed.
Overall Conclusions

• Web design would be simpler if all respondents used the same type of device (*but they don’t*)
  – Or if they web surveys designed for desktops/laptops delivered a good experience for mobile users (*but they often don’t*)
• Mobile optimization can help, but doesn’t necessarily optimize user experience
• In mobile design, there seems to be a common trade-off between
  – Sufficient size of design elements
  – Sufficient information on screen (to reduce scrolling)
• Testing is extremely important, on different smartphones, with real users if possible

Thank You!

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