The Role Played by the Device Screen Size and by the Questionnaire Optimization within the Mobile Survey Participation

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OUTLINE

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3. Goals & hypotheses
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7. Conclusions
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1. **Background: the context**

- **Web survey framework**
  - “unintended mobile respondents”  
    (Peterson, 2012)

- **Mobile devices: not negligible**  
  (Revilla et al., 2015)
  - Netquest panel (186 surveys): 1/3 mobile resp.  
    (Revilla, 2016)
  - Devices characteristics  
    (Sweeney & Crestani, 2006)
    - Virtual keyboard
    - Speed of Internet connection
    - Device & **screen sizes**
      - Differences within the mobile devices

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2. **Literature: previous findings**

- **Mobile devices → affect data collection**
  - Key factor: **screen size**
  - Higher portability  
    (Brick et al., 2007)
    - Higher social desirability bias  
      (Mavletova & Couper, 2013)
    - Multitasking  
      (Toninelli & Revilla, 2016)
  - Quality and comparability potentially affected
    - Response rates reduced  
      (Baker-Prewitt, 2013)
    - Increased breakoff rates  
      (Buskirk & Andrus, 2014)
    - Longer response times  
      (Mavletova, 2013; Liebe et al., 2015)
    - Undesirable differences (responses)  
      (Peytchev & Hill, 2008)
2. **Literature: previous findings**

- **Importance of the “screen size”**
  - Reduced visibility (scrolling) (Peytchev & Hill, 2008)
    - Higher effort/burden (de Bruijne & Wijnant, 2013)
  - Different completion times (Couper & Peterson, 2015)
    - Neg. link screen size/interview length (Liebe et al., 2015)
    - Positive correl. screen size/acquiescence tendency (Liebe et al., 2015)
  - Frequent solution: **questionnaire optimization** (de Bruijne & Wijnant, 2013; Fischer & Bernet, 2014; Mitchel, 2014)

3. **Goals & hypotheses: contribution**

- Focus on mobile devices only
  - High diversity
- Exact screen size
  - Measured in inches (diagonal)
- **Optimization effect** (& interaction with size)
- More complete view
  - Different indicators (5) analyzed
3. Goals & hypotheses: hypotheses

Effect of the screen size on:
- Completion time ($CT$)
- Instructional Manipulation Check ($IMC$)
- Answer Consistency ($AC$)
- Survey Experience ($SE$) – “Easy” & “Like”

Moreover (sub-hypotheses):
- Questionnaire Optimization effect
- Interaction effect: size * optimization

4. Data: the experiment

Netquest panel (Spain)
- Two-wave survey
  - Wave 1 (w1): Feb. 23rd - Mar. 2nd 2015
  - Wave 2 (w2): Mar. 9th - Mar. 18th 2015
  - Completes: 1,800 (w1; 54.3% of contacted); 1,608 (w2; 89.3%)

Experimental design
- Survey condition randomly assigned (each wave):
  - $PC =$ participation using PC
  - $MNO =$ participation using mobile devices (quest. non-optimized)
  - $MO =$ participation using mobile devices (quest. optimized)

- Panelists analyzed here: 719 (mobile both waves)
4. Data: the questionnaire

- Sensitive topics (Mavletova & Couper, 2013)
  - >100 questions
    - Deviant behaviors, Immigration, Alcohol consumption, …
    - Survey experience
    - Background variables
    - …
  - Different layout/scale proposed
    - E.g.: “yes/no”, 11-point scale; grids/separate items

5. Methodology: analyses

- Step 1: ANOVA
  - Two way ANOVA (by group)
    - Direct effects (size & opt.) + interaction (size*opt.)
    - One way ANOVA & post-hoc (PH) test

- Step 2: Regression
  - $Y = \text{indicator, w1}$
    - Multiple regression (CT, AC$^1$)
    - Logistic regression (IMC)
    - Ordered logistic regression (SE)

<table>
<thead>
<tr>
<th>Quart. Classes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 (2.8-4.0]</td>
<td>34.6</td>
</tr>
<tr>
<td>Q2 (4.0-4.5]</td>
<td>19.9</td>
</tr>
<tr>
<td>Q3 (4.5-5.0]</td>
<td>32.6</td>
</tr>
<tr>
<td>Q4 (5.0-10.1]</td>
<td>12.9</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Average 4.62
Std. dev. 1.13

$^1$ For this indicator w1 and w2 data are compared
5. Methodology: analyses

■ Step 1: ANOVA
■ Step 2: Regression

N.B.: in regression models variables not significant (p >= .1) and their parameters are not listed.

➢ Independent variables’ list

- **Screen size (W1)**
- **Optimization (W1)**
- **Size*Optim. (W1)**
- Pixel density (W1)
- **How Long Acc. Int.**
- **Freq. Acc. Int.**
- **Fare-TimeUse**
- **Fare-Wifi**
- **Conn. speed satisf.**
- **Internet (use/skill)**
- **Survey experience**
- **Survey context**
- **Background**

6. Results: completion times

H1

■ Two way ANOVA (w1)

<table>
<thead>
<tr>
<th>Indicator: CT</th>
<th>Effect</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>Part. η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen size</td>
<td>10.17</td>
<td>3</td>
<td>.000</td>
<td>.043</td>
<td></td>
</tr>
<tr>
<td>Optimization</td>
<td>3.21</td>
<td>1</td>
<td>.074</td>
<td>.005</td>
<td></td>
</tr>
<tr>
<td>Size*Optimiz.</td>
<td>1.11</td>
<td>3</td>
<td>.344</td>
<td>.005</td>
<td></td>
</tr>
</tbody>
</table>

• H1 supported
• H1_opt / H1_int not supported
✓ Smaller screen → longer CTs
✓ PH: Q1 vs Q2, Q3, Q4 (-22.1%)

Average CT = 16.3 min.
6. Results: completion times

**Regression / CT (w1)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coeff.</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>1207.36</td>
<td>.000</td>
</tr>
<tr>
<td>Screen size (W1)</td>
<td>-34.87</td>
<td>.010</td>
</tr>
<tr>
<td>Optimization (W1)</td>
<td>-24.56</td>
<td>.450</td>
</tr>
<tr>
<td>Size*Optim.</td>
<td>19.61</td>
<td>.198</td>
</tr>
<tr>
<td>Freq. Acc. Int.</td>
<td>-6.06</td>
<td>.068</td>
</tr>
<tr>
<td>Age</td>
<td>5.82</td>
<td>.000</td>
</tr>
</tbody>
</table>

- **H1 supported** (smaller screens increases CTs)
  - Previous literature findings confirmed
- **H1\textsubscript{opt}** (optimization shortens CTs) **not supported**
  - Vertical scrolling more relevant
- **H1\textsubscript{int}** not supported

\[ R^2 / \text{adj. } R^2 = .103 / .068 \]
\[ n = 469 \]

---

6. Results: instr. manipul. check

**Pearson \(\chi^2\) (w1)**

<table>
<thead>
<tr>
<th>Indicator: IMC</th>
<th>(\chi^2)</th>
<th>df</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen size (quart.)</td>
<td>4.14</td>
<td>3</td>
<td>.247</td>
</tr>
<tr>
<td>Optimization</td>
<td>8.99</td>
<td>1</td>
<td>.003</td>
</tr>
</tbody>
</table>

- **H2 not** (generally) supported
  - But Q1 vs Q4: +62.9% IMC fails
- **H2\textsubscript{opt}** supported
  - Optimization reduces IMC fails
  - PH: Opt. \(\rightarrow\) -44.4% IMC fails

\[ \text{Average CT} = 13.8\% \]
6. **Results:** instr. manipul. check

**H2**

**Logistic regression / IMC (w1)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coeff.</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>-1.87</td>
<td>.265</td>
</tr>
<tr>
<td>Screen size (W1)</td>
<td>-.37</td>
<td>.071</td>
</tr>
<tr>
<td>Optimization (W1)</td>
<td>-.62</td>
<td>.045</td>
</tr>
<tr>
<td>Size*Optim.</td>
<td>.29</td>
<td>.185</td>
</tr>
<tr>
<td>Easy survey</td>
<td>-.62</td>
<td>.015</td>
</tr>
<tr>
<td>Age</td>
<td>.04</td>
<td>.009</td>
</tr>
<tr>
<td>Educ. level</td>
<td>.101</td>
<td></td>
</tr>
<tr>
<td>(4) – Professional</td>
<td>.72</td>
<td>.033</td>
</tr>
</tbody>
</table>

- **H2** (smaller screens increases IMC fail %) **not supported**
  - No higher fail in reading instructions
- **H2**\textsubscript{opt} supported
  - Optimization reduces IMC fail %
- **H2**\textsubscript{int} not supported

\[\text{Nagelkerke } R^2 = .165\]
\[n = 469\]

---

6. **Results:** answer consistency

**H3**

**Two way ANOVA (w2 vs w1)**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Effect</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>Part. ( \eta^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>Change of size(^1)</td>
<td>1.189</td>
<td>2</td>
<td>.305</td>
<td>.004</td>
</tr>
<tr>
<td></td>
<td>Survey condit.(^2)</td>
<td>.065</td>
<td>3</td>
<td>.978</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>C.o.s. * S.c.</td>
<td>.441</td>
<td>6</td>
<td>.852</td>
<td>.004</td>
</tr>
</tbody>
</table>

- **H3** not supported
- **H3**\textsubscript{opt} / **H3**\textsubscript{int} not supported
- No direct/interaction effect on AC
  - PH: confirmed

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6. Results: answer consistency

**Multiple regr. / AC (w2 vs w1)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coeff.</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>.871</td>
<td>.000</td>
</tr>
<tr>
<td>Screen size (w1)</td>
<td>-.001</td>
<td>.509</td>
</tr>
<tr>
<td>Screen size change (Δ)</td>
<td>-.004</td>
<td>.097</td>
</tr>
<tr>
<td>SurveyCond_MO-MO</td>
<td>.009</td>
<td>.115</td>
</tr>
<tr>
<td>SurveyCond_MO-MNO</td>
<td>-.002</td>
<td>.727</td>
</tr>
<tr>
<td>SurveyCond_MNO-MO</td>
<td>-.001</td>
<td>.789</td>
</tr>
<tr>
<td>Easy particip. (w1)</td>
<td>.010</td>
<td>.034</td>
</tr>
<tr>
<td>Easy particip. (Δ)</td>
<td>.008</td>
<td>.025</td>
</tr>
<tr>
<td>Felt easy (Δ)</td>
<td>.007</td>
<td>.045</td>
</tr>
<tr>
<td>Perceived sensit. (w1)</td>
<td>-.012</td>
<td>.001</td>
</tr>
<tr>
<td>Perceived sensit. (Δ)</td>
<td>-.010</td>
<td>.005</td>
</tr>
<tr>
<td>Educ. level (w1)</td>
<td>.005</td>
<td>.020</td>
</tr>
</tbody>
</table>

- **H3** (smaller screens → affect AC) **not supported**
  - Difficulty (small screens) does not affect consistency
- **H3_{opt}** (optimization → affect AC) **not supported**
  - Layout has no effects on consistency

<table>
<thead>
<tr>
<th>R² / adj. R²</th>
<th>0.086 / 0.049</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>589</td>
</tr>
</tbody>
</table>

---

6. Results: survey experience/1

**Two way ANOVA (w1)**

<table>
<thead>
<tr>
<th>Indicator: Easy</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>Part. η²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screen size (quart.)</td>
<td>4.260</td>
<td>3</td>
<td>.005</td>
<td>.018</td>
</tr>
<tr>
<td>Optimization</td>
<td>11.836</td>
<td>1</td>
<td>.001</td>
<td>.017</td>
</tr>
<tr>
<td>Size*Optimiz.</td>
<td>1.921</td>
<td>3</td>
<td>.125</td>
<td>.008</td>
</tr>
</tbody>
</table>

- **H4/Easy** supported¹
- **H4_{opt}/Easy** supported²
- **H4_{int}/Easy** not supported

- Smaller screens / not opt. quest. → Survey less easy
- PH: Q1 vs Q3, Q4 (-7%) / Opt. (+6.3%)  

¹ = Result confirmed by the Kruskal-Wallis test (p = .001)
² = Result confirmed by the Kruskal-Wallis test (p = .000)

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6. Results: survey experience 1

**Ordinal logistic regr. / Easy**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coeff.</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen size (W1)</td>
<td>-.008</td>
<td>.927</td>
</tr>
<tr>
<td>Quest. not optim. (W1)</td>
<td>-.805</td>
<td>.000</td>
</tr>
<tr>
<td>Size*Optim.</td>
<td>.054</td>
<td>.564</td>
</tr>
<tr>
<td>Pixel density (W1)</td>
<td>.003</td>
<td>.111</td>
</tr>
<tr>
<td>Freq. Acc. Int.</td>
<td>.047</td>
<td>.024</td>
</tr>
<tr>
<td>Fare-Wifi</td>
<td>.847</td>
<td>.052</td>
</tr>
<tr>
<td>Conn. speed satisf.</td>
<td>.527</td>
<td>.000</td>
</tr>
<tr>
<td>Like survey</td>
<td>1.290</td>
<td>.000</td>
</tr>
<tr>
<td>Felt easy</td>
<td>.243</td>
<td>.071</td>
</tr>
<tr>
<td>Lonely part.</td>
<td>.470</td>
<td>.042</td>
</tr>
</tbody>
</table>

- **H4** (smaller screens → less easy) **not supp.**
  - Higher scrolling not influencing perceived survey easiness
- **H4** \_opt supported (no optimization → more difficult)
  - Higher burden if not optimized
- **H4** \_int not supported

Nagelkerke $R^2$ .333

$n$ 469

---

6. Results: survey experience 2

**Two way ANOVA (w1)**

<table>
<thead>
<tr>
<th>Indicator: Like</th>
<th>$F$</th>
<th>df</th>
<th>$p$</th>
<th>Part. $\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screen size (quart.)</td>
<td>2.103</td>
<td>3</td>
<td>.099</td>
<td>.009</td>
</tr>
<tr>
<td>Optimization</td>
<td>3.677</td>
<td>1</td>
<td>.056</td>
<td>.005</td>
</tr>
<tr>
<td>Size*Optimiz.</td>
<td>.277</td>
<td>3</td>
<td>.842</td>
<td>.001</td>
</tr>
</tbody>
</table>

- **H4**/Like supported (sign.1%) 1
- **H4**\_opt/Like supported (sign.1%) 2
- **H4**\_int/Like not supported

✓ Bigger screens (but…)/ Opt. quest. → Survey more liked
✓ PH: **H4** not supported / Opt. increases “Like” (+3.3%)

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6. **Results:** survey experience/2

**H4**

- **Ordinal logistic regr. / Like**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coeff.</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen size (W1)</td>
<td>.117</td>
<td>.155</td>
</tr>
<tr>
<td>Quest. not optim. (W1)</td>
<td>.006</td>
<td>.977</td>
</tr>
<tr>
<td>Size*Optim.</td>
<td>-.165</td>
<td>.077</td>
</tr>
<tr>
<td>Easy survey</td>
<td>1.292</td>
<td>.000</td>
</tr>
<tr>
<td>Felt easy</td>
<td>.667</td>
<td>.000</td>
</tr>
<tr>
<td>Perceived sensit.</td>
<td>.267</td>
<td>.087</td>
</tr>
<tr>
<td>Lonely part.</td>
<td>-.392</td>
<td>.081</td>
</tr>
</tbody>
</table>

Nagelkerke $R^2$ .299

\[ n = 469 \]

- **H4** (smaller screens $\rightarrow$ lower “like”) **not supp.**
- **H4_{opt}** (optimization $\rightarrow$ higher “like”) **not supported**
  - Device size & optimization do not influence (directly) how much survey is liked
  - **H4_{int}** not supported

---

7. **Conclusions:** main findings

- **Does the factor affects the indicator?**

<table>
<thead>
<tr>
<th></th>
<th><strong>CT</strong></th>
<th><strong>IMC</strong></th>
<th><strong>AC</strong></th>
<th><strong>SE (Easy)</strong></th>
<th><strong>SE (Like)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H</strong> (screen size)</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>NO</strong></td>
<td><strong>Partially (ANOVA)</strong></td>
<td><strong>Partially (ANOVA)</strong></td>
</tr>
<tr>
<td><strong>H_{opt}</strong> (optimizat.)</td>
<td><strong>NO</strong></td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>YES</strong></td>
<td><strong>Partially (ANOVA)</strong></td>
</tr>
<tr>
<td><strong>H_{int}</strong> (size*optim.)</td>
<td><strong>NO</strong></td>
<td><strong>NO</strong></td>
<td><strong>NO</strong></td>
<td><strong>NO</strong></td>
<td><strong>NO</strong></td>
</tr>
</tbody>
</table>

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7. Conclusions: discussion

… thus?

- Small sized devices do not affect data quality…
  - Even if the burden (CTs) and the SE can be affected
- … moreover potential issues (IMC, SE) can be attenuated using optimized questionnaires
  - Positive for the willingness in participating again
  - Differently applied by different survey developers
- … current issues are becoming less important
  - Bigger devices; higher resolutions; advanced technol.
- Focus on mobile: wider data collection options

8. Limits and further research

- Limits…
  - Non-probability based panel
  - Focus on Spain
  - Topics not sufficiently studied in depth
  - Quick evolution of phenomenon/technology

- … & further research
  - General population studies
  - Replication studies
  - E.g. trends of experience in using mobile devices
  - Keep on monitoring it (enhanced indicators, detailed and systematic paradata collection)
9. References

- Buskirk T.D., Andrus C. (2014). “Making mobile browser surveys smarter: results from a randomized experiment comparing online surveys completed via computer or smartphone”. Field Methods, published online before print 14 April 2014.
9. References


For further information:
- Daniele Toninelli - daniele.toninelli@unibg.it
- Melanie Revilla - melanie.revilla@upf.edu
6. **Results:** completion times

- **One way ANOVA** (w1)
  - **H1 supported**
    - Post-hoc test (Tuckey): Q1 vs …
      - Q2 (p=.0030; -13.9%)
      - Q3 (p=.0001; -15.7%)
      - Q4 (p=.0001; -22.1%)
  - Smaller screen (Q1) → longer CTs

---

**Indicator:** CT / Test: Welch

<table>
<thead>
<tr>
<th>p</th>
<th>.00001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-hoc</td>
<td>Q1 vs Q2,Q3,Q4</td>
</tr>
</tbody>
</table>

- Back
6. Results: instr. manipul. check $H_2$

- **Pearson $\chi^2$ (w1)**
  - Post-hoc test (Beasley & Schumacker, 1995)
    - $H_2$ not supported
      - No signif. differences
      - $ps \geq .1559$
    - $H_{2_{opt}}$ supported
      - Optimized ($p=.0125; -44.0\%$)

- Optimization $\rightarrow$ reduces IMC

6. Results: survey experience/1 $H_4$

- **Two way ANOVA (w1)**
  - Post-hoc test (Tuckey)
  - $H_4$/Easy supported:
    - Q1 vs...
      - Q3 ($p=.0110; -5.6\%$)
      - Q4 ($p=.0174; -7.0\%$)
  - $H_{4_{opt}}$/Easy supported:
    - Optimized vs not-opt. ($t = -4.13; p=.0000; +6.3\%$)

- Smaller screen (Q1) and not-optimized questionnaire $\rightarrow$ less easy the survey

Average “Easy partic.” $= 3.31$ (3.22 MNO vs 3.41 MO)
6. Results: survey experience/2

- Two way ANOVA (w1)
  - Post-hoc test (Tuckey)
  - H4/Like not supported:
    - No significance differences by quartile classes ($p \geq .1653$)
  - H4$_{opt}$/Like supported:
    - Optimized vs not-opt. ($t = -2.07; p = .0385; +3.3\%$)
  - Optimized questionnaire → survey more liked

Average “Like survey” = 3.11

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