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Recruiting Young and Urban Groups into a Probability-Based Online Panel by Promoting Smartphone Use

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Abstract

A sizable minority of all web surveys are nowadays completed on smartphones. People who choose a smartphone for Internet-related tasks are different from people who mainly use a PC or tablet. Smartphone use is particularly high among the young and urban. We have to make web surveys attractive for smartphone completion in order not to lose these groups of smartphone users. In this paper we study how to encourage people to complete surveys on smartphones in order to attract hard-to-reach subgroups of the population. We experimentally test new features of a survey-friendly design: we test two versions of an invitation letter to a survey, a new questionnaire lay-out, and autoforwarding. The goal of the experiment is to evaluate whether the new survey design attracts more smartphone users, leads to a better survey experience on smartphones and results in more respondents signing up to become a member of a probability-based online panel. Our results show that the invitation letter that emphasizes the possibility for smartphone completion does not yield a higher response rate than the control condition, nor do we find differences in the socio-demographic background of respondents. We do find that slightly more respondents choose a smartphone for survey completion. The changes in the layout of the questionnaire do lead to a change in survey experience on the smartphone. Smartphone respondents need 20% less time to complete the survey when the questionnaire includes autoforwarding. However, we do not find that respondents evaluate the survey better, nor are they more likely to become a member of the panel when asked at the end of the survey. We conclude with a discussion of autoforwarding in web surveys and methods to attract smartphone users to web surveys.

Keywords: mobile surveys, autoforward, survey design, probability-based online panel

Smartphone users are different from people who mainly use a PC or laptop to access the Internet (Busse & Fuchs 2012; Couper et al. 2017; Maslovskaya et al. 2017). Over time there has been a persistent difference in correlates of coverage of smartphone users in both Europe and the United States. People who use the smartphone for Internet browsing are younger and live in more urban areas than people who use PCs, laptops or tablets (Busse & Fuchs 2012, 2014). There is a small but growing group of people who are "mobile-only" (Lugtig et al. 2016; Maslovskaya et al. 2017), which to some degree overlap with hard-to-reach respondents in general (Mac Ginty & Firchow 2017). Young and urban respondents are generally hard-to-reach in surveys; smartphone penetration and usage is also highest in this group (Haan et al. 2014).

In 2017, 60% of Dutch adults report to own a PC, 82% a laptop, 72% a tablet and 89% a mobile or smartphone. Only 39% of respondents report to have used a laptop in the last 3 months to access the Internet, 36% a tablet, and 79% a smartphone (Statistics Netherlands 2017). Despite the fact that smartphones are used often by many people, many respondents still prefer PCs or laptops to participate in surveys. Between 10-30% of all web surveys are started on smartphones (Bosnjak et al. 2018; Brosnan et al. 2017; Masvlovskaya et al. 2017). This "gap" between the frequent use of smartphones in general, and infrequent use of them in web surveys can probably be explained by respondents' expectations and experiences of completing web surveys on smartphones.

Two differences stand out when the web survey experience on PCs and smartphones are compared. First, the screen on smartphones is much smaller, leading to challenges in presenting complex survey questions. Without adaptations, web survey question texts may not fit a smartphone screen, forcing respondents to scroll vertically or horizontally. Several studies have shown that splitting up grids and displaying one or a few items per page when participating on a mobile phone is a good solution to this problem (Keusch & Yan 2016; Mavletova & Couper 2016; Antoun et al. 2017). Still, even in this format, and controlling for respondent and question characteristics, Couper & Peterson (2017) find that mobile surveys take longer to complete. Mavletova & Couper (2015) moreover find that break-off rates are generally higher when respondents complete a web-survey on a smartphone, and that breakoff rates are considerably higher when web surveys are not optimized for smartphones. Despite web surveys becoming smartphone-completable, they are often still not smartphone-friendly or smartphone-optimized (Revilla et al. 2017). Designing surveys to be smartphone-friendly is necessary to convince potential

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respondents that surveys can be completed on smartphones, and to make sure that they do not drop out.

The second difference has to do with how respondents navigate from question to question, and page to page. PC respondents use a mouse and keyboard whereas smartphone respondents use their fingers. Answer selection is often done with radio buttons, while page-to-page navigation is typically done with 'next' and 'back' buttons. Some smartphone respondents may have trouble selecting those answers, or even finding them, especially when the 'next' and 'back' buttons are at the bottom corners of the page.

With autoforwarding respondents no longer have to press the 'next' button to move to the next page. Instead they auto-advance, auto-submit or auto-forward to the next question after an answer is given. An early study on autoforwarding (Hays et al. 2010) focusing on PC users showed that autoforwarding may shorten the completion time, but may come at the expense of losing a smooth navigation experience. Respondents using the PC may be familiar with clicking multiple times to advance from page-to-page. More recent studies investigated autoforwarding specifically in the context of the rise of smartphones in web surveys (Arn et al. 2015). They have found that autoforwarding may work well with easy questions (Selkälä & Couper 2017), and can shorten response times (de Bruijne 2016), although there is a risk that respondents may find autoforwarding confusing, or need longer to think about an answer, especially when the questionnaire consists of cognitively difficult questions.

This study reports on an experimental survey that had the twin goal of convincing potential respondents to start a survey on their smartphone, and to deliver a better survey experience by a better layout and eliminating any need to scroll on the smartphone. We tested two versions of an invitation letter, in which one version emphasized that the survey was smartphone-friendly, while the other did not. These two conditions were crossed with 3 different versions of the questionnaire: 1) the old, not-smartphone optimized layout, 2) a new, smartphone-friendly layout of the questionnaire, and 3) a smartphone friendly layout combined with autoforwarding. We expect that the new invitation letter leads to a higher proportion of people who start the survey on a mobile phone, and also that those respondents are younger and come from more urban areas. We expect that the new questionnaire layout leads to shorter completion times, a better survey experience, and ultimately, more respondents who sign up to become a panel member.

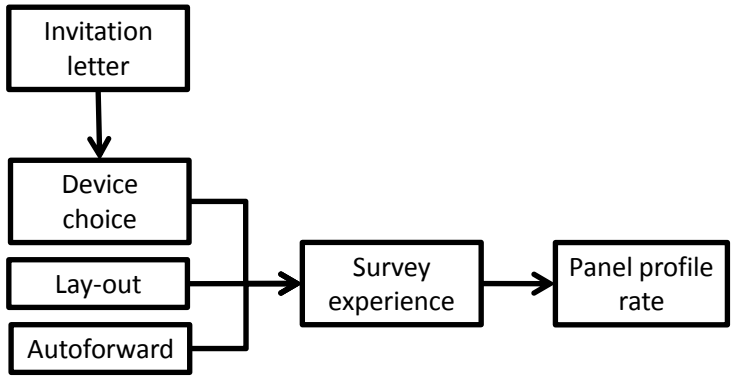


Figure 1 Theoretical model. The type of advance letter (mobile phone emphasis or not) determines device choice. Device, along with the experimental layout and navigation conditions determines the survey experience, which in turn affects how likely respondents become a panel member

Methods

Sample and Recruitment

The goal of the survey was to recruit respondents for the I&O Research Panel. This is a probability-based online panel of people in the Netherlands. Panelists are recruited through an opt-in question asked at the end of a recruitment survey that is fielded twice a year.[1] In this paper, we use data from the second round of 2017, which was fielded on August 30, 2017. A random sample of addresses selected from the postal address file of the Netherlands was invited by mail to participate in an online survey about trends in Dutch society. Because panelists from particular regions and urban areas in the Netherlands were underrepresented in the I&O Research Panel, the sample was a two-stage stratified cluster sample, with clusters consisting of 20 cities with a population larger than 100,000 inhabitants and 5 provinces (Friesland, Groningen, Flevoland, Noord-Brabant and Limburg). In each of the 20 cities[2], 1500 addresses were selected using simple random sampling, while in each of the provinces (excluding cities already selected within those provinces), 6000 addresses were selected. The survey stayed online until October 1st. Respondents could always leave the survey, and start where they left off at a later

1 In order to become a member of the I&O Research Panel, people have to complete a double opt-in procedure.

2 The cities included are Amsterdam, Rotterdam, Tilburg, Breda, Eindhoven, Nijmegen, 's Hertogenbosch, Arnhem, Dordrecht, Ede, Apeldoorn, Zwolle, Oss, Maastricht, Roosendaal, Bergen op Zoom, Hilversum, Sittard-Geleen, Doetinchem and Heerlen.

moment. A raffle was held among all participants, in which five 100-euro and twentyfive 20-euro gift vouchers for a popular online-shopping website were given. No reminders were used. In our study, we used unweighted data[3].

Experiment with the Invitation Letter

The invitation letter to the survey asked whomever opened the letter to give the letter to the youngest person living in the household over the age of 16. The reason for this is again the fact that young people were underrepresented in the I&O panel. The invitation letter mentioned that the survey was about safety, social media, health and leisure, and provided a URL with individualized login to the survey. Within the invitation letter we embedded an experiment: in the old version of the letter (conditions 1, 2 and 4) we showed an icon of a regular PC next to the URL. In another version (conditions 3 and 5), we replaced the icon of the PC with a mobile phone, and included an additional sentence below the URL that stated that the survey was easy to complete on PCs, tablets or mobile phones. The goal of this experiment was to test whether 1) respondents would be more likely to use a mobile phone for completion and 2) whether we could attract young and urban respondents at a higher rate. The two versions of the invitation letter are shown in Appendix A.

Experiment Within the Questionnaire

Within the questionnaire, we experimented with the layout and navigation, split into three conditions, shown visually in Appendix B. In all three conditions, questions were presented page-by-page, and all versions used radio buttons. The versions differed however in the following ways:

1. A condition in which the old layout was used, not optimized for smartphones (condition 1).
2. A condition in which the new layout optimized for smartphones was used. In this layout answer options were presented vertically, and the width of the questionnaire was automatically adapted to the size of the screen (conditions 2 and 3).
3. A condition that was identical to the new layout used in conditions 2 and 3, with autoforwarding added to this (conditions 4 and 5). When a respondent selected an answer, the next question was automatically shown on a new page. A ‘forward’ and ‘back’ button were still present so that respondents could skip a question or correct an earlier answer. Autoforwarding was used throughout the entire questionnaire.

3 We repeated our analyses using sampling weights which correct for unequal selection probabilities of households across strata and clusters in our sample, but found no meaningful differences in the results.

Table 1 Experimental design of study

	Invitation letter	Smartphone friendly layout	Autoforwarding	Gross sample size
Condition 1	Old	No	No	12000
Condition 2	Old	Yes	No	12000
Condition 3	New	Yes	No	12000
Condition 4	Old	Yes	Yes	12000
Condition 5	New	Yes	Yes	12000

Notes: The new letter included an icon of a smartphone, as well as the note that the survey could be completed on all devices. The old letter showed an icon of a PC.

Table 1 summarizes the design of our study. In total, we used 5 conditions, in which elements from the invitation and questionnaire experiments were combined. At the end of the recruitment survey, respondents received the question whether they would like to become a member of the I&O Research Panel. The new smartphone-friendly layout was responsive to smartphones. The old-layout was not responsive.

Analysis

We study whether the invitation experiment leads to a different response rate across devices and a different composition of the respondents. Then we study whether the layout and autoforwarding experiments lead to shorter survey completion times, a better evaluation of the survey and a higher proportion of respondents becoming a panel member (Profile Rate or PROR (Callegaro & DiSogra 2008)).

In order to determine what device respondents used to complete the survey, we coded every device that was used at the start of the survey. Devices with a screensize of 6.0 inches or smaller were defined as 'smartphone'. Devices with a screensize larger than this were defined as PC/tablet. Because we compare multiple groups on different variables, we choose to conduct significant tests with $\alpha = .005$ (Benjamin et al. 2018).

Results

Response to the Survey Across Invitation Letter Conditions

Table 2 shows the effect of the invitation letter on response rates and response composition in the recruitment survey. We find that the response rate for the recruitment

Table 2 Composition of response in recruitment survey

	Old letter	New letter	Statistical difference test
Response rate	6.01%	6.22%	$\chi^2(1)=1.09$, $p=.29$
Smartphone completion within responses	19.0%	23.1%	$\chi^2(1)=9.36$ $p<.005$
Within smartphone respondents			
Young (<25 year)	26.6%	25.2%	$\chi^2(1)=.18$, $p=.67$
From a big city (> 100.000 inhabitants)	52.4%	50.7%	$\chi^2(1)=.22$, $p=.64$
Within PC respondents			
Young (<25 year)	13.1%	14.1%	$\chi^2(1)=.60$, $p=.44$
From a big city (> 100.000 inhabitants)	48.4%	47.8%	$\chi^2(1)=.12$, $p=.73$

interview using the old letter (conditions 1, 2 and 4) is 6.01%, and for the new letter (conditions 3 and 5) is 6.22%. This difference is not significant.

Although the invitation letter does not lead to a higher response rate, we do see a difference in the proportion of respondents using a smartphone. When respondents receive the old letter 19.0% decide to use a smartphone, whereas this is 23.1% when they receive the new letter (see Table 2). In terms of the composition of the response, we find that the new letter does not lead to younger people, or people living in urban areas being more likely to respond.

Effects of Device, Layout and Autoforwarding on Survey Experience

Respondents can choose themselves what device they use for survey completion. As a consequence, there will be self-selection effects between PC and smartphone respondents when we study the survey experience. To account for the selection effects, we split the following analyses by respondents who completed the survey on a PC and a smartphone.

First, we look at survey completion times. The new layout and autoforwarding should lead to a relatively shorter completion time on smartphones. For PC respondents, Table 3 shows that median completion times in the old design (condition 1=10.1), the new design (condition 2 and 3 = 10.5) and the new design + autoforward do not differ (conditions 4 and 5 = 10.5). When respondents complete the survey on smartphones, the completion time is shorter in the new design, and when autoforwarding is used (medians in conditions 1, 2-3 and 4-5 = 10.5, 9.9 and 9.5, Kruskal-Wallis Test p-value <.005). We conclude that response times were about

Table 3 Net response rate, completion time, survey evaluation and profile rates split for device used, across 5 experimental conditions.

	Device used	Net response recruitment survey	Survey completion time in minutes (median)	Mean survey evaluation (standard deviation)	Panel members	Panel profile rate
Condition 1	PC	612	10.1	7.6 (1.2)	419	68.5
	Smartphone	135	10.5	7.4 (1.4)	85	63.0
Condition 2	PC	568	10.4	7.5 (1.3)	382	67.3
	Smartphone	137	10.0	7.5 (1.3)	96	70.1
Condition 3	PC	585	10.6	7.4 (1.4)	405	69.2
	Smartphone	152	9.9	7.5 (1.3)	104	68.4
Condition 4	PC	571	10.2	7.5 (1.2)	390	68.3
	Smartphone	138	9.0	7.7 (1.4)	90	65.2
Condition 5	PC	562	10.1	7.5 (1.3)	386	68.7
	Smartphone	193	10.0	7.7 (1.3)	136	70.5

Notes: See Table 1 for explanation of the experimental conditions. The panel profile rate is calculated conditional on respondents starting the recruitment survey. The total response rate of the survey is 6.23% in condition 1, 5.89% in condition 2, 6.14% in condition 3, 5.91% in condition 4, and 6.29% in condition 5. The unconditional panel recruitment rate is 4.20% in condition 1, 3.98% in condition 2, 4.24% in condition 3, 4.00% in condition 4, and 4.35% in condition 5.

the same in all conditions when respondents used a PC, but about 20% shorter when the new layout and autoforwarding were used for smartphone respondents.

At the end of the recruitment survey, respondents were asked to rate the survey experience on a scale from 1 (very bad) to 10 (very good). Only the endpoints were labelled. Smartphone respondents on average evaluate the questionnaire with a 7.4, 7.5 and 7.7 in conditions 1, 2-3 and 4-5. This difference among smartphone respondents is not significant ($F(2,728)=2.97$, $p=.05$). This implies that despite the shorter time it took to complete the survey, smartphone respondents were not happier with the new layout and autoforwarding.

Effects on Panel Membership

Finally, we study whether the combined effect of the new letter and the questionnaire experiments have any effect on the panel membership rate. When we look at the PC respondents only, we find no differences between conditions. The panel profile rate, conditional on starting the survey, ranges from a low of 67.3% in condi-

tion 3 to a high of 68.7% in condition 5 for PC respondents. For smartphone respondents, we find no effect for panel membership either. The profile rate in conditions with the old layout is 63.0%, 69.2% in the new layout and 67.8% in the new layout combined with autoforward. A test across the three layout conditions showed that this difference is not significant ($\chi^2(2)=1{,}73$, $p=.42$). There is a strong relationship between the survey evaluation and panel membership however. People who did not become a panel member give the survey a 6.9 on average, whereas panel members give the survey a 7.8 on average. In terms of the theoretical model shown in Figure 1, we have to conclude that the survey experience does affect the panel membership rate. Our experimental manipulations does however not result in respondents being happier with the survey, despite the reduction in the time to complete the survey.

Response Quality

We finally take a look at response quality, as a further exploratory analysis of the effects of our experimental conditions and to understand whether the reduction in interview time on smartphones comes at the price of lower data quality. Earlier studies have indicated that respondents may sometimes inadvertently skip questions in the autoforward condition, or otherwise have trouble navigating the questionnaire. Do we find evidence for this in our data? We do not have validation data in order to check whether the data respondents provided is accurate, nor detailed audit trail data, nor did the questionnaire include response scales which allow for psychometric modeling of data quality. We therefore rely on indirect indicators of data quality, which have been used before by for example Kaminska & Lynn (2012) and Lugtig & Toepoel (2016) to model data quality of smartphone survey responses. Specifically, we look at five sets of indicators:

1. whether respondents finished the questionnaire, how many questions were not answered, and how many times respondents answered “Don’t know”.
2. two indicators for response behavior in scales: For straightlining, whether at any point in the questionnaire the respondent gives the same answer to all items on the following scales: a three-item scale asking about the difficulty of completing forms, a 12-item scale asking about the frequency of leisure activities, a 7-item scale asking about the importance of aspects of life (family, friends, leisure time, politics, work, religion, school), a 4-item scale asking about interest in food, and a 4-item scale asking about fear for terrorism. If the respondent straightlined on any of these scales, we assigned a score of 1, and if not, we assigned a 0.
3. we also code how many answers respondents choose in 2 check-all-that-apply questions asking for the use of 14 types of social media, and consumption of

11 types of new sources. More answers are considered to be indicative of better data.

4. we code the primacy effect by counting how often respondents clicked the first answer on three scales. The two scales mentioned above, and a third scale, where respondents were asked to indicate what should be the priorities for the Netherlands from a list of 24 policy-issues. The occurrence of a primacy effect is a sign of lower data quality
5. finally we check whether respondents left a comment to the final question "do you have any remarks" and if so, we count how many characters were included in these answers. Longer answers are considered better.

Table 4 shows the differences between the three different questionnaire layout conditions, split for the device that respondents used. Across the 8 indicators that we distinguish to study data quality, we only find differences for 3 of them. For the number of "don't know" responses, we find more don't know responses on smartphones and fewer don't know responses when autoforward is used. For both straightlining and the number of answers chosen in the check-all-that apply question, we find that smartphone users provide better quality: they straightline less, and provide more answers in the check-all-that apply question. As respondents could self-select their device, it is likely that the differences we find here are self-selection effects.

Most striking is that we find no other effects for any of the experimental conditions, nor any interactions between our experiment and device used. This implies that we find that the answers that respondents give to our questionnaire do not depend on the questionnaire layout. No matter what layout condition respondents get, the answers they provide are of about the same quality. Faster responses in the smartphone friendly and autoforwarding conditions do not come as a price of lower data quality.

Table 4 Response quality indicators across the three layout questionnaires, split for the device used by the respondent

	Old layout (not friendly)		Smartphone friendly layout		Friendly layout + autoforwarding	
Device	PC	Smartphone	PC	Smartphone	PC	Smartphone
Dropout %	4.4	3.7	3.3	3.9	2.7	2.5
Mean Item missing	.27	.34	.26	.33	.26	.27
Mean "Don't know" answers	.66	1.33	.68	.86	.67	.69
Any Straightlining	.34	.23	.34	.27	.34	.29
# answers chosen in 2 check-all-that-apply questions	7.22	7.45	7.23	7.81	7.21	8.13
# Primacy effect (max=3)	1.81	1.86	1.82	1.77	1.80	1.92
% Left a comment	17	21	18	18	16	17
Mean character length of comment if comment given	100	61	112	77	98	58

Notes: Univariate ANOVA Tests per behavior with layout, autoforward, device used and interactions between these variables as factors. Findings: Dropout: no effects, Item missings: no effects, DK: main effect of device, autoforward, Straightlining: effect of device, Check-all-that-apply: Effect of device, Primacy effect: no effects, Left a comment: no effects, Length of comment: no effects.

Discussion

In this study, we tested two ways to recruit smartphone-users into a probability-based online panel. We find that a new invitation letter, emphasizing the possibility to participate on smartphones, does not lead to any more or different respondents participating in an online-recruitment survey when compared to an old letter emphasizing PCs. Respondents are however somewhat more likely to use a smartphone to complete the recruitment interview. One possible cause of our null-finding is the relatively small change in the introduction letter: we used a sentence and changed an icon, but did not use specific fonts, or changed the content of the letters.

A second experiment had the aim to ensure that respondents who started the recruitment interview were more likely to become a panel member. A new responsive questionnaire layout and method of navigation had the aim to make the survey experience shorter and more enjoyable. Here we find that that the new layout and autoforwarding lead to a reduction of about 20% in the survey completion time for smartphone respondents, but that smartphone respondents do not evaluate the new questionnaire more positively. Consequently, we find no differences in the panel profile rate across conditions.

The reduction in response times does not appear to have led to lower data quality. We believe that this is a promising finding. This contrasts the findings of for example de Bruijne (2016) who found that respondents skip questions when autoforwarding is used. Perhaps this has to do with the fact that we use a fresh cross-sectional sample instead of experienced panel members. The fact that we use a cross-sectional survey also leads to a limitation: the response rates in our study were very low. Using reminders or incentives could help to increase these and perhaps alter our findings with regards to the invitation letter.

We do not believe that a higher response rate would lead to differences in our results for the questionnaire design experiments. The panel profile rate conditional on response will probably decrease when more difficult to reach respondents participate in the recruitment interview, but it is hard to imagine that harder-to-reach respondents respond differently to the questionnaire layout designs we tested.

Selkälä & Couper (2017) argue that autoforwarding mainly works for questions that require little cognitive effort. Our survey consisted of relatively simple questions asking about a variety of topics. It thus remains to be seen whether the reduction in completion times that we observe also holds in other studies. One way to understand the response behavior for different types of questions is by studying audit trails, which can be collected with web surveys, and look at response behavior in more detail. We did however not observe accidental skipping of questions in the autoforward conditions, as was reported by de Bruijne (2016).

Despite the fact that respondents who use a smartphone in our study need less time, they do not evaluate the survey to be better. Perhaps our experimental manipulation was not strong enough; we still used radio buttons for example in all conditions. Making questionnaire more smartphone friendly is still a big challenge for survey research. Smartphone users are generally younger and live in more urban areas; two of the characteristics of respondent groups who are hard-to-recruit in many countries. How should we design our surveys so that these people are more likely to participate? There are perhaps ways in which we can make the recruitment process more attractive to smartphone users. Adding a QR code, NFC-tag or other measures to facilitate the transition from a paper invitation letter to a questionnaire in a smartphone browser may help somewhat, but a large challenge remains for future survey research. In an era of declining response rates and diversifying device use, how can we design surveys so that there are as few barriers to survey completion as possible?

References

Antoun, C., Katz, J., Argueta, J., & Wang, L. (2017). Design Heuristics for Effective Smartphone Questionnaires. *Social Science Computer Review*, doi:10.1177/0894439317727072.

Arn, B., Klug, S., & Kolodziejski, J. (2015). Evaluation of an adapted design in a multi-device online panel: A DemoSCOPE case study. *methods, data, analyses*, *9*(2), 28.

Benjamin, D. J., Berger, J. O., Johannesson, M., Nosek, B. A., Wagenmakers, E.- J., Berk, R., ... & Cesarini, D. (2018). Redefine statistical significance. *Nature Human Behaviour*, *2*(1), 6.

Bosnjak, M., Bauer, R., & Weyandt, K. W. (2018). Mixed Devices in Online Surveys: Prevalence, Determinants, and Consequences. In Theorbald, A. (ed). *Mobile Research* (pp. 53-65). Springer Gabler, Wiesbaden.

Brosnan, K. Grün, B., & Dolnicar, S. (2017). PC, Phone or Tablet?: Use, Preference and Completion Rates for Web Surveys. *International Journal of Market Research*, *59*(1), 35-55.

Busse, B., & Fuchs, M. (2014). Recruiting Respondents for a Mobile Phone Panel. *Methodology, 10.* 21-30. Doi: 10.1027/1614-2241/a000064

Busse, B., & Fuchs, M. (2012). The components of landline telephone survey coverage bias. The relative importance of no-phone and mobile-only populations. *Quality & quantity*, *46*(4), 1209-1225.

Callegaro, M. (2010). Do you know which device your respondent has used to take your online survey? *Survey Practice*, *3*(6).

Callegaro, M., & DiSogra, C. (2008). Computing Response Metrics for Online Panels, *Public Opinion Quarterly*, *72*(5), 1008-1032, doi: 10.1093poq/nfn065

Couper, Mick P., Antoun, Christopher, & Mavletova, A. (2017). Mobile Web Surveys. In P.P. Biemer, E.D. de Leeuw, S. Eckman, B. Edwards, F. Kreuter, L.E. Lyberg, N.C. Tucker, B.T. West (Eds). *Total Survey Error in Practice*. New York: Wiley. 133-154.

Couper, M. P., & Peterson, G. J. (2017). Why do web surveys take longer on smartphones?. *Social Science Computer Review*, *35*(3), 357-377.

De Bruijne, M. (2016). Online vragenlijsten en mobiele devices (Online questionnaires and mobile devices). *Jaarboek van de Marktonderzoeksassociatie*, 137-15. Available on http://moa04.artoo.nl/clou-moaweb-images/images/bestanden/pdf/Jaarboeken_MOA/Marktonderzoek_2016_H9.pdf

Haan, M., Ongena, Y. P., & Aarts, K. (2014). Reaching hard-to-survey populations: Mode choice and mode preference. *Journal of Official Statistics*, 30(2). 355–379

Hays, R. D., Bode, R., Rothrock, N., Riley, W., Cella, D., & Gershon, R. (2010). The impact of next and back buttons on time to complete and measurement reliability in computer-based surveys. *Quality of Life Research*, *19*(8), 1181-1184.

Keusch, F., & Yan, Ting (2016). Web versus mobile web: an experimental study of device effects and self-selection effects. *Social Science Computer Review*, doi:10.1177/0894439316675566.

Lugtig, P., Toepoel, V., & Amin, A. (2016). Mobile-only web survey respondents. *Survey Practice*, *9*(4).

Lynn, P., & Kaminska, O. (2012). The impact of mobile phones on survey measurement error. *Public Opinion Quarterly*, *77*(2), 586-605.

Mac Ginty, R., & Firchow, P. (2017). Including Hard-to-Access Population Using Mobile Phone Surveys and Participatory Indicators. *Sociological Methods & Research*. DOI: 10.1177/0049124117729702

Maslovskaya, O., Durrant, G. Smith, P. W.F., Hanson, T., & Villar, A. (2017). Mixed-device online surveys in the UK. NCRM working paper 4/17.

Mavletova, A and Couper, M P. (2015). A Meta-Analysis of Breakoff Rates in Mobile Web Surveys. In D. Toninelli, R, Pinter, & P. de Pedraza (eds.), *Mobile Research Methods: Opportunities and Challenges of Mobile Research Methodologies* (pp. 81–98). London: Ubiquity Press. DOI: http://dx.doi.org/10.5334/bar.f.

Mavletova, A., & Couper, M. P. (2016). Grouping of items in mobile web questionnaires. *Field Methods*, *28*(2), 170-193.

Mavletova, A., Couper, M. P., & Lebedev, D. (2017). Grid and Item-by-Item Formats in PC and Mobile Web Surveys. *Social Science Computer Review*, doi: 10.1177/0894439317735307.

Revilla, M., Ochoa, C., & Turbina, A. (2017). Making use of Internet interactivity to propose a dynamic presentation of web questionnaires. *Quality & Quantity*, *51*(3), 1321-1336.

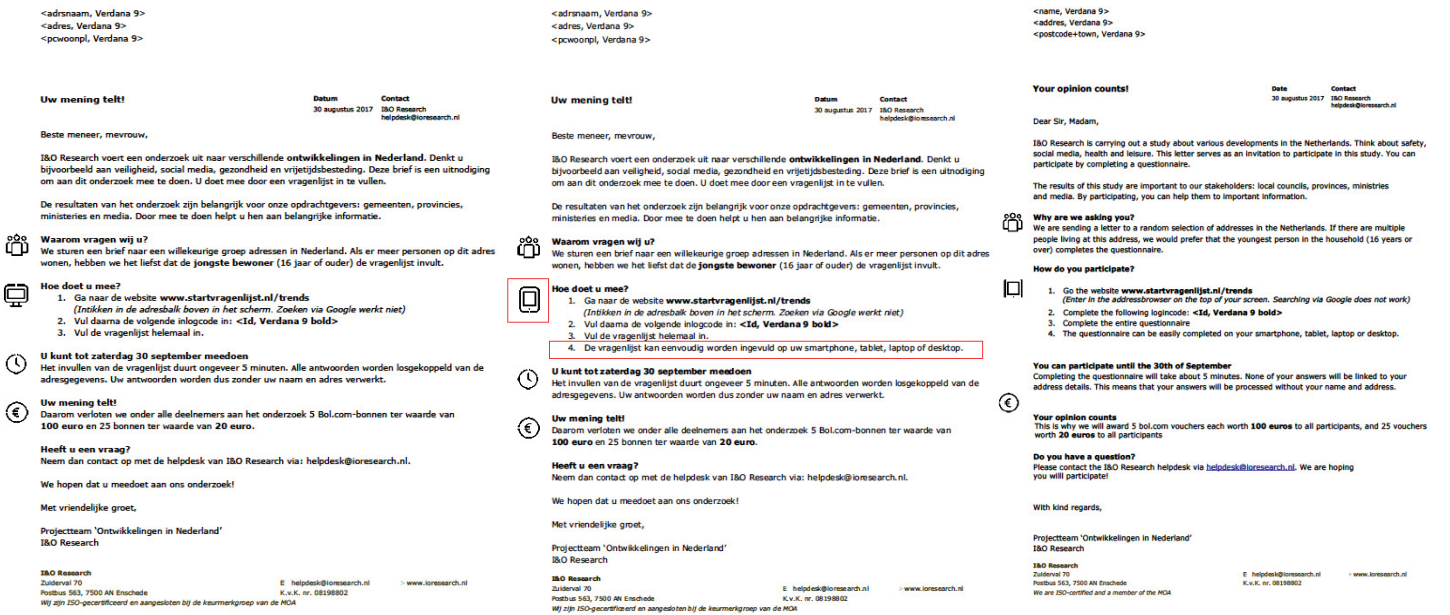
Roberts, A., de Leeuw, E.D., Hox, J., Klausch, T. L., & de Jongh, A. (2013). Leuker kunnen we het wel maken. Online vragenlijst design: standaard matrix of scrollmatrix? (We can make it nicer. Online questionnaire design: standard matrix or scrollmatrix). Jaarboek Marktonderzoeksassociatie, 133-149. Available on: http://moa04.artoo.nl/clou-moaweb-images/images/bestanden/pdf/Jaarboeken_MOA/JaarboekMarktonderzoek2013.pdf

Selkälä, A., & Couper, M. P. (2017). Automatic Versus Manual Forwarding in Web Surveys. *Social Science Computer Review*, doi: 10.1177/ 0894439317736831.

Statistics Netherlands (2017). StatLine: Internet: access, use and facilities. Available on https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83429NED/table?dl=A399

Appendix A

Original Dutch versions of old and new invitation letter (and English translation of new letter)



<adrsnaam, Verdana 9>
<adres, Verdana 9>
<pcwoonpl, Verdana 9>

Uw mening telt!

Datum 30 augustus 2017
Contact I&O Research helpdesk@ioresearch.nl

Beste meneer, mevrouw,

I&O Research voert een onderzoek uit naar verschillende **ontwikkelingen in Nederland**. Denkt u bijvoorbeeld aan veiligheid, social media, gezondheid en vrijetijdsbesteding. Deze brief is een uitnodiging om aan dit onderzoek mee te doen. U doet mee door een vragenlijst in te vullen.

De resultaten van het onderzoek zijn belangrijk voor onze opdrachtgevers: gemeenten, provincies, ministeries en media. Door mee te doen helpt u hen aan belangrijke informatie.

Waarom vragen wij u?
We sturen een brief naar een willekeurige groep adressen in Nederland. Als er meer personen op dit adres wonen, hebben we het liefst dat de **jongste bewoner** (16 jaar of ouder) de vragenlijst invult.

Hoe doet u mee?
1. Ga naar de website **www.startvragenlijst.nl/trends**
   (Intikken in de adresbalk boven in het scherm. Zoeken via Google werkt niet)
2. Vul daarna de volgende inlogcode in: **<Id, Verdana 9 bold>**
3. Vul de vragenlijst helemaal in.

U kunt tot zaterdag 30 september meedoen
Het invullen van de vragenlijst duurt ongeveer 5 minuten. Alle antwoorden worden losgekoppeld van de adresgegevens. Uw antwoorden worden dus zonder uw naam en adres verwerkt.

Uw mening telt!
Daarom verloten we onder alle deelnemers aan het onderzoek 5 Bol.com-bonnen ter waarde van **100 euro** en 25 bonnen ter waarde van **20 euro**.

Heeft u een vraag?
Neem dan contact op met de helpdesk van I&O Research via: helpdesk@ioresearch.nl.

We hopen dat u meedoet aan ons onderzoek!

Met vriendelijke groet,

Projectteam 'Ontwikkelingen in Nederland'
I&O Research

I&O Research
Zuiderval 70
Postbus 563, 7500 AN Enschede
E helpdesk@ioresearch.nl
K.v.K. nr. 08198802
I www.ioresearch.nl
Wij zijn ISO-gecertificeerd en aangesloten bij de keurmerkgroep van de MOA

<adrsnaam, Verdana 9>
<adres, Verdana 9>
<pcwoonpl, Verdana 9>

Uw mening telt!

Datum 30 augustus 2017
Contact I&O Research helpdesk@ioresearch.nl

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1. Ga naar de website **www.startvragenlijst.nl/trends**
   (Intikken in de adresbalk boven in het scherm. Zoeken via Google werkt niet)
2. Vul daarna de volgende inlogcode in: **<Id, Verdana 9 bold>**
3. Vul de vragenlijst helemaal in.
4. De vragenlijst kan eenvoudig worden ingevuld op uw smartphone, tablet, laptop of desktop.

U kunt tot zaterdag 30 september meedoen
Het invullen van de vragenlijst duurt ongeveer 5 minuten. Alle antwoorden worden losgekoppeld van de adresgegevens. Uw antwoorden worden dus zonder uw naam en adres verwerkt.

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Heeft u een vraag?
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We hopen dat u meedoet aan ons onderzoek!

Met vriendelijke groet,

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I www.ioresearch.nl
Wij zijn ISO-gecertificeerd en aangesloten bij de keurmerkgroep van de MOA

<name, Verdana 9>
<addres, Verdana 9>
<postcode+town, Verdana 9>

Your opinion counts!

Date 30 augustus 2017
Contact I&O Research helpdesk@ioresearch.nl

Dear Sir, Madam,

I&O Research is carrying out a study about various developments in the Netherlands. Think about safety, social media, health and leisure. This letter serves as an invitation to participate in this study. You can participate by completing a questionnaire.

The results of this study are important to our stakeholders: local councils, provinces, ministries and media. By participating, you can help them to important information.

Why are we asking you?
We are sending a letter to a random selection of addresses in the Netherlands. If there are multiple people living at this address, we would prefer that the youngest person in the household (16 years or over) completes the questionnaire.

How do you participate?
1. Go the website **www.startvragenlijst.nl/trends**
   (Enter in the addressbrowser on the top of your screen. Searching via Google does not work)
2. Complete the following logincode: **<Id, Verdana 9 bold>**
3. Complete the entire questionnaire
4. The questionnaire can be easily completed on your smartphone, tablet, laptop or desktop.

You can participate until the 30th of September
Completing the questionnaire will take about 5 minutes. None of your answers will be linked to your address details. This means that your answers will be processed without your name and address.

Your opinion counts
This is why we will award 5 bol.com vouchers each worth **100 euros** to all participants, and 25 vouchers worth **20 euros** to all participants

Do you have a question?
Please contact the I&O Research helpdesk via helpdesk@ioresearch.nl. We are hoping you will participate!

With kind regards,

Projectteam 'Ontwikkelingen in Nederland'
I&O Research

I&O Research
Zuiderval 70
Postbus 563, 7500 AN Enschede
E helpdesk@ioresearch.nl
K.v.K. nr. 08198802
I www.ioresearch.nl
We are ISO-certified and a member of the MOA

Figure A1 Old invitation letter (left) in conditions 1 and 3, new letter (middle) used in conditions 2, 4 and 5, and English translation (right) of new letter. The difference between the letters is emphasized by the red boxes, which were not included in the actual letter

Appendix B

Screenshots of question 1 from the survey across the different layout conditions

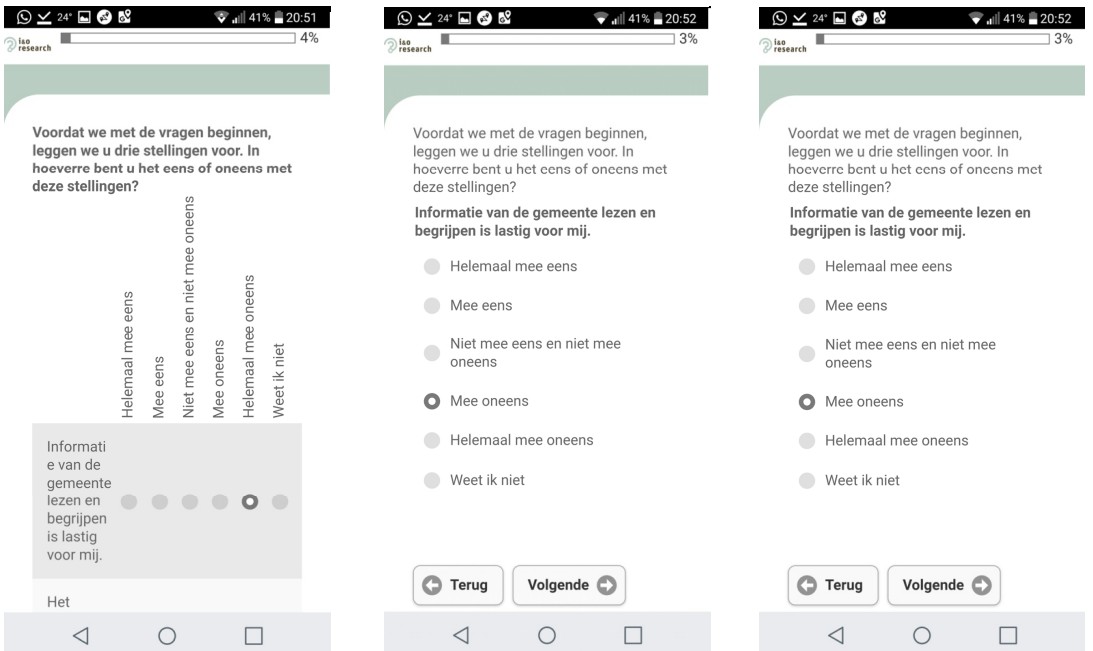

Figure B1 Screenshots of question 1 for survey in old design (conditions 1 - left), new design (condition 2 and 3 - middle) and new design + autoforward (conditions 4 and 5 - right) taken on a LG G6. The only difference between the middle and right panel is in how the respondent navigates (manually vs. autoforwarding.