



Harmonized matrix layout for different devices

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1. Introduction

CAWI surveys are mixed device surveys. As shown in Figure 1, the proportion of questionnaire logins on smartphones for Statistics Netherlands' household surveys, has become slightly higher than the proportion of logins on PCs.

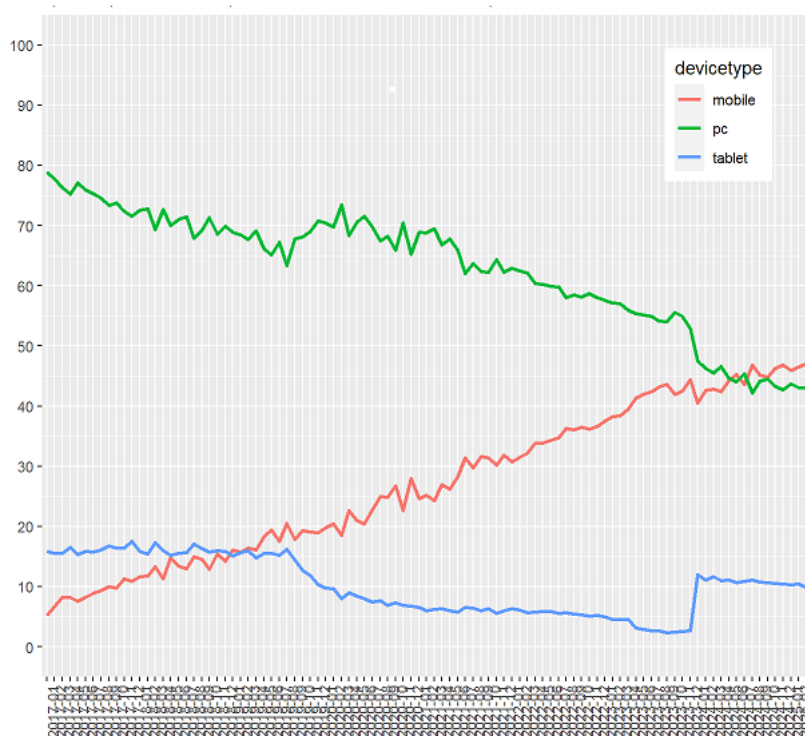


Figure 1: Device use on first login for continuous household surveys Statistics Netherlands Jan 2017-Feb 2025. Note: as of January 2024 a better methodology is used to detect tablets that were before misclassified as PCs.

Statistics Netherlands uses two layouts for CAWI surveys, depending on screen size. Typically, respondents on laptops and desktops receive the layout for large screens and respondents on smartphones the layout for small screens. The tablet uses both layouts, depending on the size of the tablet and the way it is hold.

Due to the differences in space available, some question types are displayed differently on a large screen than on a small screen, most notably the matrix (grid) questions or option list. For the PC,

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matrix questions are shown as a classic table. The question stem is shown in the top of the table, each row represents one of the question items and the labels of the answer options are displayed as headers of the columns (see Figure 2)

Opslaan X Opslaan en sluiten Terug ? Help

Nederland Vandaag

Als u het nieuws volgt, in hoeverre bent u dan geïnteresseerd in:

	Heel erg geïnteresseerd	Erg geïnteresseerd	Redelijk geïnteresseerd	Een beetje geïnteresseerd	Niet geïnteresseerd	Geen antwoord
Binnenlands nieuws?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Buitenlands nieuws?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nieuws over politiek?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Vorige **Volgende**

Figure 2: Current classic table for matrix questions for large screens

For the smartphone, a so called “stem fix” design is used. The question stem is shown fixed on the top of the screen. This is done as the stem may include important information, such as a reference period, that should be easily accessible to respondents. Without a fixed stem and with many items and answer options, respondents would need to spend quite some scrolling effort to review the question stem text. The items and answer options are displayed vertically below the stem (Figure 3). Please note that as in all Statistics Netherlands questionnaires, at the bottom of the screen a “next” button must be selected in order to proceed to the next question. This feature ensures that respondents always will scroll down to the bottom of the screen.

The difference in presentation of questions between small and large screens might affect how respondents perceive and answer the questions. This may generate device specific measurement error. In order to reduce this risk, a uniform format of matrix questions for all screen sizes was developed.



Figure 3: Current stem fix design for matrix questions for small screens

2. Experiment with alternative designs

As part of a larger experiment focused on smartphone first design (Giesen, Kompier and van den Brakel forthcoming) we tested which uniform solution for matrix questions would work best for option lists. Three new option list types were developed within a new stylesheet. In this new stylesheet some adaptations were made to better accommodate questionnaire completion on a smartphone (e.g. a minimalistic design, a bit more space between the buttons of the answer options) and to be in line with the general design system of Statistics Netherlands.

These new designs as well as the classic design were compared in an experiment. The main objective of this experiment was to determine if the various designs tested differ in data quality, user satisfaction and device effects. See the next section for more details about the new designs tested.

For the experiment a fresh sample of 12600 persons of 16 years and older received a letter inviting them to fill out a questionnaire. Of this sample 34% completed the survey. Roughly, 40% completed the survey with a smartphone and 60% used a PC or tablet. Each respondent was randomly assigned to each of the designs. The questionnaire contained many matrix questions on a variety of topics, including following news, ICT usage, trust in institutions, health and personality. At the end of the questionnaire satisfaction with various characteristics of the survey was assessed.

2.1 Stem fix design

The first new design was to use the stem fix smartphone layout also for large screens (see Figure 4). The stem of the question is fixed on top of the screen. The items and answer options scroll underneath. Depending on the length of the screen, the number of answer options and the amount of items this can be a long list.



Save & close

Help

If you follow the news, to what extent are you interested in:

Not interested

No answer

International news?

Very interested

Interested

Fairly interested

Slightly interested

Not interested

No answer

Politics?

Very interested

Interested

Fairly interested

Slightly interested

Not interested

No answer

Previous

Next

Figure 4: Stem fix design (both for small and large screen)

We made this design with the resource file and there were no design features we could not implement.

2.2 Carrousel design

The second design is called the carrousel question type (see Figure 5). Here the question stem is located at the top and the items and answer options slide in automatically after an answer option has been selected (autoforward). Respondents can navigate forward or backward to answered items by clicking on the numbers at the bottom.

An issue with this design was that within the time span we had to prepare for the experiment, it was not possible to develop and implement a design in which the question would be fixed. So for questions with many answer options the question text may become invisible while answering the question.

The screenshot shows a survey interface. At the top left is a logo consisting of three stacked 'S' shapes. To its right are two links: 'Save & close' with a floppy disk icon and '? Help' with a question mark icon. Below this is the question text: 'If you follow the news, to what extent are you interested in:'. Underneath is the sub-question 'National news?'. There are six horizontal buttons stacked vertically, each containing a response option: 'Very interested', 'Interested', 'Fairly interested', 'Slightly interested', 'Not interested', and 'No answer'. Below the buttons is a navigation bar with four items: a dark blue square with the number '1', a light blue square with '2', a light blue square with '3', and a light blue square with a right-pointing chevron '>'. At the bottom are two buttons: 'Previous' on the left and 'Next' on the right, which is highlighted in dark blue.

Figure 5: Carrousel design

Blaise made this design with a plugin and we did not have the tools to fine-tune this design. During the development, it was a challenge to optimize the animation. The animation should not start too fast so one would not see which answer was selected. On the other hand, if it starts too late, it can also be confusing and annoying. In small scale tests, we saw that respondents used the previous button if they wanted to get back to the previous item, but then were surprised to see the previous question (instead of the previous item within the matrix). The buttons with the numbers indicating the different questions seemed not to feel intuitive to all respondents.

2.3 Accordion design

The third design is called the accordion design. Here the question stem and items are visible, but only the answer options of the active field are shown (see Figure 6). Once an answer options is selected, the list of answer options collapses automatically and the answer options of the next item are displayed. The answers already provided are also displayed directly below the relevant item.



If you follow the news, to what extent are you interested in:

National news? ▶

Fairly

International news? ▼

Very interested

Interested

Fairly interested

Slightly interested

Not interested

No answer

Politics? ▶

Previous

Next

Figure 6: Accordion design

This design was made with a plugin from Blaise that generated the folding and collapsing of the questions. This worked client site and had no server connection between questions. If an answer option was selected, the questionnaire automatically forwards to the next item. The problem this version had was that in the display of the selected answer, only the category name of the category was shown and not the category label. This would lead to unwanted data model changes if we would use it for our current surveys, as category names currently are chosen for internal use and not developed to be shown to respondents. Another problem was that if the last item was entered, the questionnaire automatically forwarded to the next question (page). Tests with respondents showed that they preferred to stay on the page and press next themselves (in line with the logic of the rest of the questionnaire). Finally, as in the carrousel, due to time limitation a fixed stem was not implemented in the version used for the experiment.

3. Results

To compare the designs we looked at response behavior, substantial outcomes, match with register data and respondent satisfaction. We also analyzed if there were interaction effects between device and

design on these measures. For all analyses we controlled for the respondent characteristics gender, age, migration background, educational level, income and urbanization.

The indicators studied included breakoff, reporting “no answer” (item non response), primacy (likelihood of selecting the first answer option), recency (likelihood of selecting the last substantial answer option), straightlining (selecting the same answer for all items within a matrix), midpoint reporting, acquiescence (likelihood to agree), the mean scores and reliability of the scales involved and completion duration. For the respondent satisfaction we looked at reported satisfaction with various questionnaire characteristics (e.g. the questionnaire design and user-friendliness) and willingness to be contacted again by Statistics Netherlands.

One of the conditions in this experiment not further discussed here, was the length of the questionnaire: part of the sample received a shorter version and part a longer version of the questionnaire. Because of this we had different subsets of variables: one that was relevant for all respondents and one that was only relevant for the respondents of the larger questionnaire. This resulted in a very large number of analyses: 66 dependent variables.

The main finding of our analyses is that in the total of 66 analyses only three significant main effects and one significant interaction effect of the matrix design was found. These effects were found in analyses of ‘no answer’, recency and straightlining.

The first and most substantial significant effect was found in the analyses of choosing ‘no answer’ in the set of matrix questions that were applicable to all respondents (so both in the short and long version of the questionnaire). Here the results showed a significant effect of matrix design on ‘no answer’ (item non response) with the classic matrix question resulting in the highest level of item non response with 6% of the respondents choosing ‘no answer’. The lowest level of item non response was found in the accordion design with 3,2%. The stem fix design scored a little above 5% item non response, while the carrousel had a little under 5%.

The second significant effect found concerned the analyses of recency on the subset of matrix questions that were answered in the long version of the questionnaire only. Here again we found that the classic design performed worst with little over 7% of the respondents choosing the last answer option, followed by the stem fix and carrousel with 6%. The accordion design showed the lowest level of recency, less than 5%.

For straightlining we looked at various operationalizations. A subset of matrix questions consisted of validated scales using reversed items. For this subset we can assume that providing the same answer for each item is an implausible answer (midpoint and no answer not included). For these matrix questions no effects were found of the matrix design on straightlining.

The third and fourth significant effect of matrix design were found in analyses of straightlining in questions in which providing the same answer may in fact be plausible: a question about devices used to access the internet and a question about various purposes for using a smartphone. For the device used question significant differences in straightlining showed that the carrousel design had the highest level of straightlining and the stem fix design the lowest. For the question on purposes of use of smartphones we found a significant interaction between matrix design and the device used for completing the questionnaire. This was largest for the classic design and the accordion design.

We summarize the desirability of the effects found in Table 1.

	No answer (matrix questions applicable to all)	Recency (matrix questions long qnr only)	Straightlining (question about device use)	Interaction matrix x device on straightlining (question about types of mobile phone use)
Classic	😞	😞	😐	😞
Stem fix	😞	😐	😊	😊
Carrousel	😐	😐	😞	😊
Accordion	😊	😊	😊	😞

Table 1: Summary of the 4 significant effects of matrix design (of 66 analyses) on various indicators. The smileys indicate the desirability of the effects: 😞 very undesirable 😐 undesirable 😐 moderately desirable 😊 desirable

4. Conclusion

The main conclusion of this experiment is that the various matrix designs hardly differed on the (many) characteristics we compared them on. Based on the few differences found, the accordion and stem fix performed best.

The lack of effects of the various matrix designs indicates that we may not have to worry too much about the current situation in which we use different designs for large and small screens. However, from a theoretical perspective we still find it desirable to adapt our questionnaires towards a uniform design for all screen sizes.

We are first going to implement the accordion design into our future layout. Because we will not be using a plugin and we want a few changes to how the accordion worked during our pilot, the stem fix seems like a good fall back scenario. The good news about the lack of findings, is that if we implement the new design, the risk of significant effects on the outcomes seems low.