FORS GUIDES
to survey methods
and data management

Mobile web surveys

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Abstract:

This guide is for survey practitioners who want to conduct web surveys considering mobile devices or a mobile-only web survey. The guide points out different strategies on how to handle multiple devices and specifically mobile devices in web surveys with regard to web survey design and data quality. Furthermore, it addresses issues of questionnaire design and raises questions that can help to decide for one or the other survey software.

Keywords: smartphone survey, web survey, online survey, mobile device

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1. INTRODUCTION

At the beginning of the usage of web surveys, research made the assumption that people would answer the survey on desktop personal computers (PCs) or notebooks. Hence, the survey methodology focused on the adoption of questionnaires to different browsers and operating systems (see Couper, 2008). The increasing popularity of technologies, such as gadgets which have sensors (e.g. to quantify movement), smartphones and other mobile devices open up new opportunities for social science to collect data and hence, to generate new types of data (Couper, 2017), but it also allows people to answer web surveys on multiple devices that have Internet access (Callegaro et al., 2015, p. 192). Therefore, researchers conducting web surveys need to make the assumption that people answer their survey via multiple devices.

Particularly, mobile devices are increasingly used to answer web survey requests (see Lugtig et al., 2016). In the following, we refer to mobile devices, as devices with Internet access that are small, handy, and portable computing devices, typically with a display (with touch input or keyboard), such as smartphones, and tablets. In the context of web surveys, survey practitioners can choose between four different strategies on how to handle mobile devices in their web survey (see Callegaro et al., 2015, p. 195ff.; Couper, 2008):

1. Do not care about mobile devices.
2. Discourage/Encourage the use of mobile devices …
    a. in the invitation.
    b. at the introduction page.
    c. by blocking access of mobile devices/ by using a mobile-first design.
3. Optimize the web questionnaire for mobile browsers …
    a. of the most common mobile devices.
    b. of all mobile devices.
4. Provide a mobile web survey application (app) …
    a. for a specific web survey.
    b. within a general mobile survey application platform.

Depending on the strategy chosen for handling mobile devices, various types of data, generated by the mobile device can be collected. In this regard, measures of mobile devices can be either subjective when persons are the source of the collected data, such as in nutrition diaries or in survey questions; or measures of mobile devices can be objective when the device itself is the source of the collected data, such as in sensor data (Jäckle et al., 2018). Hence, survey practitioners need to decide whether they want to conduct a survey considering mobile devices as one potential survey mode; and whether they want to collect measures which can be collected only by mobile devices. Therefore, this guide tackles issues and gives recommendations surrounding the topics of: active versus passive data collection; mobile web survey design; data quality of mobile web surveys; and issues of survey software.

2. DATA COLLECTION

When survey practitioners consider mobile devices in their survey design, they have to decide whether they collect subjective and/or objective measures. Subjective measures are similar to questions or diaries, as the respondent is the source of the data. In the case of mobile device, these subjective measures can be triggered by events in real time and hence, questions could be asked without large recall periods (Jäckle, et al., 2018, p. 2). Objective measures are mostly passively collected data via mobile devices that automatically measure characteristics and behaviours of users, such as the investigation of personal communication behaviour (e.g. call records), network size and characteristics (e.g. contact information) type of smartphone usage (e.g. browsing history, app usage), multiple types of sensor data (e.g. step counts, geolocation, speed, environmental data) and so forth. Furthermore, data from videos and photographs can also be counted as objective measures, when they are not coded or classified by the users themselves. The decision on the type of data collected – subjective and/or objective measures - has consequences on whether a mobile survey application is needed or not. In case survey practitioners conduct their survey with the help of mobile survey application (purposed-designed applications), they can make use of a wide range of data collection approaches. In this regard, when survey conductors use mobile survey applications, which are designed for their purpose, then a further differentiation between active and passive data collection is useful.

2.1 ACTIVE DATA COLLECTION

Under active data collection, one can understand data collections in which respondents take an active role. For example, respondents of mobile web surveys can be interviewed by phone, video, or through SMS or chat exchanges (e.g. chatbots). Furthermore, data from mobile web surveys can be supplemented by other forms of data that are consciously provided by respondents (active collection of data), such as through time use diaries, audio recordings, photographs, or videos. For example, time use diaries can be used to record people's activities, location and enjoyment (see Fernee & Sonck, 2014; Hendriks et al., 2016; Jäckle et al., 2018). Furthermore, pictures or videos can be used to replace survey questions (for examples see Bosch et al., 2018; Jäckle et al., 2018; Mendelson et al., 2017; Wenz et al., in press). In addition, voice input can be used to answer open-ended questions (Revilla et al., 2018). Thus, the active collection of data from mobile devices might enrich traditional survey data, reduce response burden and might be more accurate.

Nevertheless, there is some self-selection associated with participating in mobile web surveys (see section on data quality) and in participating in activities which require the involvement of respondents (see Bosch et al., 2018). In addition, survey practitioners should keep in mind that some operating systems (e.g. Apple's iOS) may not allow third-party sensor data collection and hence, the implementation of some features, such as geo-triggering, might be restricted (Jäckle et al., 2018).

2.2 PASSIVE DATA COLLECTION

Beyond the active collection of data, researchers can use passive data collection methods to gain knowledge on attitudes, behaviours, and mobility patterns. Notably, in health-related research and traffic engineering the usage of geo-tracking, physical sensors (i.e. air quality, temperature, humidity, etc.), health information (e.g. sleep routines, heart frequencies), and

other sensor data with “wearables” or smartphones has been commonly used (e.g. Kooreman & Scherpenzeel, 2014; Greenfield et al., 2014; Lathia et al., 2017). Furthermore, some researchers logged the browsing history and the application usage to gain knowledge on how respondents used their mobile devices (e.g., Revilla et al., 2017). Moreover, Geographic Positioning System (GPS) data to generate mobility patterns (e.g. Geurs et al., 2013), or to trigger surveys at pre-specified geolocations using geo-fencing (see also Kreuter et al., 2018) are sometimes used in survey apps. Passive data collection can substitute existing factual questions, it can generate additional data, and it can be used to optimize the timing of surveys. Consequently, the response burden for participants is reduced due to a reduction in survey questions and hence, survey length.

In the context of passive data collection, researchers should bear in mind that they need the consent of the respondents to collect passive data in most countries (sometimes for each type of passive data collection separately). Furthermore, some operating systems automatically obtain consent whether an application is allowed to have access to specific data types. However, when survey practitioners want to collect passive data, they need to keep in mind that people share information depending on information type, the context in which the information is revealed, and the institution to which they are providing the information (Marwick & Hargittai, 2018). For example, Olmsted-Hawala and Nichols (2018) explicitly asked for permission to collect geolocation information in addition to the device’s default permission request. They found that females compared to men, more educated, and nonminority groups were more willing to share geolocation information (Olmsted-Hawala & Nichols, 2018). In addition, respondents are less willing to participate in tasks that collect data of a more private nature depending on the type of mobile device (smartphone versus tablet), data security concerns, and device usage behaviour (Wenz et al., in press).

3. MOBILE WEB SURVEY DESIGN

Web survey completion on mobile devices does not necessarily lead to different results than completion on a personal computer (de Bruijne & Wijnant, 2013). However, to achieve equivalent results between personal computers and mobile devices in web surveys, survey practitioners should carefully consider whether they conduct a mobile web survey only or whether they conduct a web survey where the usage of multiple devices is possible. The decision on whether to consider the usage of mobile devices influences the general survey design in various ways, such as incentive structure, survey invitation, and questionnaire design.

3.1 INCENTIVES AND INVITATION LETTERS

Many surveys use incentives to reimburse respondents for their effort and to increase overall response rates. However, when survey practitioners implement additional tasks for respondents (e.g. taking pictures) in the mobile web survey, then the incentivisation may consider these additional tasks and passive data collections. Besides general decisions on the type and amount of incentives, survey practitioners of mobile web surveys need to decide whether they provide one single incentive for the whole survey (for example Keusch et al., 2018b) or whether they split the incentives into parts (for examples see Angrisani et al., 2018; Keusch, F. Haas, G.-C., Kreuter, F., Bähr, S., & Trappmann, M., 2018a ; Kreuter, et

al., 2018). In the case of task-based incentives, survey practitioners should consider giving incentives and bonuses for:

a) Downloading the survey application.

b) Using the application for the first time/daily/updating information etc..

c) Using the application actively (i.e. 30 consecutive days).

d) Completing a questionnaire.

e) Activating data collection functions (GPS tracking, browsing history, etc.).

Besides incentives, survey practitioners should consider how they design the recruitment of respondents to their survey (e.g. via e-mails, SMS, telephone, mail, etc.), more specifically how the survey invitation should look like. In the case of mobile web surveys one can either use a URL or a QR code to direct respondents to a web browser. In this regard, one has to decide whether the URL link or the QR code already includes an identification of the respondents (e.g. username and password) or whether respondents have to type in the personalized identifiers. Furthermore, the pro and cons of using QR codes or URLs depend on the survey invitation and whether a survey application is used. For example, URLs have the advantage that people can use them without being familiar or having access to a QR code scanner. On the other hand, QR codes are very convenient if people know how to use them.

In the case of mobile survey applications, one has to decide whether the survey application should be either manually or automatically downloaded. In case of a manual download, respondents need to download the application from a digital distribution service, such as Google Play Store. When an application should be automatically downloaded, then a QR code or an active URL link (i.e. send by e-mail, SMS, or a chat service) redirects respondents to a page where the download process starts automatically.

3.2 QUESTIONNAIRE DESIGN FOR MOBILE DEVICES

The decision on whether a web survey questionnaire is presented and adapted to a mobile browser or whether a web survey is embedded in a mobile survey application affects the display of the questionnaire on mobile devices. According to the literature review of Antoun, Couper, and Conrad (2017) there is little reason to expect a large difference in response quality due to this decision. Nevertheless, survey practitioners need to keep in mind that downloading a survey application is an additional task and hence, people are less willing to participate in such a mobile web survey (see Kreuter et al., 2018; Wenz et al., in press).

When survey practitioners use a browser-based web survey, they have to decide whether they use a “smartphone-optimized” or a “smartphone-not-optimized” questionnaire design (see Toninelli & Revilla, 2016). Antoun, Katz, Argueta, and Wang (2018) conclude that “smartphone-optimized” questionnaire designs improve the respondents' survey experience, often reduces the time it takes to complete a mobile web survey, and it may reduce missing data and straightlining. The results on whether an optimization to mobile web surveys reduces breakoffs are inconclusive (Antoun et al., 2017).

In addition, survey practitioners have to decide whether the screen layout should adapt to the size of the screen or the size of the web browsers. When the layout is adapted to the screen size one has to decide whether it is either adapted to the biggest or smallest devices

(binary size, see also mobile-first design) or whether the screen layout adapts to different screen sizes (continuum of sizes, see also responsive design). In this regard, Couper and Peterson (2017) showed that much of the time difference between the completion of web surveys on personal computers and mobile devices (here smartphones) is accounted to additional scrolling required in mobile devices. Hence, the adaption of the screen layout to the multiple devices used can reduce survey time.

Previous research has shown, that the principals used to design web surveys (see Callegaro, et al., 2015; Couper, 2008) viewed on desktop or laptop computers are partly inadequate for mobile web surveys (Antoun et al., 2018). Because of this Antoun et al. (2018, p. 569) distinguished five design heuristics for creating effective screen layouts in mobile web surveys when using a "smartphone-optimized" design:

1. Readability: The font and the font size (17-18 digital pixels, 13-13.5 point font) should facilitate easy reading.
2. Ease of selection: Touch target need to be large enough to tap accurately (6.7-8mm in length and width).
3. Visibility across the page: All content should fit on the screen so that horizontal scrolling is avoided (long scales will be displayed vertically).
4. Simplicity of design features: Design features should be simple both for researchers to deploy and for respondents to use.
5. Predictability across devices: Questionnaire should function in a predictable way across different devices.

In addition to differences in the screen layout, mobile web surveys practitioners should consider design adjustments of various question formats, such as single-choice questions (using radio buttons) and multiple-choice questions (using checkboxes); text entry-fields, grids/matrix questions; slider questions; rank order questions (e.g. Revilla & Couper, 2018a) and drop-down boxes.. For example, the experimental comparison of grids/matrix questions versus item-by-item format (paging versus scrolling) in mobile web surveys found no differences in breakoff rates and almost no significant differences in test-retest correlations between latent scores (Mavletova et al., 2017). However, the results indicate that these findings depend on the length of the scale presented in the questions (Mavletova, et al., 2017). For further information on design issues of different types of questions in mobile surveys see Antoun et al. (2018, p. 565).

With regard to question formulation and response categories, one should consider having shorter introduction texts and survey questions than in other survey modes, as screen space is limited in mobile web surveys. The issue of screen size is also true for the number of response categories presented on a screen. In both cases, survey designers should reduce or avoid scrolling whenever possible.

Another decision survey practitioners have to make is whether respondents need to click the next button to proceed with the next survey question or not (automatic versus manual forwarding). In case of completing a survey on a personal computer or tablet, automatic forwarding takes less time, however, there is no time advantage of automatic forwarding in case of smartphone respondents (Selkälä & Couper, 2018). Moreover, Selkälä and Couper

(2018) conclude, that automatic forwarding might be more efficient and easy to use but may decrease response quality for cognitively demanding questions.

Survey practitioners need to consider survey length when they design web surveys in general and particularly when they design mobile web surveys. The maximum length of web surveys is around 20 minutes and ideally around 10 minutes (Callegaro et al., 2015, p. 102; Couper, 2008, p. 298; Revilla & Ochoa, 2017), however, mobile web surveys should last about 5 minutes to avoid breakoffs (Mavletova & Couper, 2015). In this regard, research is experimenting with splitting web surveys into parts (see also modular or matrix design) to reduce survey length and increase measurement quality in mobile web surveys (see Lugtig & Toepoel, 2018). Nevertheless, there are some exceptions where general population push-to-web survey of 45 minutes has been conducted with a similar data quality like the same face-to-face surveys (Ernst Stähli et al., 2018; Ochsner, M. et al., 2018).

Finally, question order principles are similar to the recommendations of web surveys (see for example, Dillman et al., 2014, chapter 7). However, there is one particular aspect for mobile web surveys, namely asking for consent to passive data collections after data has been actively collected, e.g. with a survey. These questions on “consent” should be placed at the end of a survey to increase the willingness to give permission (Olmsted-Hawala & Nichols, 2018).

4. EFFECTS ON DATA QUALITY

4.1 COVERAGE AND UNIT NONRESPONSE

In general, the growth of mobile device usage has not yet changed the selectivity of device usage (for smartphones see Gummer et al., 2018). In this regard, the proportion and differences of people who have access to internet-capable devices and those who have no access to internet-capable devices will affect coverage error and nonresponse bias (see Couper et al., 2018). Hence, research on coverage error in web surveys has two different perspectives (see Couper et al., 2017): (1) whether there is a coverage error in mobile-only web surveys (e.g. by installing a survey application), and (2) whether considering mobile devices is improving coverage in web surveys.

The first perspective requires people to install a survey application on their mobile devices. Consequently, only owners of mobile devices can participate in this type of survey unless they are provided with mobile devices (so-called device divide, see Pearce & Rice, 2013). Furthermore, there is higher unit nonresponse to mobile web surveys than to web surveys (Couper et al., 2017, p. 137). Reasons for this unwillingness to respond to a survey request are manifold (for further explanations see Couper et al., 2017, p. 137ff.; Keusch et al., 2018a; Kreuter et al., 2018; Revilla & Couper, 2018b): technological features (e.g. connect type, device type); trustworthiness and enjoyment of using mobile devices; mobile device usage behavior; use of multiple devices; and attitude towards mobile devices. Hence, coverage error and nonresponse bias is likely to occur in mobile-only web surveys for general population surveys.

The second perspective tackles the issue of whether including mobile device users increase the coverage of web surveys. Research has shown that web surveys moderately gain from covering mobile device users in terms of age (Toepoel & Lugtig, 2014). However, it has been

shown that people differ in socio-demographic characteristics, political participation and media consumption depending on their mobile device usage (de Bruijne & Wijnant, 2014; Herzing & Blom, 2018; Lugtig et al., 2016; Wells et al., 2013). So including mobile devices in a web survey does not necessarily result in less unit nonresponse. In addition, some hard to reach groups such as adolescents, refugees or migrants might be better recruited for web surveys which cover mobile devices (for an example see Keusch et al., 2018b). Thus, covering mobile devices in web surveys may avoid potential nonresponse bias.

4.2 MEASUREMENT QUALITY

Previous research finds that web surveys, in general, have good measurement qualities (Mavletova, 2013; Sommer et al., 2017; Tourangeau et al., 2013). However, with an increase of mobile device usage and, thus, mobile web surveys concerns regarding measurement error arise again. These concerns stem from at least three differences between web surveys conducted via mobile devices and web surveys conducted via personal computers (see Tourangeau et al., 2018): (1) screen size differences, (2) touchscreen interface, (3) survey setting.

First, there are no effects of screen size differences on response order effects for smartphone users (Tourangeau et al., 2017). Second and third, differences due to the usage of a touch screen interface and disruptive survey settings, may result in higher levels of item nonresponse and longer survey completion times for smartphone users than for tablet or personal computer users (Keusch & Yan, 2017; Struminskaya et al., 2015; no measurement differences were found by Andreadis, 2015; Buskirk & Andrus, 2014; Keusch & Yan, 2017; Struminskaya et al., 2015; Tourangeau et al., 2018). Furthermore, Tourangeau et al. (2018) find no difference of straightlining across devices types, but they find some inconsistent differences in scale reliability and scale validity across devices types (mobile device versus personal computers). Hence, survey conductors should be aware of and investigate potential measurement differences across multiple devices in their web survey.

5. (MOBILE) WEB SURVEY SOFTWARE

There are many commercial and open-source survey softwares available (e.g. SurveyMonkey, LimeSurvey, Qualtrics, QuestBack, and many more). Each of these survey software undergoes continuous development and each of them has its pro and cons. Nowadays, many survey software providers support the development of a web survey which is compatible with mobile web browsers. When choosing a survey software, survey practitioners should evaluate the survey software based on their specific needs for data collection, such as (1) what should the software/application track?; (2) does and how does the software/application adjust to different devices/browsers?; (3) which question formats are available, and how are they designed?; (4) how can the question format/screen layout be adjusted for your purpose?; (5) are there fieldwork monitoring features implemented?; (6) how and in which format is the data delivered?; (7) on which operating systems and browsers does the survey software/application work?.

Sometimes the complexity of the survey design requires a survey application (see Callegaro, 2013 for advantages and disadvantages of survey applications). These applications work independent of browser-based surveys and, thus, they restrict the respondents to the usage

of mobile devices. In this regard, it is important to differentiate between active and passive mobile survey applications and custom or general mobile applications. Nevertheless, the general questions mentioned above stay the same. However, in case of passive data collection surveys researchers should make sure which conditions have to be met that the application track things, i.e. needs the application to be actively open, are there different requirements for data collection in the operating systems. Furthermore, it is important to think about the frequency of data collection, for example on how often the geolocation is recorded. The latter issue can be a question of technical capacity but also a question of data protection regulations in a country.

6. MOBILE WEB SURVEYS IN THE SWISS CONTEXT

The coverage bias due to Internet accessibility is decreasing in Switzerland. In 2017, 90 percent of Swiss adults (16-74 years) and 99.6 percent of Swiss adolescents (14-19 year olds) use the Internet on a regular basis (Swiss Federal Statistical Office, 2018). Furthermore, 81 percent of the 15 to 29 years old, 73 percent of the 30 to 59 years old, and 31 percent of the people 60 years and older went online with their mobile phone in 2017 (Swiss Federal Statistical Office, 2018, October 08). Thus, the Swiss population is largely covered with Internet and mobile Internet via smartphones. Nevertheless, the usage of mobile devices has yet been rather low in several web surveys of the general population in Switzerland (e.g. Swiss Electoral Studies (Selects) 2015 about 14 percent, survey "Assessing citizens' preferences" 2018 about 14 percent, survey "Knowledge and attitude of the Swiss population towards human research and its regulations" 2018 about 16 percent mobile device participants of the total mixed mode survey; Swiss Household Panel 2017 (mixed-mode survey, wave 19) about 21 percent of the web survey users participated via mobile devices) and mobile device usage seems to depend on the announced survey length (e.g. "Knowledge and attitude of the Swiss population towards human research and its regulations" 2018 had a survey length of max. 15 minutes). Therefore, survey practitioners need to evaluate whether the current trend of mobile device usage, the potential usage of mobile devices in their survey, and the effort they make to adjust a web survey for mobile devices is worthwhile. For survey researchers who are interested in doing a mobile-only survey, the questions mentioned above are of minor concern. Nevertheless, it is very likely that mobile only surveys are only useful for some target populations in Switzerland. However, there is no scientific evidence for this assumption yet.

Finally, survey practitioners need to consider data protection regulations especially when they use pictures or passive data collection methods. As the data protection regulations are undergoing continuous adjustments, survey practitioners should consult the homepage of the Federal Data Protection and Information Commissioner in Switzerland (FDPIC, retrieved October, 2018: https://www.edoeb.admin.ch/edoeb/en/home/the-fdpic/task.html) to receive information on the current state of the legal framework for their specific data collection.

7. IMPLICATIONS FOR SURVEY PRACTITIONERS

Below, we formulate five recommendations that, given the currently available research, appear to be good advice for survey practitioners who care about the usage of mobile devices in their web surveys.

Recommendation 1 – Do not ignore potential selectivity which might be introduced by web surveys and in particularly by mobile web surveys. In this regard, it is important to think about the target population, as for some target populations mobile web surveys are more relevant than for other target populations, e.g. adolescents versus elderly.

Recommendation 2 – Think about the different devices with which people could participate in your web survey. Therefore, think about how to handle mobile devices in web surveys (browser-based or application-based survey).

Recommendation 3 – Think carefully about the design of mobile web survey, e.g. questionnaire, length, etc., as a well-designed mobile web survey is likely to have the same data quality as a well-designed web survey.

Recommendation 4 – Consider using different data collection approaches when conducting a mobile web survey. Maybe response burden can be lowered by finding different questionnaire designs, such as voice input for open-ended questions or by replacing survey questions with passively collected data.

Recommendation 5 – Check the privacy and data protection regulations, as it might change and vary in different countries (and for different citizens).

8. FURTHER READINGS

There are several introductory books on the topic of mobile web surveys, and the book by Toninelli, Pinter, and Pedraza (2016) is the most recent one published. Furthermore, the article of Antoun, Katz, Argueta, and Wang (2018) gives a great literature overview about how to design effective smartphone questionnaires. Moreover, the article by Tourangeau et al. (2018) points out some important findings with regard to data quality issues in web surveys which were conducted via smartphone, tablet and laptop. Nevertheless, a lot of research is going on in the field of mobile web survey design which promises more conclusive recommendations in the next couple of years. Hence, survey practitioners should check the mobile web survey literature on their topic of interest for updates.

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