Mobile Methods:

The Collection of Social Scientific Data On — And With — Mobile Media[1]

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Abstract

This chapter introduces key issues and considerations relating to the collection of social scientific data on – and with – mobile devices. I start this paper by arguing that it is better to define "mobile methods" as methods that involve the use of mobile devices, rather than as methods typically used by mobile researchers. Next, I discuss several ways in which mobile devices can be integrated into survey, interview, and field method designs. Finally, I consider how mobile digital trace data can be used ethically, and two different ways in which it can be woven into the data collection process to augment rather than replace traditional methods.

What are Mobile Methods? Associative Versus Functional Definitions

"Mobile methods" can be defined as methods that are typically used in mobile communication research or, by contrast, they can be defined as methods that make the use of mobile devices central to the data collection process. The former definition is *associative* while the latter is *functional*. I will discuss each of these definitions and make the case that the functional approach is a more fruitful way of defining mobile methods.

The associative approach to defining mobile methods follows the logic that if mobile communication scholarship is a field, and fields have their own methodological practices, then mobile methods are of the set of methodological approaches commonly used by mobile communication scholars. In other words, any method commonly associated with mobile communication scholarship may be considered to be a mobile method. Defining mobile methods in this way provides legitimation to a fairly new field of mobile communication research by providing a necessary component of its constitution. Nevertheless, this definition poses at least two significant problems. First, given that mobile communication scholarship is by its nature multidisciplinary, and includes research from across a range of social sciences traditions, mobile methods are quite diverse. Taipale and Fortunati (2014) show this empirically through a review of mobile communication articles published in five journals over 20 years. Their analysis of 66 articles published in these journals shows mobile scholars typically use traditional quantitative and qualitative approaches. This then raises a conundrum for mobile scholars: if mobile methods are not unique to mobile scholarship, should mobile communication research really be considered its own field? Second, discussion of mobile methods will be limited to a review of the traditional methodological approaches used in the social sciences. These reviews already exist in

a variety of introductory methods textbooks and reviewing them again here would be of limited value.

The functional approach to defining mobile methods posits that a mobile method is any method in which mobile devices and services are central to the data collection process. There are several advantages to defining mobile methods in this way. First, it is consistent with how mobile communication scholars have defined the field of mobile communication. For example, Campbell (2013) argues that mobile communication is distinct from other forms of communication because it consists of, "devices and services that supported mediated social connectivity while the user is in physical motion" (p. 9). With this definition, he then goes on to argue that mobile communication is distinct from other forms of communication and that this justifies treating mobile communication as a distinct field. In this way, the distinct properties of mobile devices and services are central to the definition of the field. If we accept this approach to defining the field, it then seems fitting that we use the same approach to define the sub-field of mobile methods. That is, we use the functional approach to show that mobile methods are distinct from other methods because they involve the use of mobile technology.

A second advantage of the functional definition is that it allows for a discussion of mobile methods that is relevant to the broad set of researchers, including those who do not identify as mobile communication scholars. This exposes researchers in a variety of fields to mobile communication scholarship and may draw attention to related mobile communication scholarship in the process. The functional definition also helps mobile scholars avoid being ensnared in traditional debates about the superiority of quantitative versus qualitative methods. Instead,

scholars can focus on the variety of ways in which mobile devices can be woven into quantitative, qualitative, and hybrid approaches.

To conclude, the functional definition has several advantages over the associative definition; I will use the functional approach in the remainder of this chapter.

Mobile Methods in Action:

Weaving Mobile Devices into Empirical Social Scientific Research Designs

Having made the case for the functional approach, I will now use this approach to discuss how mobile methods can be woven into empirical social scientific methods. Specifically, I will focus on survey, interview, and field methods, because these are commonly used in empirical social scientific research and are likely to be familiar to a broad range of readers. Rather than overwhelming the reader with a comprehensive review of the vast number of studies that examine the integration of mobile devices in research designs, I will instead focus what I consider to be key considerations that will be useful to those who are new to mobile methods. For a broader examination of mobile methods, see Büscher, Urry, and Witchger's edited book titled, *Mobile Methods.* After I discuss the role of mobile devices in traditional survey, interview, and field methods, I will spend the remainder of the chapter discussing how digital trace data can be integrated into mobile methods.

Surveys

On the face of it, administering questionnaires by mobile devices is similar to administering questionnaires using Personal Computers (PCs) or more traditional pen and paper approaches. Respondents are asked a set of closed and sometimes open-ended questions, and

they often complete these questions on their own. Despite these similarities, delivering surveys through mobile devices rather than fixed terminals or paper raises distinct methodological considerations and opportunities.

It should be acknowledged that many web-based surveys can be completed on either PCs or mobile devices. Survey websites are typically able to deliver differently formatted versions of the same survey, depending on whether respondents are using PCs or mobile devices. Nevertheless, even when the same survey is available in these different formats, researchers can benefit from considering how respondents and responses differ between PCs and mobile devices.

One consideration is the type of respondents that complete mobile surveys versus those that complete surveys using PCs. In most countries mobile devices have been more widely adopted than PCs (GlobalStats 2018). In the United States it has also been shown that those who only have mobile phones typically have lower levels of education, income, and are more likely to be visible minorities, than those who have both PCs and mobile phones (Pew 2018). This means that researchers who at least have a mobile version of their surveys are in a better position to recruit respondents from these marginalized groups than those who only use PC-based surveys. Of course, researchers may consider using pen and paper surveys to recruit an even wider range of respondents, including those who do not have smartphones or are not competent enough to use mobile web browsers. This would be particularly important if researchers wanted to recruit from older and less educated populations (Bucher 2018).

Researchers using surveys administered through mobile devices should also consider the implications for data quality. Unlike PC-based surveys, mobile surveys can be completed in a variety of social settings, which may increase distraction and lower response quality. However,

Berens, Schlosser, and Höhne (2018) compare surveys completed across 1,701 PCs and 893 mobile devices and find that there are actually somewhat higher levels of multitasking on PCs (45%) than on mobile devices (39%). They find no significant differences between these groups regarding indicators of data quality, such as non-item response.

Another consideration for researchers considering using mobile based surveys is how screen size and text entry methods influence response times, completing rates, and responses to open-ended questions. Peytchev and Hill (2008) found that respondents using mobile devices avoided responding to text entry questions when given the choice. They found that screen size and issues with text entry negatively affected the likelihood that respondents would require information or complete answers. However, given that screen sizes have increased and text entry methods have improved since this research was conducted, it is not clear if these issues would remain for current research. More recently, Mavletova (2013) found somewhat similar results regarding response quality using an experimental design with 1,013 respondents in Russia. Mavletova found lower completion rates and shorter answers among those who completed surveys on mobile devices versus those who completed the same surveys on PCs. A contributing factor may be that mobile based surveys require more scrolling than PCs based surveys (Couper & Peterson, 2017), which in turn increases response time (Rogalski, Schlosser, & Höhne, 2018) and may decrease completing rates. De Bruijne and Wijnant (2014) show that it is possible to improve response rates and questionnaire design by recruiting through the use of text messages, using scrolling layouts, and minimizing the use of open-ended questions.

Survey through mobile devices need not happen at just one point in time. Because mobile devices are typically carried with respondents throughout the day, they are well suited to

delivering frequent surveys as part of an Experience Sampling Method (ESM) approach. For example, Gergle & Hargittai (forthcoming) used a texting app and deployed it on a single Android phone. This app sent six prompts via text messages to twenty-five adults, six times a day, for a total of total of two days. Respondents texted back a total of 1,166 replies to these prompts. By completing the surveys via text message researchers were able to recruit a diverse sample that did not exclude non-smartphone users. This approach also helped to maintain respondent privacy and contributed to a high response rate.

Interviews

Mobile devices may also be integrated into interviews, where the focus is on deeply understanding the thoughts, feelings, narratives, and cultural logics held by respondents. The highly personal and social nature of these devices, and their integration into daily routines, means that they can be used to stimulate and enhance conversations during in-depth or ethnographic interviews.

For example, Ørmen & Thorhauge (2015) conducted interviews with respondents who had consented to allowing a GPS app track their movements throughout the day. These respondents also captured screen shots to show their activities during the day. The GPS and screen capture data were then used during interviews to help augment memories of their daily lives. They argue that this process helped them instigate discussion and reflection, and it also helped them to contextualize and organize material.

Jones et al. (2011) also used mobile devices to stimulate interview questions and enhance the accuracy of memoires. They asked respondents to take pictures of what they considered to be positive and negative aspects of the area in which they lived. These photos and their associated

positions on a map were used during interviews to gather a better understanding of community dynamics.

In addition to drawing on photos and location, mobile phone interfaces can also be used to stimulate discussion during interviews. For example, Kaufmann (forthcoming) discusses two studies in which interfaces are integrated into qualitative interviews. The first study explored how respondents used mobile devices during their shopping practices by having respondents refer to their mobile devices during the interviews. Respondents explored their shopping app folders and the various ways in which they personalized their smartphone interfaces to carry out shopping activities. In the second study, Kaufmann discusses how mobile phones were used during interviews with Syrian refugees. Mobile phones were used as a way of stimulating discussion about their recent journeys and to help them reflect on the important role that their mobile devices played in these journeys. Through these two examples, Kaufmann argued that mobile devices can be used during interviews as: ice breakers; a visual stimulus to trigger memories, thoughts and discussions; a source that helps respondents structure their responses to questions; and a point of reference that helps interviewees discuss their app usage.

Field Research

Field research involves studying respondents as they go about daily or prescribed activities in natural settings. Although field research is not necessarily separate from interview or survey research — surveys can be used to capture activities in natural settings and interviews can be conducted before, during, or after field-based activities — the mobile and highly personal nature of mobile devices make it worth considering the aspects of field research that are

particularly well suited to mobile devices. Field experiments and experience sampling methods (ESM) are where mobile devices are particularly useful.

Field experiments are experiments that take place outside of the laboratory, in natural settings. As with classic experimental design, respondents are randomly assigned to two or more groups, at least one of which receives a "treatment" that is expected to bring about a change. Researchers then monitor the groups to see if any differences arise between treatment group and the control group. Mobile devices can be used to randomly assign respondents into groups, deliver treatments, and track changes in the behaviours of respondents during experiments. Respondents' activities can be carried out and monitored with mobile devices as they go about their daily routines, which minimizes the need for respondents to visit traditional laboratories where their behaviour may be influenced by these settings. It also minimizes contact with researchers who may inadvertently influence the results of a study. All if this increases the ecological validity of experiments, which is the extent to which the results of experiments apply to real world settings.

Chen, Hanrahan Yua., & Carroll (forthcoming), discuss four studies that show how mobile devices in field experiments deliver "scripts" that structure community activities. Respondents follow these scripts, during which time their mobile devices are used to collect usage logs, user generated content, and ESM surveys. These studies show how mobile devices can be central to both deliver treatment materials and collect complex and rich data in field experiments.

I have worked with Tetsuro Kobayashi and colleagues (Boase et al., 2015; Kobayashi & Boase, 2015) to develop an app that randomly assigns respondents in treatment and control

groups, administers treatment materials, collects logged data on mobile activities, and administers on-screen surveys. 95 adults living in Japan and 68 adults living in the United States, recruited from a larger panel, agreed to install the app on their phones and complete a daily on-screen survey 60 times. The app randomly assigned half of the participants into a treatment group and the other half into a control group. For those in the treatment group, every day the app would select an individual listed in the address book and with whom there had been no logged calling, texting, or email exchange in the previous 60 days. The app would then display the selected name on the screen and ask if the respondent wanted to communicate with that individual. Indictors of reconnection were recruited through subsequent calling, texting, or email contact, and through an exist survey. Respondents in the control group did not receive these prompts. Using this method, we were able to examine the extent to which mobile devices could be used to reactivate dormant relationships and the extent to which national cultural differences might influence this process.

Although mobile devices can be used at various points in field experiments, a systematic review of 101 articles involving field experiments by Zhange et al. (forthcoming) shows that the most common approach to integrating mobile devices is simply to administer treatment materials. This is clearly an opportunity for future researchers to better integrate mobile methods into field research.

Mobile Trace Data: Issues and Opportunities

Mobile trace data are collected through the use of mobile devices. Examples of mobile trace data include: logged calling and texting data, location data saved in photograph files, GPS

logs, and app usage logs. Mobile trace data are an extremely important new source of data that have only recently become available to social scientists. These data provide accurate and detailed information on individual and social behaviours that can provide new insight into longstanding concerns in the social sciences (Lazer & Radford, 2017), and they can contribute to economic and social development (see Engø-Monsen's chapter in this book). At the same time, these data pose serious privacy concerns that place both respondents and researchers at risk. Given the increasing importance of mobile trace data to social research, I devote the remainder of this chapter to this topic. I will first discuss ethical considerations for the use of this type of data, and then discuss two approaches to contextualizing this data.

Ethical Considerations and The Use Of Mobile Digital Trace Data

Although it would be logical to first discuss and familiarize the reader with various approaches to using mobile digital trace data, I will instead start with a discussion of ethics. While this may seem to be putting the cart before the horse, the highly personal and sensitive data of mobile digital trace data necessitates that ethics be given the highest priority. Indeed, the ethical implications of mobile methods may, rightly so, be of such concern that a reader may not be able to focus the 'how' of mobile digital trace data because issues relating to the 'ought' are so present in mind. In this section I will very briefly provide an account of the most sensitive and private aspect mobile digital trace data and then discuss how researchers might approach this type of data.

Mobile digital trace data most directly has ethical implications for researchers working in quantitative and behaviour traditions. This data provides a trove of information about human activities that are not easily captured in traditional designs. Some quantitative researchers who

focus on data analysis may be attracted to the complex and novel nature of this data. At the same time, this data may also hold appeal to qualitative and interpretive researchers who see the value in using it to stimulate reflection and discussion during interviews or in natural settings. In short, digital trace data is of broad appeal to researchers working in very different traditions.

The highly personal and sensitive nature of digital trace data requires that researchers carefully consider how, and even if, they should use this data in their research. It may be tempting to take the position that digital trace data should never be used in research. However, it is also worth considering that social researchers have been studying highly personal and sensitive topics for decades, and that the ethical approaches that they have developed can also apply to the study of digital trace data. I will review four of these approaches briefly.

First, as with a traditional research project, informed consent is extremely important in the use of digital trace data. Respondents should be informed of exactly what information will be copied or transferred from their mobile devices, and then decide whether to consent to participating in a project or not. Although researchers may be tempted to downplay or gloss over this information, informed consent requires that respondents have complete awareness and understanding of the consent they are providing. Moreover, researchers should understand that consent is a process rather than a one-time event and should give respondents the option to stop or reverse their decision to consent at any point during or after the data collection. In the case where the anonymization process makes it impossible to revoke consent after data has been collected, researchers should make respondents aware of this constraint when asking for consent.

Second, researchers interested in using digital trace data should consider that just because data is available for collection does not imply that it should be collected. Particularly in the case

of sensitive data, collecting only that data which is necessary to address research questions should be collected. For example, if a research question requires an understanding of calling frequency, it is not necessary to collect call log information such as phone numbers, times and dates, or direction of call. Instead, researchers may develop an app that calculates or counts the total number of calls in a given time period and sends only that information to researchers. Or, if developing a new app was unfeasible, researchers could still use existing privacy-oriented apps to collect the data necessary for their calculation, then immediately delete the log data after calling frequency had be calculated. Qualitative researchers can also take steps to limit their exposure to sensitive log information. If respondents were asked to open their call logs during an interview as a means of stimulating discussion and reflection on their calling activities, interviewers could avoid looking at the respondents' screens and ask respondents to describe the interactions there without revealing specific names.

Third, another common approach to dealing with sensitive information in social research is to keep this information under lock and key. With digital data, researchers should encrypt files containing sensitive information and limit who is able to obtain copies of this data. Moreover, when publishing with this data, mobile researchers should ensure that identifying information is not revealed. Just as traditional qualitative researchers often use pseudonyms instead of real names when quoting their respondents, researchers can change identifying information such as actual times and dates in logged data when writing their results. As is common in quantitative studies, researchers should generally publish the results of groups or subgroups, rather than the results pertaining to specific individuals since doing so might inadvertently reveal their identities.

Fourth, submitting project proposals for review by ethics committees can provide researchers with perspectives or considerations that they may have overlooked. This also helps to ensure that research is in line with the ethical practices of the research communities in which they are operating. Once again, this practice that is used in traditional research is also helpful to ensure that mobile digital trace data is collected in a way that is ethical.

Having made the case that there are ways of ethically using digital trace data, I will now discuss two important ways that mobile trace data can be woven into the data collection process. The purpose of this discussion is to give those who are new to mobile methods a sense of how to contextualize and identify important mobile trace data, rather than to advocate simply copying data from mobile devices. Copied data alone often lacks context and meaning necessary to satisfactorily address important questions. Moreover, as discussed in the previous section of this chapter, copying only necessary data is a way of reducing risk to respondents. In the remainder of this chapter I will discuss how mobile trace data can be used to ask respondents questions, and how respondents themselves can point researchers to important mobile trace data.

Using Mobile Trace Data to Ask Questions

If there are particular types of mobile digital trace data that researchers would like to better understand, they may use mobile app-based surveys to ask questions about this data. In my research with Kobayashi and other colleagues, I have been interested in better understanding communication within personal networks. We recognized that logged calling and texting data may provide a useful understanding of how relationships within personal networks develop over time, and how they may be constrained by differences in kin and work institutions across different societies. However, this logged data was also missing critical information regarding the

nature of the relationships — for example, if interaction was occurring with friends or family, strong or weak ties, etc. — and also the content of these interactions. In order to help fill in this information, we designed several apps that would use mobile digital trace data as part of survey questionnaires.

In two separate studies (Boase & Kobayashi, 2012; Kobayashi & Boase, 2012; Boase et al., 2015; Kobayashi & Boase, 2015; Suzuki, Kobayashi, & Boase, 2016; Jamieson, Boase, & Kobayashi, forthcoming), we designed apps that draw on information from calling, texting, and email logs, in conjunction with address book data, and ask questions about individuals with whom respondents had interacted in on-screen survey questions. Each day, the app would randomly choose the name of someone that was in respondents' address books and with whom there had been at least one call, text, or email in the past 24 hours. In order to avoid collecting information that was unnecessary to our study, the processing of this data only occurred on respondents' devices. The app did not send us sensitive information such as names from address books, phone numbers, or text or email content. Phone numbers and email addresses were masked by the app using a hashing algorithm, which allowed us to see if the same or different individuals were being contacted over time. The daily on-screen survey questions provided us with general but useful information regarding the nature of relationships and the content of interactions without providing details that would identify respondents or the people with whom they had communication.

For example, if a respondent texted someone in their address book named "John Smith" in the past 24 hours, and the app randomly selected this individual for a daily survey, then the name "John Smith" would appear directly in the survey questions. Questions would include,

"Are you close friends with John Smith?" or "Do you discuss political issues with John Smith?"

The app would send the hash identifier associated with John Smith to researchers and the

responses to those questions to our survey response data base, but it would not send the name

"John Smith" or any of his phone numbers or email addresses stored on the respondent's phone.

In this way, we are able to trace the calling, texting, and email history of this specific individual

using the log data, and further understand the relationships and types of exchanges that the

respondent has with this individual, without receiving or retaining sensitive information about

this individual such as his name, phone numbers, or email addresses.

Because this daily on-screen survey was repeated over thirty days, and the app randomly

selected individuals each day, we were able to understand the relationships and types of

interactions maintained with active personal networks for our respondents. We then used this

information to study a diverse set of topics, including how cultural institutions in Japan and the

United States may influence personal network communication patterns and composition (Boase

& Kobayashi, 2012; Boase et al. 2015), identifying political conversation partners in personal

networks (Suzuki, Kobayashi, & Boase, 2016), and the interaction of tie strength, social role, and

media multiplexity in personal networks (Jamieson, Boase, & Kobayashi, forthcoming).

While fruitful, there were two significant limitations to this approach of using address

book names in on-screen survey questions. First, we used this approach with a panel of

respondents that trusted the company administering the surveys, and who were fully informed

about exactly how the app processed and collected this data. Failure to meet either of these two

conditions would likely result in low completion rates due to privacy concerns or a lack of trust

in researchers. Second, this method only allowed for a sampling of active relationships, which

meant that contextual information about inactive or dormant ties was not captured.

This approach is not limited to address book or logged communication data. For example,

it may be possible to develop survey apps that ask individuals questions about apps on their

phones. Researchers develop the app such that it asks questions using the names of heavily used

apps, or perhaps then names of the social network apps on a respondent's phone. This would

allow researchers to target questions to apps that were relevant to respondents and avoid asking

many questions about apps that respondents may not even use.

Asking Respondents to Identify Specific Mobile Trace Data

Another approach to contextualizing digital trace data in mobile surveys, in-person

interviews, and during field experiments, is to ask respondents to identify trace data that fits a

given criteria. For example, I directed the development of an app that asks respondents to select

names from the mobile address books or call logs as a way of responding to on-screen survey

questions (Boase 2018). I then used this app in a national survey of 411 Canadian adults to ask

respondents to identify six different types of personal network members: a very close friend,

somewhat close friend, someone you live with, someone you work with, someone with different

political views, and someone who helped you with something important. The masked hash

identifiers associated with these ties were than saved as responses to these questions, which

allowed for the tracing of calling and texting patterns in the larger data set of 2.2 million calling

and texting logs. This led to the identification of more than 2,000 network members that provide

different types of support and information. As with the pervious apps discussed above, the actual

names, phone numbers, and text message content were not collected by the app. However,

because the app also collected times and dates of calls and texts within the phone log, the hash

identifiers can be used to trace the ebbs and flows of calling and texting communication of

specific relationships over long periods of time. This provides a new way of understanding the

dynamic and time ordered nature of communication with key network members, without

collecting names or phones numbers or other sensitive content from mobile devices.

While this project was limited to the identification of logged calling and texting data, this

same approach could be used with many other types of data as well. For example, for researchers

who want to understand the types of locations in which individuals visit during a typical day,

they might develop an app that asks respondents a question about the general nature of a location

that they visit more than one day in a row. The app could record their answer to this question –

for example, if it was their home, work place, coffee shop, or somewhere else -- and then note

the times in which individuals visited this location over a given period of time. With this method,

the actual GPS coordinates of this location would not need to be sent to researchers, and

respondents would have autonomy over their own description of the location and whether they

wanted to share this information with researchers.

Asking respondents to identify specific digital trace data helps researchers learn more

about the context of that data or what it means. Ultimately, this process helps to sort through and

understand the significance of certain data within larger, often messy, digital trace data sets.

Conclusion

In this paper I made the case that "mobile methods" should be defined as methods that

involve the use of mobile phones in the data collection process. I then considered various ways

in which mobile devices can be utilized in traditional survey, interview, and field method designs. Finally, I discussed the role of digital trace data in mobile methods and explored two ways of leveraging this data to augment rather than replace traditional approaches.

This is only a starting point, and is intended to give those new to this area a sense of how mobile methods can be used in empirical social research. Mobile methods, like mobile research and mobile technology itself, are relatively new and will continue to evolve. As researchers develop new ways of ethically weaving mobile devices and mobile trace data into research, their methodological utility will continue to increase in significance.

In regards to the development of mobile methods involving digital trace data, one necessary step in this evolution is the development of new techniques that allow researchers to identify meaningful patterns in complex and large mobile data sets. This will likely involve more sophisticated ways of combining mobile trace data with data from other sources – e.g. infer communication context by combining logged communication data with geographical/spatial databases – while safeguarding privacy in the process. It is possible that many such techniques are simply impossible to conduct in a way that maintains respondent privacy. Nevertheless, without the development of sound ethical approaches to this type of analysis, research in this area become dominated by companies and organizations that have little incentive to publish their results and conduct research ethically. Another point in the evolution of this field will be the use of machine learning and artificial intelligence by social researchers. While these technologies alone may fail to provide valuable insights, when used as tools by skilled social researchers they have great potential to help identify meaningful patterns in large and complex mobile trace data. Regardless of these technical advances, how this area develops in the long-run will depend

heavily on laws and organizational policies that determine access to mobile data, and provide

protections to mobile users.

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