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Qualitative HCI Research

Going Behind the Scenes

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SYNTHESIS LECTURES ON HUMAN-CENTERED INFORMATICS

John M. Carroll, *Series Editor*

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CHAPTER 4

Gathering Data

GETTING FOOTAGE

Once overall decisions about the focus of the documentary and the locations for filming have been made, it is time for the film crew to gather footage. As anyone who has watched behind-the-scenes accounts from wildlife documentaries will know, the gathering of footage requires a variety of techniques, from filming sequences with the narrator on location to using powerful long lenses or specialist cameras, e.g., for underwater shots. Sometimes things do not go according to plan, such as when the subject of the documentary fails to show up or attacks the camera, and rapid re-planning is needed. Conversely, at other times, unanticipated, delightful things may happen, such as capturing a very rare behaviour or interaction between animals. The same can be true of qualitative data gathering: it may be valuable to apply complementary techniques to obtain richer data that yields deeper insight. There will be moments of surprise and delight, but there will also be times of frustration and challenge, when things do not go according to plan and there is a need to improvise or change direction.

The analyst can only work with the data that is collected. Therefore, it is important to gather the best possible data, working within the resources of the project. The most common techniques for gathering data are discussed below: observation, semi-structured interviews, think-aloud, focus groups and diary studies. The increasing focus on the use of technologies while mobile, in the home, and in other locations are leading to yet more ways of gathering qualitative data. As Rode (2011, p.123) notes: "as new technologies develop, they allow new possibilities for fieldwork—remote interviews, participant-observation through games, or blogs, or virtual worlds, and following the lives of one's informants via Twitter." The possibilities are seemingly endless, and growing. The limit may be the imagination of the research team. We have chosen to focus on established techniques because they are the most widely used, and because many of the same basic skills are required for more novel methods exploiting new technologies.

Whatever method(s) of data collection are employed, it is wise to pilot test them before launching into extensive data gathering. This is to check that the data gathering is as effective as possible and to ensure that the resulting data can be analysed as planned to address the purpose of the study. If the study design is highly iterative then it is important to review the approach to data gathering before every data gathering episode, e.g., as described using GT (Chapter 6).

4.1 THE ROLE OF THE RESEARCHER

Before presenting an overview of methods for gathering data, we will briefly review the roles of the researcher, in particular, their relationship with participants. Are they more like a "fly on the wall" that does not impact the participant or situation, or are they more like an active participant in the situation that does influence the context?

Some kinds of studies, such as diary studies and think-aloud studies, typically involve little engagement between the researcher and participant. Once these types of studies are initiated the researcher is reliant on having designed it well and on participants providing data as anticipated. Good pilot testing is advised! Such studies are relatively easy to describe in terms of how participants were instructed. Interventions by the researcher may be planned, and may nudge data gathering. However, on the whole, the approach does not evolve significantly during the study, and the role of the researcher is limited. For example, it is likely that substituting one researcher for another would have little effect on what data is gathered. Arguably, the same is true of relatively structured interview and observational studies. However, it is important to be aware of, and reflect on, the potential effect that data gathering may have on participants' behaviour.

In many documentaries it is apparent that the subjects' behaviour is influenced by the presence of the camera. Similarly, many subscribe to the view that it is not possible to conduct a study of a situation without both influencing and being influenced by that situation. Being observed influences participants' behaviour. The researcher's challenge is to limit the influence of data gathering on the data that is gathered. Like "fly on the wall" documentaries, some observational studies involve the researcher trying to minimise the effect of their presence on the activity being observed by avoiding asking questions. Then, for some studies, it may be a reasonable approximation to assume that the presence of the researcher has little influence on the data that is gathered. However, it is important to reflect on the likelihood that observational factors such as the Hawthorne effect, in which participants were found to perform better when being observed (Roethlisberger and Dickson, 1939), might have an impact on findings.

In interviews, the influence of the researcher is likely to be smallest when the interview is structured. While it is arguably impossible (perhaps even undesirable) to remove all traces of researcher influence from a study, it is possible to approach a piece of research with the intention to remain as open and unbiased as possible in order to minimise the influence of the researcher. For example, if the purpose of the study is to understand how a particular group of professionals use technology to support their working practices and the implications for design, the researcher may decide to observe the use of a broad range of technologies rather than restrict participants to using particular technologies. They might decide to observe with minimal intervention rather than ask questions. For example, in our study of how ambulance controllers use technology to maintain awareness of the situation, both within the control room and in the outside world of ambulances

and incidents (Blandford and Wong, 2004), it seemed reasonable to assume that the way we related with study participants had little influence on their performance as professionals.

More active participation brings the researcher into the frame, and increases their influence on the data being gathered. This is most obvious in studies involving action research, in which the researcher is intentionally intervening and working with participants to assess the effects of interventions on perceptions, processes, and outcomes (Kock, 2013). It is also likely to be the case where the researcher acts as a participant observer, playing an active role within the study context, and to a lesser extent in approaches such as Contextual Inquiry (Holtzblatt and Beyer, 2013), which bring the researcher into the observation/interview space, though data gathering is still shaped mainly by the activities being performed (see Chapter 6). In our think-aloud observations of how professionals interact with information (Makri et al., 2008a; Makri and Warwick, 2010) we took a more active role than is usual in think-aloud studies. Here, we not only wanted to understand what professionals did when interacting with information, but also why they did what they did. We asked probing, opportunistic questions such as "what did you just do?" and "why did you click there?" While we cannot be certain that this did not influence participants' behaviour, we did not find any evidence of influence, e.g., changes in behaviour as a result of our questioning.

In some studies, the researcher and their relationship with participants is central to the research process. This relationship can have a strong influence on what information is shared with participants, how it is shared by participants, how it is interpreted by the researcher, and how it is reported. For example, Rode et al. (2004) discuss their approach of exploring families' use of programmable technologies in the home by using fuzzy felt props as being "provocative," aiming to establish "rich dialog" with participants. They describe the props as being effective mediating representations to support the conversation about programmable devices in the home to give a rich contextual understanding of use.

Semi-structured interviews inevitably bring in the interests of the researcher as well as the participant. To pretend that they are purely objective is to downplay the individuality of each researcher and the relationship between researcher and participant. The interview is a dialogue between people. Where the interview strays into potentially sensitive areas, such as negative feelings around technology use, it may even be unethical to remain artificially detached from the setting. In such situations, it is impossible to substitute one researcher for another without further changes. The researcher is shaping the conversation and the data that is gathered, and the extent of that shaping should be recognised and reported transparently and unapologetically.

Where the topic is one that participants might be sensitive about, it can sometimes help to have pre-existing common ground between the researcher doing data gathering and the participant, e.g., being of the same sex or a similar age. An example might be intimate health issues that are important for the design of some health behaviour change technologies and interactive medical devices. Where multiple researchers are available, this might mean matching them well to partic-

ipants. Where there is a single researcher, it might mean reviewing the purpose of the study to be sure that data gathering is likely to be productive.

While the researcher may be an expert in HCI (or similar), it is the participants who are experts in their work and in living their lives; they may not always understand the details of the technologies that they use, but they have the greater understanding of their own situations and their needs. This differential expertise is at the heart of qualitative HCI studies. We normally recommend taking an apprentice stance during fieldwork (Beyer and Holtzblatt, 1998) but we have experienced situations where this has not felt appropriate. For example, while doing observational work on a ward we heard a complaint by a doctor that a device's alarm could neither be silenced nor turned down. The nurse said she had tried everything to turn the volume down but it did not work. Curious as to what the problem was and dissatisfied with the response because of the effect on the patient who was critically ill, we decided to help rather than just observe. The device's volume button alone only operated the pulse volume, while holding down the alarm silence button for three seconds and then using the volume controls operated the alarm volume, which the nurse did not know. We had to be sensitive in how we raised this issue with the nurse, as our expertise in interaction design challenged her position (Furniss, 2014).

It is also important to remember that participants may have an interest in the research and its outcomes after their participation in a study. In the short term, it may be important to manage their expectations where those expectations are unrealistic, e.g., of having a fully functioning new system within a few months. In the longer term, it is a courtesy to offer to keep participants and others who facilitate research informed of the outcomes of the research, though not all will want this.

In the following sections, we summarise the most common approaches to gathering data in qualitative HCI studies.

4.2 OBSERVATION

Put simply, observation involves watching and noting what happens, and usually takes place in the situation where the technology of interest is or will be used. The focus may be on work or leisure activities, and how the technology supports, hinders or otherwise shapes them, or on people's interactions with the technology. Observation is often complemented by interviews, e.g., Contextual Inquiry, described in Chapter 6. There are many possible forms of observation, and many dimensions on which observational studies may vary, including:

- The **extent to which participants are aware they are being observed**. Covert observation is unusual in HCI, but there are exceptions. In interaction labs there is often a one-way mirror to allow observation of participants. Participants are usually told they are being observed but they cannot see who is behind the mirror. Covert observation

and one-way mirrors are also used in simulation labs, e.g., mock-up hospital operating theatres or home spaces.

- The **extent to which obtaining informed consent is necessary** for the observation. In some situations, it may not be feasible to seek infomed consent, such as when observing group interaction behaviour in public spaces. But it is still possible to let people know you are observing them by putting up signs, giving out leaflets, etc. If some people do not want to take part, you should delete any data that includes them. It is also essential to get permission from the owner of the space to conduct the observation.

- The **extent to which the observer becomes a participant** in the situation being observed. As discussed above, sometimes observers try to be unobtrusive; at other times they are clearly present in the situation. In action research (Chapter 6), where the researcher is intervening and assessing the effects of the intervention, the researcher is a key participant. In other situations, the researcher may minimise their active engagement, particularly if they are studying expert work in a domain which they have limited knowledge of.

- How **realistic the environment** in which observation takes place is. While many observational studies take place in the workplace, some take place in specially designed simulation laboratories (e.g., where there might be safety implications of working in the real environment), in specially instrumented "smart homes" (e.g., when studying how people interact with novel home technologies) or in laboratory settings (e.g., when studying people's interactions with a novel computer interface).

- Whether the observation is of **established systems** to support requirements gathering and understanding people's needs for **new systems**, or whether it involves an intervention such as the introduction of a novel technology. When new technology is introduced, the ways that people interact with that technology, or the way it changes their behaviour, is likely to be the focus of the observation.

- How **structured the observation notes** are. For some studies, where the objects of interest are clearly defined, observation notes may be highly structured and systematic; where the study is more broad or exploratory, notes may include sketches and notes of various aspects that relate to the research question. In some studies, other forms of data capture may supplement the researcher's notes, e.g., audio recording, still photos or video.

In summary, there is no single right way to conduct an observational study. The study design should be appropriate to the study aims, but it is also likely to be shaped by the expertise of the

researcher (e.g., to what extent they can meaningfully participate in the situation), the structure and culture of the situation being observed, the resources available and even the personality of the researcher (e.g., what they feel comfortable observing). Furthermore, the way a study is conducted will often evolve over time as the researcher develops an understanding of the context and an ability to participate constructively in it.

Planning an observational study involves several steps. The first is to select the setting(s) for observation. Just as participants for an interview study are recruited based on selection criteria, so settings for observation are chosen based on their suitability for addressing the research questions, and this might involve elements of convenience as well as objective suitability. For example, for his MSc project (Rajkomar and Blandford, 2012), Rajkomar aimed to investigate the use of infusion pumps, which deliver intravenous medication, in intensive care. Negotiating access through our nearest hospital turned out not to be too difficult, so we did that; we are aware that the resulting analysis may only apply to the one hospital setup, but we did our best to present our method and findings in sufficient detail that they could be replicated in other healthcare settings to assess their generalisability. We return to the topic of generalisability in Chapter 8.

Another step is to determine what is to be documented in each observation. It is not possible to observe everything so some focus is needed. This focus may be shaped by extant theory and by the research question. For example, we have tested and extended DCog in several studies (Rajkomar and Blandford, 2012; Furniss et al., 2015; Rajkomar et al., 2015). Given a focus on the design or use of a particular technology, it is likely that an HCI study will focus on user interactions with that technology, or on the broader system of work that they are situated in.

It is also necessary, as discussed above, to agree on the role of the observer within the study setting. Most perspectives on research study the situation as an outsider looking in. Participant observation and action research involve the researcher playing a more active role in the context while also studying it. These research approaches are discussed in Chapter 6.

In any observational study, data needs to be gathered, through note taking, perhaps audio, image and video recording, and maybe from existing documentation. It may also be necessary to refine the focus of the study. For example, when studying the work of ambulance control and the role of technology within this, we came to recognise that situation awareness, and the ways in which the work system and technology supported it, was an important theme. As well as continuing to pay attention to their interactions with their information systems, we developed a more detailed focus on how the ambulance dispatchers maintained situation awareness and how the systems they were working with supported this (Blandford and Wong, 2004).

Whatever is observed, it is important that detailed notes are taken and that correspondingly detailed digital data is recorded so that analysis results in a rich and insightful description of the situation.

4.3 THINK-ALOUD

In some forms of observation, the researcher is clearly present, shaping the data gathering through the questions they ask; in contrast, in a traditional think-aloud study the researcher retreats into the background. Think-aloud involves the users of an interactive system articulating their thoughts as they work with that system. Think-aloud studies typically focus on the interaction with a particular interface, and so are well suited to identifying strengths and limitations of that interface as well as the ways that people undertake their tasks using the interface. Think-aloud is most commonly used in laboratory-based usability studies, but also has a valuable role in situated studies; for example, our observations of how lawyers interact with information on the Web (Makri et al., 2008a) involved the lawyers thinking aloud so that we could better understand their interactive behaviour and their rationale for that behaviour.

There are two important aspects of preparing participants to think aloud. One is instructing them in how to think aloud: participants might tell the researcher what they are doing while interacting with a system; it is more important that they should provide a "stream of consciousness" on what they are *thinking*. Depending on the focus and scope of the study, participants might be encouraged to focus their think-aloud verbalisations primarily on the interface and their interactions with it, or primarily on the broad work they are undertaking. It is often helpful for people to practice thinking aloud using another system before starting data gathering, particularly if the focus of interest is on their reactions to a new interface, so that by the time they start using it they are comfortable with thinking aloud.

The second aspect of preparation is what tasks people are instructed to complete. When gathering data for a qualitative study, it is most common to ask people to simply do their work while thinking aloud (this is obviously not a suitable approach to take if that work involves talking or interacting with other people!). For example, in several of our studies of how people interact with information (e.g., Makri et al., 2007; Makri et al., 2008a; Makri and Warwick, 2010), we have asked participants to choose their own tasks. These think-aloud studies were naturalistic in the sense that the tasks were intended to be as realistic as possible in an observational setting. As most of our participants were students, they would typically choose to find information for their dissertations. Practicing lawyers typically chose tasks that involved finding information related to a case they were working on. In other studies of information interaction, we have given specific tasks to users; for example, when we compared the support for exploratory search provided by three different search interfaces (Diriye et al., 2010), one of the specific tasks we set was for users to find a web page on human trafficking. Specific tasks are also often given to users when think-aloud is used for usability or user testing, or for studies of cognition. However, this is outside the scope of this book.

Thinking aloud does not come naturally to everyone, so participants may sometimes fall silent. When this happens, asking "what are you thinking?" or similar can be useful for prompting

them to resume thinking aloud (without being too abrupt a reminder). Sometimes participants may be unusually chatty, which may distract them from the task(s). When this happens, politely steer the participant back to the task.

In traditional think-aloud approaches (e.g., Boren and Ramey, 2000; Ericsson and Simon, 1984), it is recommended that researcher interventions are kept to a minimum in an attempt to avoid the interventions changing what users subsequently say or do as they continue to interact with the system. However, Nørgaard and Hornbæk (2006) found that, when conducted in practice, think-aloud studies did not do this. While this can be viewed negatively, this need not necessarily be the case; in think-aloud studies aimed at understanding users' interaction behaviour and their rationale behind this behaviour, asking questions can be more useful than staying silent. McDonald et al. (2015) found that the most useful types of intervention a researcher can make during a think-aloud observation are those that sought participant explanations and opinions. Interventions aimed at seeking clarification about participants' actions were found to be less useful. The decision on whether, how and how often to intervene in a think-aloud study should be made by referring back to the purpose of the study and, ultimately, by asking oneself, "are the benefits of intervening in this way likely to outweigh the drawbacks?" Piloting the study allows the researcher to find out, and to amend their approach if necessary. As with most other data gathering techniques, there are many different ways to go about gathering data, and these are shaped by the interests of the researcher, the purpose of the study and the practicalities of the situation. Olmsted-Hawala et al. (2010) outline and compare several different think-aloud protocols that you may want to consider.

4.4 SEMI-STRUCTURED INTERVIEWS

While think-alouds are often effective ways to gather verbal data from participants about perceptions and use of technology, they are only possible when people do "work" in a fixed place and already have access to the technology of interest. When "work" is mobile, or when the focus is on people's perceptions rather than their actions, or infrequent events that are hard to observe, interviews (discussed in depth by Portigal, 2013) are often a more appropriate way of gathering data.

Interviews may be more or less structured; a completely structured interview is like a questionnaire in that all questions are pre-determined, although a variety of answers may be expected; a completely unstructured interview is more like a conversation, albeit one with a particular focus and purpose. Semi-structured interviews fall between these poles, in that many questions (or at least themes) will be planned ahead of time, but lines of enquiry will be pursued within the interview to follow up on interesting and unexpected avenues that emerge.

Interviews are best suited for understanding people's perceptions of and experiences with technology. People's ability to self-report facts accurately is limited; for example, in one study (Blandford and Rugg, 2002), we asked participants to tell us how they completed a routine task,

and then to show us how they completed it. The practical demonstration revealed many steps and nuances that were absent from the verbal account: these details were taken for granted, so obvious that participants did not even think to mention them.

It is important to prepare carefully for interviews. One key step is recruiting suitable participants (discussed in the previous chapter). Another is planning the interview carefully (Arthur and Nazroo, 2003). Even though semi-structured interviews are less formal than structured ones, they are more than coffee shop chats: they have a purpose, and you will typically plan to cover several topics that address that purpose. This plan is called a topic guide, semi-structured interview script or interview guide. It should list topics to cover, and may include examples of possible questions that might be asked, or adapted. It can be useful to have prepared important questions verbatim—not because the question should be asked rigidly as prepared, but that it gives one way of asking it. This is particularly valuable if the researcher's mind goes blank during the interview. The topic guide should also serve as a plan for the interview, providing a logical order for covering topics. In practice, participants may introduce topics earlier than you plan, so the plan may change substantially. The overall plan for an interview would typically have the following structure:

1. **Opening the conversation:** It is important to put participants at their ease early on, and to assure them that they have expertise and experiences that you wish to understand.

2. **Introducing the research:** This involves ensuring that the participant is aware of the purpose of the research, and has given informed consent and understands their right to withdraw. It is also important to check whether they are happy to have the interview recorded.

3. **Beginning the interview:** The early stages usually focus on gathering background facts. This might include details about the participant's job or technology use. This can help with putting participants at their ease as well as contextualising the rest of the interview.

4. **During the interview:** The body of the interview will be shaped by the themes of interest for the research. HCI interviews are likely to involve participants focusing on issues surrounding the usability, usefulness and use of technology. These are likely to be topics they do not consider in such depth in their everyday lives; for many people, technology design and use are not the focus of their attention, except when it goes wrong. It can be helpful to have access to the technology during the interview, if this is possible.

5. **Closing the interview:** Participants should be given the chance to add anything else they want to say—e.g., on closely related topics, or things they forgot to say earlier. Many participants think of additional things to say once the recorder is off, and these may be noted. At the end, participants should be thanked and told what will happen next with

the data they provided. For example, the interview data may be used to inform future technology design. Participants are often glad to contribute to studies that aim to improve the technology they work with.

When interviewing, it is important to avoid leading questions and to make sure all questions are clear and succinct. It is often effective to employ a variety of strategies for questioning, including the use of broad and narrow questions. Try to use open rather than closed questions to invite detail. A useful technique for probing more detail is to echo the participant's words. For example, if the participant says, "I wish the information on this screen was clearer" and then goes silent, the researcher might say, "you wish the information was clearer?" This can invite the participant to provide more detail while demonstrating that the researcher is listening.

Within the core phase of interviewing, one technique to help with recall is the use of examples, asking people to focus on the details of specific incidents rather than generalisations. For example, the critical incident technique (Flanagan, 1954) can be used to elicit details of unusual and memorable past events. In the context of HCI, this might include times when a technology failed or when particular demands were placed on a system. A variant of this approach is the Critical Decision Method (Klein at al., 1989). In brief, this approach involves working with participants to reconstruct their thought processes while dealing with a problematic situation that involved working with partial knowledge and making difficult decisions. The Critical Decision Method helps to elicit aspects of expertise that are particularly well suited to studying technology use in high-pressure environments where the situation is changing rapidly and decisions need to be made, such as control rooms, operating theatres and flight decks.

When exploring future design possibilities, it is often useful to be very "grounded" to get at critical details that need to be understood for interaction design. Figure 4.1 shows some example questions that we devised for understanding women's needs for a decision support tool for making choices about contraception.

- Think back to the most recent (or the first) time you had to make a choice about contraception.
- What was it that caused you to review your choice of contraception?
- Talk me through how you made the decision: who did you talk with about it? What sources of information did you consult? Did you look online for information? Did you use any online tools to help you make a decision? Do you remember which ones?
- [If they used online resources]: What features of the resources did you find particularly helpful [ideally focusing on named resources if they can remember them]? Were there things they could have done better, or features that you'd have liked that weren't available?
- If you look ahead to the future, what do you think might prompt you to review your choice of contraception?
- Can you imagine any new kinds of online resources or apps that you'd like to see to help you make an informed choice? What might they be like?

Figure 4.1: Example questions to probe past experiences for the design of a future contraception decision support tool.

When planning for the design of future tools, it is important to understand the contexts in which people might choose to use them. To make the situation "real" for people, it is often effective to present detailed scenarios of use and invite people to critique them. An example from the same study is shown in Figure 4.2.

Imagine the following situation:

At your local chemist, they've installed a small, discreet booth (it looks a bit like a photo booth, except that it has neither photos nor signage on the outside) near the pharmacy counter. When you visit the chemist (for whatever reason), the shop assistant tells you that the booth is available for you if ever you wish to review your method of contraception, and hands you a short leaflet describing the decision support tools that you can access in the booth and inviting you to try it out. You step inside and draw the curtain. There, you find an interactive display that allows you to explore the benefits and limitations of a wide range of contraceptive methods, to express your values, to explore myths and truths about different methods, and to print out information about the methods you find most interesting, together with details of how to get access to each of those methods or where to go if you wish to discuss the options further. You spend about 10 minutes in the booth. When you step outside, you notice a couple of other women hovering around, apparently waiting to try out the booth for themselves.

Could you imagine yourself doing this? What would prompt you to make use of such a resource? Would you feel comfortable about it? Would it be something you'd find a positive experience? Would it give you more confidence in your decision? How could it be improved?

Figure 4.2: Example scenario from a study that focused on the design of a future contraception decision support tool.

Not all HCI studies are heavily directed towards informing design: some focus more on understanding people's experiences with technology, or on constructing models of technology use in practice. Charmaz (2014) describes an intensive interview as a "directed conversation." Her focus is on interviewing within GT, and on eliciting participants' experiences. She emphasises the importance of listening, of being sensitive, and of encouraging participants to talk, of asking open-ended questions and not being judgmental. Although the participant should do most of the talking, the interviewer will shape the dialogue, steering the discussion towards areas of research interest while attending less to areas that are out of scope. She emphasises the "contextual and negotiated" (p. 71) qualities of an interview: that the interviewer is a participant in shaping the conversation. Therefore, it is often important to reflect on the interviewer's role when analysing the data and reporting the outcomes of a study.

Legard et al. (2003) present two views of in-depth interviewing. One starts from the premise that knowledge is "given" and that the researcher's task is to dig it out. Although they do not use the term, this is in a positivist tradition. The other view is an interpretivist one, i.e., that knowledge is negotiated through the conversation between interviewer and interviewee. We describe these contrasting traditions in Chapter 6. Legard et al. emphasise the importance of building a relationship, noting that the interviewer is a "research instrument," but also that researchers need "a degree

of humility, the ability to be recipients of the participant's wisdom without needing to compete by demonstrating their own" (p. 143). Some have introduced other instruments to complement how the interview and conversation is handled. For example, Blythe and colleagues used sketches and artwork as "tickets to talk" and "tickets to be silent" for people in a residential care home (Blythe et al., 2010). These acted as excuses to talk and afforded more comfortable silences within a shared space respectively. These metaphorical tickets could suit engagement with groups that are vulnerable, different from ourselves, and when discussing potentially sensitive non-work-related issues.

4.5 FOCUS GROUPS

Focus groups (e.g., Krueger and Casey, 2014) may be an alternative to interviews. However, they also have important differences. The researcher typically takes a role as facilitator but the main interactions are between participants, whose responses build on and react to each others'. The composition of a focus group can have a great effect on the dynamic and outcome in terms of data gathered. Sometimes a decision will be made to gather data through focus groups to exploit the positive aspects of group dynamics; at other times, the decision will be more pragmatic. For example, Adams et al. (2005) gathered data from individual practicing doctors through interviews, because these people typically had their own offices (a location for an interview), but also had very busy diaries, so that each interview had to be scheduled for a time when the participant was available (and many had to be delayed or rescheduled due to the demands of work). However, they gathered data from trainee nurses through focus groups because these people formed a cohort who knew each other reasonably well, and who often had breaks at the same time, so it was both easier and more productive to conduct focus groups than interviews.

Planning for a focus group has many similarities with planning for interviews, except that all people in the group need to be introduced, that questions cannot reasonably be so detailed or personal and that topics should be presented in a way that encourages open discussion between participants. It is usually a good idea to establish and agree to some rules at the beginning of the focus group to ensure that people are willing and able to express their views. For example, participants might be encouraged to take turns in speaking and to encourage others to speak so that everyone has a say. It is also useful to reassure participants that their views will remain confidential. Towards the end of the focus group, it is useful for the researcher to sum up key themes that arose to check that participants agree with the summary.

An important purpose of HCI focus groups is often to understand people's experiences with an existing technology and to elicit requirements for new or improved technology. Traditional HCI approaches such as personas and scenarios can be useful in supporting these types of focus groups. For example, when we were at the early stages of designing a "semantic sketchbook" mobile app that aimed to support users in making connections between people, places and information on the

Web, we ran a focus group with potential users of the app to elicit their requirements. In the focus group, we presented several personas and scenarios to illustrate potential uses of the app and then asked questions based on them. For example, one of the personas, Richard, was invited to provide the app with access to his calendar (in order for the app to suggest places he might want to visit when he was already in a particular area). We asked the focus group participants what would encourage and discourage them to provide the app with access to their calendars. While we received a variety of responses, we were able to converge on a consensus that nothing would completely reassure participants. We therefore decided against supporting this functionality in our subsequent designs. The personas and scenarios helped participants to better understand the implications of proposed design features.

4.6 DIARY STUDIES AND AUTOETHNOGRAPHY

Diary studies enable participants to record data in their own time, at particular times of day or when a particular trigger occurs. Diary entries may be more or less structured; for example, the Experience Sampling Method (Csikszentmihalyi and Larson, 2014; Consolvo and Walker, 2003) requires participants to report their current status in a short, structured form, often on their smartphones, whereas video diaries may allow participants to audio-record their thoughts, with accompanying video, with minimal structure. Kamsin et al. (2012) investigated people's time management strategies and tools using both interviews and video diaries. While interviews gave good insights into people's overall strategies and priorities, the immediacy of video diaries delivered a greater sense of the challenges that people faced in juggling the demands on their time and of the central role that email plays in many academics' time management. As an alternative to a video diary, it is possible to ask participants to capture their own images related to the focus of the research study, e.g., on their smartphones. These images can act as prompts for later interviews (e.g., Kindberg et al., 2005), where the researcher can ask participants for details about the images and why they were taken.

When planning a diary study, it is important to prepare clear instructions for participants, and to pilot test them with a few volunteers to make sure that they are not open to misinterpretation. When recruiting people to a diary study, it is common to plan an initial interview to introduce participants to the study and allow them to answer any questions they may have, and a debriefing interview to enable participants to reflect on their experiences and discuss the data in more detail. It is also often useful to recruit more diary study participants than you think you will need, as some will inevitably drop out or not record data as regularly as required.

Another approach that has been used occasionally to better understand user experience, particularly with mobile and personal devices, is autoethnography (Ellis et al., 2011; O'Kane et al., 2014). This is a form of diary study where the diary is kept by the researcher to record their experiences of living with a particular technology. For example, O'Kane "lived with" a wrist blood pressure

monitor used by people with conditions such as hypertension. While a single person's experience cannot be considered representative of a broader population, it can be an excellent starting point. O'Kane et al. (2014) note that autoethnography can be a useful first step in user research as it can provide in-depth data and fresh insights that might help in planning subsequent studies with other participants.

Figure 4.3: Exemplar photos from an autoethnography (O'Kane et al., 2014), illustrating different contexts in which the researcher found herself measuring her blood pressure (a dark place, a washroom, an airport lounge, a restaurant, a café). Images courtesy of Aisling Ann O'Kane. Far left image from O'Kane et al. (2014). Used with permission.

4.7 WORKING WITH EXISTING SOURCES

There are some research questions that are best addressed by analysing existing sources. For example, reviews of mobile apps can provide an overview of what certain people think of the app, and published games reviews can provide insights into what features matter to games reviewers (Calvillo-Gamez et al., 2008). When working with existing textual sources, it is important to understand the limitations of those sources. Without knowledge of the authors or the ability to ask further questions, you are limited to the data as presented. It is also important to determine criteria for including and excluding particular text and to apply those criteria rigorously and transparently. For example, Rubin et al. (2010) analysed blog posts on Google Blog with a focus on finding potential examples of serendipity ("happy accidents"). They analysed only those blog posts that included one of several defined phrases in the blog text, e.g., "I had an aha moment" or "discovered…by accident."

Another useful source of data can be videos (e.g., from YouTube), particularly when there is existing data for contexts that may be hard to access, such as people's homes. For example, Paay et al. (2015) discuss the use of existing video material to study people's interactions while cooking. Similarly, Blythe and Cairns (2009) draw on user-generated content (particularly YouTube resources)

to present an analysis of people's responses to a new smart phone, exploring the use of different analysis methods (the theme for the following chapter) to draw out insights from the data.

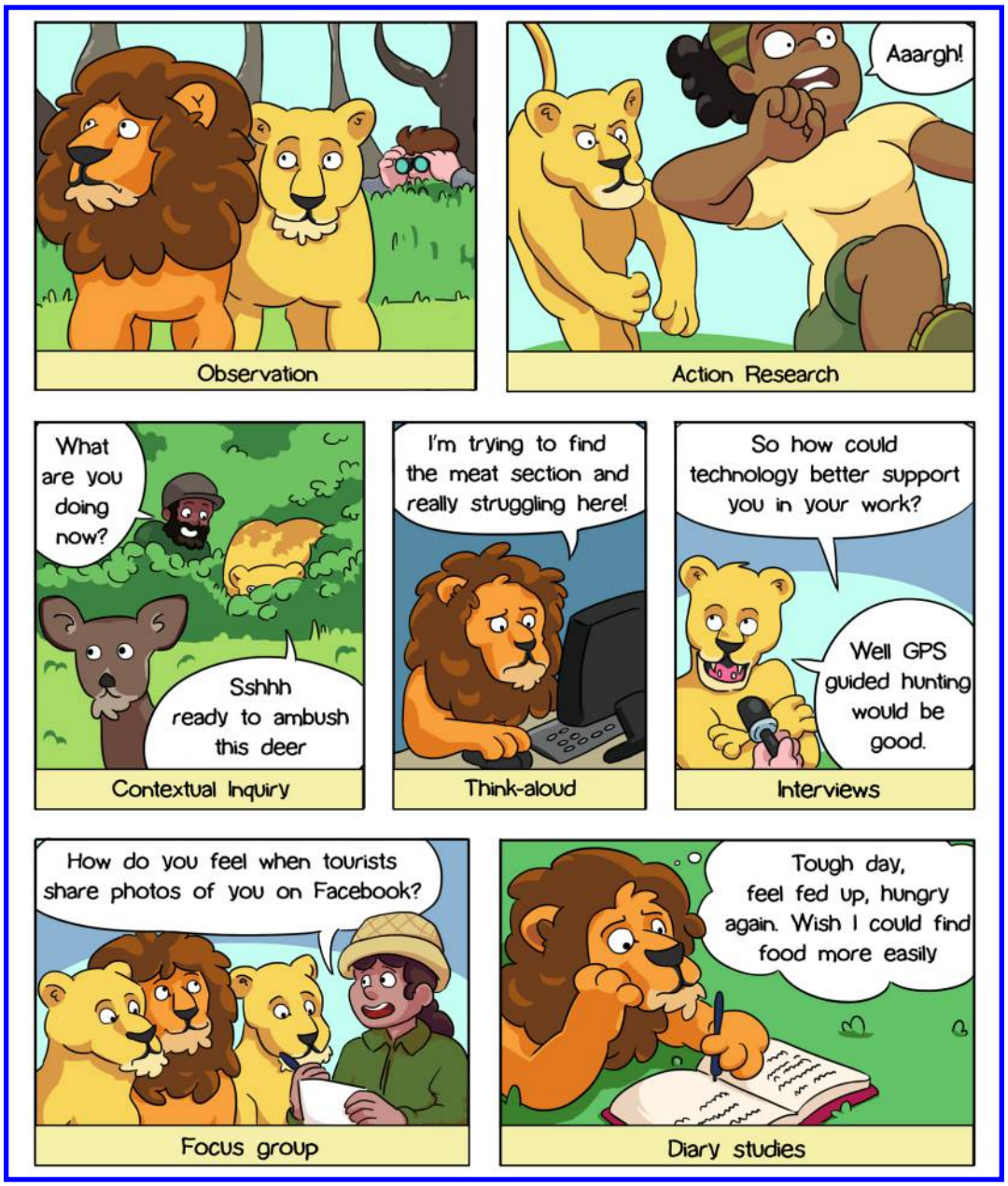

Figure 4.4: There are many different semi-structured qualitative methods and techniques that can be adopted and adapted to good effect. Different methods will be more or less suitable for different purposes.

4.8 SUMMARY AND CHECKLIST: DATA GATHERING

Researchers want to gather the most appropriate and best quality data that they can, so that the next stage (analysis) delivers valuable findings.

Checklist C summarises some of the issues that need to be considered when gathering data.

Checklist C: Data gathering	
Techniques for data gathering	How will data be gathered (interviews, observation, etc.)? How will it be recorded? If multiple methods are to be used, how will they be sequenced and coordinated (see Chapter 6)? What role (if any) will theory play in data gathering? What protocol will be used for observations? What script will be used for semi-structured interviews? What participant instructions will be given for think-alouds? How will data gathering be timed, e.g., to sample particular kinds of activity? What is the likely relationship between interviewer and participant, and how is this likely to affect the data that is gathered? [Reflect:] Is the proposed data gathering method appropriate to the purpose of the study?

Bibliography

Adams, A., Blandford, A., and Lunt, P. (2005). Social empowerment and exclusion: A case study on digital libraries. *ACM Transactions on CHI*. 12.2. 174–200. DOI: 10.1145/1067860.1067863. 54, 89

Adams, A. and Blandford, A. (2005). Digital libraries' support for the user's 'information journey'. *Proceedings of the 5th ACM/IEEE-CS joint conference on Digital libraries* (pp. 160–169). ACM. DOI: 10.1145/1065385.1065424. 45

Adams, A., Lunt, P., and Cairns, P. (2008). A qualitative approach to HCI research. In: Cairns, Paul and Cox, Anna eds. *Research Methods for Human-Computer Interaction*. Cambridge, UK: Cambridge University Press, pp. 138–157. 69, 90

Ament, M. G. A., Cox, A. L., Blandford, A., and Brumby, D. P. (2013). Making a task difficult: Evidence that device-oriented steps are effortful and error-prone. *Journal of Experimental Psychology: Applied*, Vol 19(3), 195-204. DOI: 10.1037/a0034397. 62

Anderson, R. J. (1994). Representations and requirements: The value of ethnography in system design. *Human-computer Interaction*, 9(3), 151–182. DOI: 10.1207/s15327051hci0902_1. 64

Arthur, S. and Nazroo, J. (2003). Designing fieldwork strategies and materials. In J. Ritchie and J. Lewis (Eds.) *Qualitative Research Practice: A Guide for Social Science Students and Researchers*, London: Sage, pp. 109–137. 41

Atkinson, R. and Flint, J. (2001). Accessing hidden and hard-to-reach populations: Snowball research strategies. *Social Research Update*, 33(1), 1–4. 26

Atkinson, P. and Hammersley, M. (1994). Ethnography and participant observation. *Handbook of Qualitative Research*, 1(23), 248–261. 68

Attfield, S., Fegan, S., and Blandford, A. (2008). Idea Generation and Material Consolidation: Tool Use and Intermediate Artefacts in a Case Study of Journalistic Writing. *Cognition, Technology & Work*. DOI: 10.1007/s10111-008-0111-6. 30

Attfield, S. and Blandford, A. (2011). Making sense of digital footprints in team-based legal investigations: the acquisition of focus. *Human–Computer Interaction Journal*. 26(1&2). 38–71. DOI: 10.1080/07370024.2011.556548. 10

Barbour, R. S. (2001). Checklists for improving rigour in qualitative research: a case of the tail wagging the dog?. *BMJ: British Medical Journal*, 322(7294), 1115–1117. DOI: 10.1136/bmj.322.7294.1115. 94

BBC (2014). Nature: behind the scenes. www.bbc.co.uk/nature/collections/p00mr6nq (accessed 1st Feb. 2016). xvii

Beyer, H. and Holtzblatt, K. (1998). *Contextual Design: Defining Customer-centered Systems.* Elsevier. 36, 68

Blandford, A. (2014). Semi-structured qualitative studies. In: Soegaard, Mads and Dam, Rikke Friis (eds.). *The Encyclopedia of Human-Computer Interaction*, 2nd Ed. Aarhus, Denmark: The Interaction Design Foundation. Available online at http://www.interaction-design.org/encyclopedia/semi-structured_qualitative_studies.html. xv

Blandford, A. and Attfield, S. (2010). *Interacting with information.* Synthesis Lectures on Human-Centered Informatics, 3(1), 1–99. Morgan & Claypool. DOI: 10.2200/S00227ED-1V01Y200911HCI006.1

Blandford, A. and Rugg, G. (2002). A case study on integrating contextual information with usability evaluation. *International Journal of Human-Computer Studies*. 57.1, 75–99. DOI: 10.1006/ijhc.2002.1013. 40

Blandford, A. and Wong, W. (2004). Situation Awareness in Emergency Medical Dispatch. *International Journal of Human-Computer Studies*. 61(4). 421–452. DOI: 10.1016/j.ijhcs.2003.12.012. 27, 35, 38, 68

Blandford, A., Adams, A., Attfield, S., Buchanan, G., Gow, J., Makri, S., Rimmer, J., and Warwick, C. (2008a). The PRET A Rapporter framework: Evaluating digital libraries from the perspective of information work. *Information Processing & Management*. 44. 4–21. DOI: 10.1016/j.ipm.2007.01.021. 11

Blandford, A., Berndt, E., Catchpole, K., ... and Randell, R. (2015a). Strategies for conducting situated studies of technology use in hospitals. *Cognition, Technology & Work*, 17(4), 489–502. DOI: 10.1007/s10111-014-0318-7. 14

Blandford, A., Farrington, K., Mayer, A., Walker, D., and Rajkomar, A. (2015b). Coping strategies when self-managing care on home haemodialysis. *Journal of Renal Nursing*, 7(5), 222–228. DOI: 10.12968/jorn.2015.7.5.222. 15

Blomberg, J. and Burrell, M. (2009). An ethnographic approach to design. In: Sears, A. & Jacko, J. (Eds.) *Human-Computer Interaction: Development Process*, pp. 71–94. NY: USA. CRC Press. 64

Blythe, M. and Cairns, P. (2009). Critical methods and user generated content: the iPhone on YouTube. *Proc. SIGCHI Conference on Human Factors in Computing Systems* (1467–1476). ACM. DOI: 10.1145/1518701.1518923. 47

Blythe, M., Wright, P., Bowers, J., Boucher, A., Jarvis, N., Reynolds, P., and Gaver, B. (2010). Age and experience: ludic engagement in a residential care setting. *Proceedings of the 8th ACM Conference on Designing Interactive Systems* (pp. 161–170). ACM. DOI: 10.1145/1858171.1858200. 45

Boren, T. and Ramey, J. (2000). Thinking aloud: Reconciling theory and practice. *Professional Communication, IEEE Transactions on*, 43(3), 261–278. DOI: 10.1109/47.867942. 40

Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. DOI: 10.1191/1478088706qp063oa. 3, 56, 57, 80, 98

Bryman A. and Burgess RG (1994). Developments in qualitative data analysis: an introduction. In A Bryman & RG Burgess (Eds.) *Analysing Qualitative Data*. London: Routledge. Pp. 1–17. DOI: 10.4324/9780203413081_chapter_11. 2

Button, G. and Sharrock, W. (2009). *Studies of Work and the Workplace in HCI: Concepts and Techniques.* Synthesis Lectures on Human-Centered Informatics, 2(1), 1–96. Morgan & Claypool. DOI: 10.2200/S00177ED1V01Y200903HCI003. 67

Byron, K. (2013). *Creativity in Research. Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship*, 437–447. DOI: 10.1007/978-1-4614-3858-8_9. 91

Calvillo-Gamez, E. H., Cairns, P., and Blandford, A. (2008). Assessing the gaming experience using puppetry. In Bernhaupt, R., IJsselsteijn, W., Mueller, F., Tscheligi, M., and Wixon, D. (Eds.). *Workshop on Evaluating User Experience in Games. ACM SIGCHI*. ACM Press. 47

Carayon, P., Hundt, A. S., Karsh, B. T., Gurses, A. P., Alvarado, C. J., Smith, M., and Brennan, P. F. (2006). Work system design for patient safety: the SEIPS model. *Quality and Safety in Health Care*, 15(suppl 1), i50–i58. DOI: 10.1136/qshc.2005.015842. 93

CASP (2013). CASP Qualitative checklist. Available from http://media.wix.com/ugd/dded87_29c5b002d99342f788c6ac670e49f274.pdf (accessed 17/11/15). 84

Charmaz, K. (2014). *Constructing Grounded Theory* (2nd ed.). Sage. 44, 59, 69, 80

Concato, J., Shah, N., and Horwitz, R. I. (2000). Randomized, controlled trials, observational studies, and the hierarchy of research designs. *New England Journal of Medicine*, 342(25), 1887–1892. DOI: 10.1056/NEJM200006223422507. 88

Consolvo, S. and Walker, M. (2003). Using the experience sampling method to evaluate ubicomp applications. *Pervasive Computing, IEEE*, 2(2), 24–31. DOI: 10.1109/MPRV.2003.1203750. 46

Corbin, J. and Strauss, A. (2015). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory* (4th Ed). Sage. 12, 27, 69, 70, 91

Crabtree, A., Nichols, D. M., O'Brien, J., Rouncefield, M., and Twidale, M. B. (2000). Ethnomethodologically informed ethnography and information system design. *Journal of the American Society for Information Science*, 51(7), 666–682. DOI: 10.1002/(SICI)1097-4571(2000)51:7<666::AID-ASI8>3.0.CO;2-5. 67

Crabtree, A., Rodden, T., Tolmie, P., and Button, G. (2009). Ethnography considered harmful. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 879–888). ACM. DOI: 10.1145/1518701.1518835. 10

Csikszentmihalyi, M. and Larson, R. (2014). Validity and reliability of the experience-sampling method. *Flow and the Foundations of Positive Psychology* (pp. 35–54). Springer Netherlands. DOI: 10.1007/978-94-017-9088-8_3. 46

Curzon, P., Blandford, A., Butterworth, R., and Bhogal, R. (2002). Interaction design issues for car navigation systems. In Sharp, Chalk, LePeuple, and Rosbottom (Eds.) *Proc. HCI* 2002 (Vol. 2). 38–41. BCS. 12

Cycil, C. , Perry, M,J., and Laurier, E. (2014). Designing for frustration and disputes in the family car. *International Journal of Mobile HCI*, 6 (2). pp. 46–60. DOI: 10.4018/ijmhci.2014040104. 16

Denzin, N. K. and Lincoln, Y. S. (2011). *The SAGE Handbook of Qualitative Research*. Sage. 2, 3, 18

Diriye, A., Blandford, A., and Tombros, A. (2010). Exploring the impact of search interface features on search tasks. *Research and Advanced Technology for Digital Libraries* (pp. 184–195). Springer Berlin Heidelberg. DOI: 10.1007/978-3-642-15464-5_20. 39

Dourish, P. (2006). Implications for design. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 541–550). ACM. DOI: 10.1145/1124772.1124855. 10, 89

Ellis, C., Adams, T. E., and Bochner, A. P. (2011). Autoethnography: an overview. *Historical Social Research/Historische Sozialforschung*, 273–290. 46

Ellis, D., Cox, D., and Hall, K. (1993). A comparison of the information-seeking patterns of researchers in the physical and social sciences. *Journal of Documentation* 49(4), pp. 356–369. DOI: 10.1108/eb026919. 19

Ellis, D. and Haugan, M. (1997). Modelling the information-seeking patterns of engineers and research scientists in an industrial environment. *Journal of Documentation* 53(4), pp. 384–403. DOI: 10.1108/EUM0000000007204. 19

Erdelez, S. (2004). Investigation of information encountering in the controlled research environment. *Information Processing and Management*, 40(6), 1013–102. DOI: 10.1016/j.ipm.2004.02.002. 54

Ericsson, K.A. and Simon, H.A. (1984). *Protocol Analysis: Verbal Reports as Data.* Cambridge, MA: MIT Press. 40

Flanagan, J. C. (1954). The critical incident technique. *Psychological Bulletin*, 51(4), 327. DOI: 10.1037/h0061470. 42

Flick, U. (2009). *An Introduction to Qualitative Research*. Sage. 98

Fry, C. L., Ritter, A., Baldwin, S., Bowen, K. J., Gardiner, P., Holt, T., Jenkinson, R. & Johnston, J. (2005). Paying research participants: a study of current practices in Australia. *Journal of Medical Ethics*, 31(9), 542–547. DOI: 10.1136/jme.2004.009290. 16

Fugard, A. J. and Potts, H. W. (2015). Supporting thinking on sample sizes for thematic analyses: a quantitative tool. *International Journal of Social Research Methodology*, 18(6), 669–684. DOI: 10.1080/13645579.2015.1005453. 30

Furniss, D. and Blandford, A. (2006). Understanding Emergency Medical Dispatch in terms of Distributed Cognition: a case study. *Ergonomics*, 49(12-13), 1174–1203. DOI: 10.1080/00140130600612663. 15, 19, 20, 66

Furniss, D., Blandford, A., and Curzon, P. (2011a). Confessions from a grounded theory PhD: experiences and lessons learnt. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 113–122). ACM. DOI: 10.1145/1978942.1978960. 12, 71, 80

Furniss, D., Blandford, A., and Mayer, A. (2011b). Unremarkable errors: Low-level disturbances in infusion pump use. *Proc. BCS HCI Conference*. 197–204. http://dl.acm.org/citation.cfm?id=2305353.

Furniss, D. (2014). HCI observations on an oncology Ward: A fieldworker's experience. Chapter 3 of D. Furniss, A. A. O'Kane, R. Randall, S. Tavena, H. Mentis, and A. Blandford (Eds), *Fieldwork for Healthcare: Case Studies Investigating Human Factors in Computing Systems*, Vol. 1. Synthesis Lectures on Assistive, Rehabilitative, and Health-Preserving Technologies. Morgan & Claypool. DOI: 10.2200/S00552ED1V01Y201311ARH005. 36

Furniss, D., Masci, P., Curzon, P., Mayer, A., and Blandford, A. (2015). Exploring medical device design and use through layers of distributed cognition: how a glucometer is cou-

pled with its context. *Journal of Biomedical Informatics*, 53, 330–341. DOI: 10.1016/j.jbi.2014.12.006. 1, 15, 38

Gale, N. K., Heath, G., Cameron, E., Rashid, S., and Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology*, 13(1), 117. DOI: 10.1186/1471-2288-13-117. 56

Garris, R., Ahlers, R., and Driskell, J. (2002). Games, motivation and learning: a research and practice model. *Simulation and Gaming*. 33. 44–467. DOI: 10.1177/1046878102238607. 80

Gaver, W. and Dunne, A. (1999). Projected realities: conceptual design for cultural effect. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 600–607). ACM. DOI: 10.1145/302979.303168. 16

Glaser, B. G. and Strauss, A. L. (2009). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Transaction Books. 69

Grady, C., Dickert, N., Jawetz, T., Gensler, G., and Emanuel, E. (2005). An analysis of US practices of paying research participants. *Contemporary Clinical Trials*, 26(3), 365–375. DOI: 10.1016/j.cct.2005.02.003. 16

Grbich, C. (2013). *Qualitative Data Analysis: An Introduction*. 2nd ed. Sage. 69, 98

Guion, L. (2002). Triangulation: Establishing the Validity of Qualitative Studies. University of Florida Institute of Food and Agricultural Sciences working paper FCS6014. http://edis.ifas.ufl.edu/fy394. 94

Hallgren, K. A. (2012). Computing inter-rater reliability for observational data: an overview and tutorial. *Tutorials in Quantitative Methods for Psychology*, 8(1), 23. 63

Hammersley, M. and Atkinson, P. (2007). *Ethnography: Principles in Practice*. Routledge. 64

Harboe, G., Minke, J., Ilea, I., and Huang, E. M. (2012). Computer support for collaborative data analysis: augmenting paper affinity diagrams. *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work* (pp. 1179–1182). ACM. DOI: 10.1145/2145204.2145379. 55

Hartswood, M., Procter, R., Rouncefield, M., and Slack, R. (2003). Making a case in medical work: implications for the electronic medical record. *Computer Supported Cooperative Work*, 12(3), 241–266. DOI: 10.1023/A:1025055829026. 10

Hayes, G. R. (2011). The relationship of action research to human-computer interaction. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 18(3), 15. DOI: 10.1145/1993060.1993065. 69

Heath, C. and Luff, P. (1991). Collaborative activity and technological design: Task coordination in London Underground control rooms. *Proceedings of the second conference on European Conference on Computer-Supported Cooperative Work* (pp. 65–80). Kluwer. DOI: 10.1007/978-94-011-3506-1_5. 65

Henwood, K.L. and Pidgeon, N.F. (1992). Qualitative research and psychological theorising. *British Journal of Psychology*, 83, 97–111. DOI: 10.1111/j.2044-8295.1992.tb02426.x. 89, 90, 91, 93

Hertzum, M. and Jacobsen, N. E. (2001). The evaluator effect: A chilling fact about usability evaluation methods. *International Journal of Human-Computer Interaction*, 13(4), 421–443. DOI: 10.1207/S15327590IJHC1304_05. 18

Hollan, J., Hutchins, E., and Kirsh, D. (2000). Distributed cognition: toward a new foundation for human-computer interaction research. *ACM Transactions on Computer-Human Interaction*, 7(2), 174–196. DOI: 10.1145/353485.353487. 15, 65, 66

Holtzblatt, K. and Beyer, H. R. (2013). Contextual Design. In: Soegaard, Mads and Dam, Rikke Friis (eds.). *The Encyclopedia of Human-Computer Interaction*, 2nd Ed. Aarhus, Denmark: The Interaction Design Foundation. Available online at http://www.interaction-design.org/encyclopedia/contextual_design.html. 35, 68

Hsu, A. and Blandford, A. (2014). Designing for Psychological Change: Individuals' Reward and Cost Valuations in Weight Management. *Journal of Medical Internet Research*. 16.6:e138. http://www.jmir.org/2014/6/e138/. 1

Hughes, J., King, V., Rodden, T., and Andersen, H. (1994). Moving out from the control room: Ethnography in system design. *Proceedings of the 1994 ACM Conference on Computer Supported Cooperative Work* (pp. 429–439). ACM. DOI: 10.1145/192844.193065. 10

Hutchins, E. (1995). *Cognition in the Wild* (Vol. 262082314). Cambridge, MA: MIT press. 10

Joffe, H. (2012). *Thematic Analysis. Qualitative Methods in Mental Health and Psychotherapy: A Guide for Students and Practitioners*, 209–223. 57, 63, 98

Kamsin, A., Blandford, A., and Cox, A. L. (2012, May). Personal task management: my tools fall apart when I'm very busy! *CHI'12 Extended Abstracts on Human Factors in Computing Systems* (pp. 1369–1374). ACM. 12, 27, 46, 73

Kaptelinin, V. (2013). Activity Theory. In: Soegaard, Mads and Dam, Rikke Friis (eds.). *The Encyclopedia of Human-Computer Interaction*, 2nd Ed. Aarhus, Denmark: The Interaction Design Foundation. Available online at http://www.interaction-design.org/encyclopedia/activity_theory.html. 66

Karlson, A. K., Iqbal, S. T., Meyers, B., Ramos, G., Lee, K., and Tang, J. C. (2010). Mobile task-flow in context: a screenshot study of smartphone usage. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 2009–2018). ACM. DOI: 10.1145/1753326.1753631. 16

Kidder, L. H. and Fine, M. (1987). Qualitative and quantitative methods: When stories converge. *New Directions for Program Evaluation*, 1987(35), 57–75. DOI: 10.1002/ev.1459. 112

Kindberg, T., Spasojevic, M., Fleck, R., and Sellen, A. (2005). The ubiquitous camera: An in-depth study of camera phone use. *Pervasive Computing, IEEE*, 4(2), 42–50. DOI: 10.1109/MPRV.2005.42. 10, 46

Kippendorff, K. (1980). *Content Analysis: An Introduction to its Methodology*. Beverly Hills, CA:Sage Publishers. 62, 63

Kjeldskov, J. and Graham, C. (2003). A review of mobile HCI research methods. In *Human-computer Interaction with Mobile Devices and Services* (pp. 317–335). Springer Berlin Heidelberg. DOI: 10.1007/978-3-540-45233-1_23. 69

Klein, G. A., Calderwood, R., and Macgregor, D. (1989). Critical decision method for eliciting knowledge. *IEEE Transactions on Systems, Man and Cybernetics*, 19(3), 462–472. DOI: 10.1109/21.31053. 42

Klein, H. K. and Myers, M. D. (1999). A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly*, 67–93. DOI: 10.2307/249410. 89, 91

Kock, N. (2013). Action Research: Its Nature and Relationship to Human-Computer Interaction. In: Soegaard, Mads and Dam, Rikke Friis (eds.). *The Encyclopedia of Human-Computer Interaction*, 2nd Ed. Aarhus, Denmark: The Interaction Design Foundation. Available online at http://www.interaction-design.org/encyclopedia/action_research.html. 35, 69

Krueger, R. A. and Casey, M. A. (2014). *Focus Groups: A Practical Guide for Applied Research*. Sage publications. 45

Kvale, S. and Brinkmann, S. (2009). *InterViews: Learning the Craft of Qualitative Research Interviewing*. Sage. 98

Laurie, J. and Blandford, A. (2016). Making time for mindfulness. *International Journal of Medical Informatics*. DOI: 10.1016/j.ijmedinf.2016.02.010. 73

Lazar, J., Feng, J. H., and Hochheiser, H. (2010). *Research Methods in Human-Computer Interaction*. Wiley. 69

Legard, R., Keegan, J., and Ward, K. (2003). In-depth interviews. In J. Richie & J. Lewis (Eds) *Qualitative Research Practice: A Guide for Social Science Students and Researchers*, 138–169. 44

Lewis, J. and Ritchie, J. (2003). Generalising from qualitative research. In Ritchie, J and Lewis, J (Eds.) *Qualitative Research Practice: A Guide for Social Science Students and Researchers*, 263–286. 89, 90

Li, S., Blandford, A., Cairns, P., and Young, R. M. (2008). The effect of interruptions on post-completion and other procedural errors: An account based on the activation-based goal memory model. *Journal of Experimental Psychology: Applied*. 14.4. 314–328. 62

Lincoln, Y. S. and Guba, E. G. (1985). Naturalistic Inquiry. Sage. DOI: 10.1016/0147-1767(85)90062-8. 93

Lipson, J. G. (1997). The politics of publishing: protecting participants' confidentiality. In J. Morse (Ed.) *Completing a Qualitative Project: Details and Dialogue*. Sage Publications. 81

Mackay, W. E. and Fayard, A. L. (1997). HCI, natural science and design: a framework for triangulation across disciplines. *Proceedings of the 2nd Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques* (pp. 223–234). ACM. DOI: 10.1145/263552.263612. 94

Makri, S., Blandford, A., Gow, J., Rimmer, J., Warwick, C., and Buchanan, G. (2007). A library or just another information resource? A case study of users' mental models of traditional and digital libraries. *Journal of the American Society of Information Science and Technology*. 58.3, 433-445. DOI: http://dx.doi.org/10.1002/asi.20510. 39

Makri, S., Blandford, A., and Cox, A.L. (2008a). Investigating the information-seeking behaviour of academic lawyers: From Ellis's model to design. *Information Processing and Management* 44(2), 613–634. DOI: 10.1016/j.ipm.2007.05.001. 1, 19, 25, 35, 39, 54, 92

Makri, S., Blandford, A., and Cox, A. L. (2008b). Using information behaviours to evaluate the functionality and usability of electronic resources: From Ellis's model to evaluation. *JASIST*. 59. 2244–2267. DOI: 10.1002/asi.20927. 92

Makri, S. and Warwick, C. (2010). Information for inspiration: understanding architects' information-seeking and use behaviours to inform design. *Journal for the American Society of Information Science and Technology*, 61 (9), 1745–1770. DOI: 10.1002/asi.21338. 1, 35, 39, 54

Makri, S. and Blandford, A. (2012). Coming across information serendipitously: Part 1—A process model. *Journal of Documentation*. Vol. 68, No. 5, 684–705. DOI: http://dx.doi.org/10.1108/00220411211256030. 27, 92

Makri, S., Blandford, A., and Cox, A. L. (2011). This is what I'm doing and why: Methodological reflections on a naturalistic think-aloud study of interactive information behaviour. *Information Processing & Management*, 47(3), 336–348. DOI: 10.1016/j.ipm.2010.08.001. 71

Makri, S., Blandford, A., Woods, M., Sharples, S., and Maxwell, D. (2014). Making my own luck: serendipity strategies and how to support them in digital information environments. *Journal of the Association for Information Science and Technology*, 65(11), pp. 2179–2194. DOI: 10.1002/asi.23200. 26, 65, 92

Marshall, P., Morris, R., Rogers, Y., Kreitmayer, S., and Davies, M. (2011). Rethinking 'multi-user': an in-the-wild study of how groups approach a walk-up-and-use tabletop interface. *Proc. CHI 2011*, pp. 3033–3042. ACM. DOI: 10.1145/1978942.1979392. 16

Mays, N. and Pope, C. (2000). Qualitative research in health care: Assessing quality in qualitative research. *BMJ: British Medical Journal*, 320(7226), 50. DOI: 10.1136/bmj.320.7226.50. 93, 94

McCarthy, J. and Wright, P. (2005). Putting 'felt-life' at the centre of human–computer interaction (HCI). *Cognition, Technology & Work*, 7(4), 262–271. DOI: 10.1007/s10111-005-0011-y. 10

McDonald, S., Zhao, T., and Edwards, H. M. (2015). Look who's talking: Evaluating the utility of interventions during an interactive think-aloud. *Interacting with Computers*. DOI: 10.1093/iwc/iwv014. 40

Mentis, H. M., Reddy, M., and Rosson, M. B. (2013). Concealment of emotion in an emergency room: Expanding design for emotion awareness. *Computer Supported Cooperative Work (CSCW)*, 22(1), 33–63. DOI: 10.1007/s10606-012-9174-2. 10

Miles, M. B. and Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook.* Sage. 25, 60, 93, 94, 98

Moggridge, B. (2007). *Designing Interactions*. Cambridge: MIT press. 10

Morse, J. M. (1997). *Completing a Qualitative Project*. Sage publications. 98

Nørgaard, M. and Hornbæk, K. (2006). What do usability evaluators do in practice?: an explorative study of think-aloud testing. *Proceedings of the 6th Conference on Designing Interactive Systems* (pp. 209–218). ACM. DOI: 10.1145/1142405.1142439. 40

O'Kane, A. A., Rogers, Y., and Blandford, A. E. (2014). Gaining empathy for non-routine mobile device use through autoethnography. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 987–990). ACM. DOI: 10.1145/2556288.2557179. 46, 47

Oliver, D. G., Serovich, J. M., and Mason, T. L. (2005). Constraints and opportunities with interview transcription: Towards reflection in qualitative research. *Social Forces*, 84(2), 1273–1289. DOI: 10.1353/sof.2006.0023. 51

Olmsted-Hawala, E. L., Murphy, E. D., Hawala, S., and Ashenfelter, K. T. (2010). Think-aloud protocols: A comparison of three think-aloud protocols for use in testing data-dissemination web sites for usability. *Proceedings CHI 2010*, 2381–2390. ACM: New York. DOI: 10.1145/1753326.1753685. 40

Paay, J., Kjeldskov, J., and Skov, M. B. (2015). Connecting in the kitchen: An empirical study of physical interactions while cooking together at home. *Proceedings 18th ACM Conference on Computer Supported Cooperative Work & Social Computing* (pp. 276–287). ACM. DOI: 10.1145/2675133.2675194. 47

Pace, S. (2004). A grounded theory of the flow experiences of Web users. *International Journal of Human-Computer Studies*, 60(3), 327-363. DOI: 10.1016/j.ijhcs.2003.08.005. 25

Palen, L. (1999). Social, individual and technological issues for groupware calendar systems. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 17–24). ACM. DOI: 10.1145/302979.302982. 10

Pennathur, P. R., Thompson, D., Abernathy III, J. H., Martinez, E. A., Pronovost, P. J., Kim, G. R., Lubomski, L. H., Marsteller, J. A., and Gurses, A. P. (2013). Technologies in the wild (TiW): human factors implications for patient safety in the cardiovascular operating room. *Ergonomics*, 56(2), 205–219. DOI: 10.1080/00140139.2012.757655. 93

Pidgeon, N. and Henwood, K. (1996). Grounded theory: Practical implementation. In *Handbook of Qualitative Research and Methods for Psychology and the Social Sciences*. 69

Pontis, S., Kefalidou, G., Blandford, A., Forth, J., Makri, S., Sharples, S., ... and Woods, M. (2015). Academics' responses to encountered information: Context matters. *Journal of the Association for Information Science and Technology*. DOI: 10.1002/asi.23502. 25

Portigal, S. (2013). *Interviewing Users: How to Uncover Compelling Insights*. Rosenfeld Media. 40

Preece, J., Sharp, H., and Rogers, Y. (2015). *Interaction Design* (4th ed.). Wiley. 17

Rajkomar, A. and Blandford, A. (2012). Understanding infusion administration in the ICU through distributed cognition. *Journal of Biomedical Informatics*. Vol. 45, No 3. 580–590. DOI: 10.1016/j.jbi.2012.02.003. 38

Rajkomar, A., Farrington, K., Mayer, A., Walker, D., and Blandford, A. (2014). Patients' and carers' experiences of interacting with home haemodialysis technology: implications for quality and safety. *BMC Nephrology*, 15(1), 195. DOI: 10.1186/1471-2369-15-195. 15, 27, 28

Rajkomar, A., Mayer, A., and Blandford, A. (2015). Understanding safety–critical interactions with a home medical device through Distributed Cognition. *Journal of Biomedical Informatics*, 56, 179–194. DOI: 10.1016/j.jbi.2015.06.002. 1, 28, 38, 65, 72

Randall, D. and Rouncefield, M. (2013). Ethnography. In: Soegaard, Mads and Dam, Rikke Friis (eds.). *The Encyclopedia of Human-Computer Interaction*, 2nd Ed. Aarhus, Denmark: The Interaction Design Foundation. Available online at http://www.interaction-design.org/encyclopedia/ethnography.html. 28, 64

Randell, R., Ruddle, R. A., Mello-Thoms, C., Thomas, R. G., Quirke, P., and Treanor, D. (2013). Virtual reality microscope versus conventional microscope regarding time to diagnosis: an experimental study. *Histopathology*, 62(2), 351–358. DOI: 10.1111/j.1365-2559.2012.04323.x. 28

Reason, P. and Bradbury, H. (Eds.). (2001). *Handbook of Action Research: Participative Inquiry and Practice*. Sage. 69

Rochlin, G. (1999). Safe operation as a social construct. Ergonomics. 42.11. 1549–1560. DOI: 10.1080/001401399184884. 80

Rode, J. A., Toye, E. F., and Blackwell, A. F. (2004). The fuzzy felt ethnography—understanding the programming patterns of domestic appliances. *Personal and Ubiquitous Computing*, 8(3-4), 161–176. DOI: 10.1007/s00779-004-0272-0. 35

Rode, J. A. (2011). Reflexivity in digital anthropology. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 123–132). ACM. DOI: 10.1145/1978942.1978961. 33

Roethlisberger F.J. and Dickson W.J. (1939). *Management and the Worker*. Cambridge, Mass., Harvard University Press. 34

Rogers, Y. (2012). *HCI Theory: Classical, Modern, and Contemporary*. Synthesis Lectures on Human-Centered Informatics. Morgan & Claypool. DOI: 10.2200/S00418ED1V01Y-201205HCI014. 14, 69

Rubin, V. L., Burkell, J., and Quan-Haase, A. (2010). Everyday serendipity as described in social media. *Proceedings of the American Society for Information Science and Technology*, 47(1), 1–2. DOI: 10.1002/meet.14504701409. 47

Schneider, H., Hill, S., and Blandford, A. (2016). Patients know best: Qualitative study on how families use patient-controlled personal health records. *Journal of medical Internet research*, 18(2), e43. DOI: 10.2196/jmir.4652. 10

Segerståhl, K. and Oinas-Kukkonen, H. (2011). Designing personal exercise monitoring employing multiple modes of delivery: Implications from a qualitative study on heart rate moni-

toring. *International Journal of Medical Informatics*, 80(12), e203–e213. DOI: 10.1016/j.ijmedinf.2011.08.011. 25

Shneiderman, B. (2001). *Leonardo's Laptop: Human Needs and the New Computing Technologies*. Cambridge, MA: MIT Press. 54

Silverman, D. (2013). *Doing Qualitative Research: A Practical Handbook*. (4th ed.) Sage Publications Limited. 98

Smith, J. A. (Ed.). (2008). *Qualitative Psychology: A Practical Guide to Research Methods.* Sage. 98

Smith, P., Blandford, A., and Back, J. (2009). Questioning, exploring, narrating and playing in the control room to maintain system safety. *Cognition Technology and Work*. 279-291. DOI: 10.1007/s10111-008-0116–1. 67, 80

Thimbleby, H. (2008). Write now. In P. Cairns and A. Cox (Eds.) *Research Methods in Human-Computer Interaction*, 196–211. 98

Vincent, C. J. and Blandford, A. (2015). Usability standards meet scenario-based design: Challenges and opportunities. *Journal of Biomedical Informatics*, 53, 243–250. DOI: 10.1016/j.jbi.2014.11.008. 97

Vom Lehn, D. and Heath, C. (2005). Accounting for new technology in museum exhibitions. *International Journal of Arts Management*, 11–21. 65

Wenger, E. (1998). *Communities of Practice: Learning, Meaning, and Identity*. Cambridge University Press. DOI: 10.1017/cbo9780511803932. 66

Willig, C. (2008). *Introducing Qualitative Research in Psychology*. 2nd ed. Open University Press. 98

Winkelman, W. J., Leonard, K. J., and Rossos, P. G. (2005). Patient-perceived usefulness of online electronic medical records: employing grounded theory in the development of information and communication technologies for use by patients living with chronic illness. *Journal of the American Medical Informatics Association*, 12(3), 306–314. DOI: 10.1197/jamia.M1712. 83

Wolcott, H. F. (2009). *Writing Up Qualitative Research*. 3rd ed. Sage. 79, 98

Wong, W. and Blandford, A. (2002). Analysing Ambulance Dispatcher Decision Making: Trialling Emergent Themes Analysis. In *Proc. HF2002* (electronic publication). 56

Woolrych, A., Hornbæk, K., Frøkjær, E., and Cockton, G. (2011). Ingredients and meals rather than recipes: A proposal for research that does not treat usability evaluation methods as indivisible wholes. *International Journal of Human-Computer Interaction*, 27(10), 940–970. DOI: 10.1080/10447318.2011.555314. 12

Yardley, L. (2000). Dilemmas in qualitative health research. *Psychology and Health*, 15(2), 215–228. DOI: 10.1080/08870440008400302. 12, 89

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Ann Blandford is Professor of Human–Computer Interaction at University College London and Director of the UCL Institute of Digital Health. Her research focuses on the design and use of interactive technology in healthcare delivery, and particularly on how to design systems that fit well in their context of use and for their intended purposes. She has published widely on the design and situated use of interactive health technologies, on how technology can be designed to better support people's needs and on modelling situated interactions. She has supervised over 20 Ph.D. student projects to completion, and around 100 MSc student dissertations.

Dominic Furniss is a Senior Research Associate at University College London. He works in Human Factors and HCI, largely in the context of healthcare. His expertise focuses on the evaluation of the design and use of technology in-situ, and understanding how technology enhances and disrupts the broader system it is embedded within. Qualitative research has been, and is, critical to this work. This has included atheoretical approaches using Grounded Theory, and developing novel methods to be adopted and adapted by others in Distributed Cognition and Resilience Engineering.

Stephann Makri is a Lecturer in Human–Computer Interaction at City University London, with over a decade of experience in qualitative HCI research. Motivated by big "how" questions of information interaction, such as "how do people look for and make use of information?" and "how do people come across information serendipitously?," Stephann has a passion for gaining a detailed understanding of interactive behaviour and feeding that understanding into suggestions for the design and improvement of interactive systems.