

Chapter 8

DATA GATHERING

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Objectives

The main goals of the chapter are to accomplish the following:

- Discuss how to plan and run a successful data gathering program.
- Enable you to plan and run an interview.
- Empower you to design a simple questionnaire.
- Enable you to plan and carry out an observation.

8.1 Introduction

Data is everywhere. Indeed, it is common to hear people say that we are drowning in data because there is so much of it. So, what is data? Data can be numbers, words, measurements, descriptions, comments, photos, sketches, films, videos, or almost anything that is useful for understanding a particular design, user needs, and user behavior. Data can be quantitative or qualitative. For example, the time it takes a user to find information on a web page and the number of clicks to get to the information are forms of quantitative data. What the user says about the web page is a form of qualitative data. But what does it mean to collect these and other kinds of data? What techniques can be used, and how useful and reliable is the data that is collected?

This chapter presents some techniques for data gathering that are commonly used in interaction design activities. In particular, data gathering is a central part of discovering requirements and evaluation. Within the requirements activity, data gathering is conducted

to collect sufficient, accurate, and relevant data so that design can proceed. Within evaluation, data gathering captures user reactions and their performance with a system or prototype. All of the techniques that we will discuss can be done with little to no programming or technical skills. Recently, techniques for scraping large volumes of data from online activities, such as Twitter posts, have become available. These and other techniques for managing huge amounts of data, and the implications of their use, are discussed in Chapter 10, “Data at Scale.”

Three main techniques for gathering data are introduced in this chapter: interviews, questionnaires, and observation. The next chapter discusses how to analyze and interpret the data collected. Interviews involve an interviewer asking one or more interviewees a set of questions, which may be highly structured or unstructured; interviews are usually synchronous and are often face-to-face, but they don’t have to be. Increasingly, interviews are conducted remotely using one of the many teleconferencing systems, such as Skype or Zoom, or on the phone. Questionnaires are a series of questions designed to be answered asynchronously, that is, without the presence of the investigator. These questionnaires may be paper-based or available online. Observation may be direct or indirect. Direct observation involves spending time with individuals observing their activities as they happen. Indirect observation involves making a record of the user’s activity as it happens, to be studied at a later date. All three techniques may be used to collect qualitative or quantitative data.

Although this is a small set of basic techniques, they are flexible and can be combined and extended in many ways. Indeed, it is important not to focus on just one data gathering technique, if possible, but to use them in combination so as to avoid biases that are inherent in any one approach.

8.2 Five Key Issues

Five key issues require attention for any data gathering session to be successful: goal setting, identifying participants, the relationship between the data collector and the data provider, triangulation, and pilot studies.

8.2.1 Setting Goals

The main reason for gathering data is to glean information about users, their behavior, or their reaction to technology. Examples include understanding how technology fits into family life, identifying which of two icons representing “send message” is easier to use, and finding out whether the planned redesign for a handheld meter reader is headed in the right direction. There are many different reasons for gathering data, and before beginning, it is important to set specific goals for the study. These goals will influence the nature of data gathering sessions, the data gathering techniques to be used, and the analysis to be performed (Robson and McCartan, 2016).

The goals may be expressed more or less formally, for instance, using some structured or even mathematical format or using a simple description such as the ones in the previous paragraph. Whatever the format, however, they should be clear and concise. In interaction design, it is more common to express goals for data gathering informally.

8.2.2 Identifying Participants

The goals developed for the data gathering session will indicate the types of people from whom data is to be gathered. Those people who fit this profile are called the *population* or *study population*. In some cases, the people from whom to gather data may be clearly identifiable—maybe because there is a small group of users and access to each one is easy. However, it is more likely that the participants to be included in data gathering need to be chosen, and this is called *sampling*. The situation where all members of the target population are accessible is called *saturation sampling*, but this is quite rare. Assuming that only a portion of the population will be involved in data gathering, then there are two options: probability sampling or nonprobability sampling. In the former case, the most commonly used approaches are simple random sampling or stratified sampling; in the latter case, the most common approaches are convenience sampling or volunteer panels.

Random sampling can be achieved by using a random number generator or by choosing every *n*th person in a list. Stratified sampling relies on being able to divide the population into groups (for example, classes in a secondary school) and then applying random sampling. Both convenience sampling and volunteer panels rely less on choosing the participants and more on the participants being prepared to take part. The term *convenience sampling* is used to describe a situation where the sample includes those who were available rather than those specifically selected. Another form of convenience sampling is *snowball sampling*, in which a current participant finds another participant and that participant finds another, and so on. Much like a snowball adds more snow as it gets bigger, the population is gathered up as the study progresses.

The crucial difference between probability and nonprobability methods is that in the former you can apply statistical tests and generalize to the whole population, while in the latter such generalizations are not robust. Using statistics also requires a sufficient number of participants. Vera Toepoel (2016) provides a more detailed treatment of sampling, particularly in relation to survey data.

BOX 8.1

How Many Participants Are Needed?

A common question is, how many participants are needed for a study? In general, having more participants is better because interpretations of statistical test results can be stated with higher confidence. What this means is that any differences found among conditions are more likely to be caused by a genuine effect rather than being due to chance.

More formally, there are many ways to determine how many participants are needed. Four of these are saturation, cost and feasibility analysis, guidelines, and prospective power analysis (Caine, 2016).

- Saturation relies on data being collected until no new relevant information emerges, and so it is not possible to know the number in advance of the saturation point being reached.
- Choosing the number of participants based on cost and feasibility constraints is a practical approach and is justifiable; this kind of pragmatic decision is common in industrial projects but rarely reported in academic research.

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- Guidelines may come from experts or from “local standards,” for instance, from an accepted norm in the field.
- Prospective power analysis is a rigorous method used in statistics that relies on existing quantitative data about the topic; in interaction design, this data is often unavailable, making this approach infeasible, such as when a new technology is being developed.

Kelly Caine (2016) investigated the sample size (number of participants) for papers published at the international Computer-Human Interaction (CHI) conference in 2014. She found that several factors affected the sample size, including the method being used and whether the data was collected in person or remotely. In this set of papers, the sample size varied from 1 to 916,000, with the most common size being 12. So, a “local standard” for interaction design would therefore suggest 12 as a rule of thumb. ■

8.2.3 Relationship with Participants

One significant aspect of any data gathering is the relationship between the person (people) doing the gathering and the person (people) providing the data. Making sure that this relationship is clear and professional will help to clarify the nature of the study. How this is achieved varies in different countries and different settings. In the United States and United Kingdom, for example, it is achieved by asking participants to sign an informed consent form, while in Scandinavia such a form is not required. The details of this form will vary, but it usually asks the participants to confirm that the purpose of the data gathering and how the data will be used has been explained to them and that they are willing to continue. It usually explains that their data will be private and kept in a secure place. It also often includes a statement that participants may withdraw at any time and that in this case none of their data will be used in the study.

The informed consent form is intended to protect the interests of both the data gatherer and the data provider. The gatherer wants to know that the data they collect can be used in their analysis, presented to interested parties, and published in reports. The data provider wants reassurance that the information they give will not be used for other purposes or in any context that would be detrimental to them. For example, they want to be sure that personal contact information and other personal details are not made public. This is especially true when people with disabilities or children are being interviewed. In the case of children, using an informed consent form reassures parents that their children will not be asked threatening, inappropriate, or embarrassing questions, or be asked to look at disturbing or violent images. In these cases, parents are asked to sign the form. Figure 8.1 shows an example of a typical informed consent form.

This kind of consent is also not generally required when gathering requirements data for a commercial company where a contract usually exists between the data collector and the data provider. An example is where a consultant is hired to gather data from company staff during the course of discovering requirements for a new interactive system to support timesheet entry. The employees of this company would be the users of the system, and the consultant would therefore expect to have access to the employees to gather data about the timesheet activity. In addition, the company would expect its employees to cooperate in this exercise. In this case, there is already a contract in place that covers the data

<p style="text-align: center;">Crowdsourcing Design for Citizen Science Organizations</p> <p>SHORT VERSION OF CONSENT FORM for participants at the University of Maryland – 18 YEARS AND OLDER</p> <p>You are invited to participate in a research project being conducted by the researchers listed on the bottom of the page. In order for us to be allowed to use any data you wish to provide, we must have your consent.</p> <p>In the simplest terms, we hope you will use the mobile phone, tabletop, and project website at the University of Maryland to</p> <ul style="list-style-type: none">• Take pictures• Share observations about the sights you see on campus• Share ideas that you have to improve the design of the phone or tabletop application or website• Comment on pictures, observations, and design ideas of others <p>The researchers and others using CampusNet will be able to look at your comments and pictures on the tabletop and/or website, and we may ask if you are willing to answer a few more questions (either on paper, by phone, or face-to-face) about your whole experience. You may stop participating at any time.</p> <p>A long version of this consent form is available for your review and signature, or you may opt to sign this shorter one by <i>checking off all the boxes that reflect your wishes and signing and dating the form below.</i></p> <p><input type="checkbox"/> I agree that any photos I take using the CampusNet application may be uploaded to the tabletop at the University of Maryland and/or a website now under development.</p> <p><input type="checkbox"/> I agree to allow any comments, observations, and profile information that I choose to share with others via the online application to be visible to others who use the application at the same time or after me.</p> <p><input type="checkbox"/> I agree to be videotaped/audiotaped during my participation in this study.</p> <p><input type="checkbox"/> I agree to complete a short questionnaire during or after my participation in this study.</p> <table border="1"><tr><td>NAME [Please print]</td><td></td></tr><tr><td>SIGNATURE</td><td></td></tr><tr><td>DATE</td><td></td></tr></table> <p>[Contact information of Senior Researcher responsible for the project]</p>		NAME [Please print]		SIGNATURE		DATE	
NAME [Please print]							
SIGNATURE							
DATE							

Figure 8.1 Example of an informed consent form

gathering activity, and therefore an informed consent form is less likely to be required. As with most ethical issues, the important thing is to consider the situation and make a judgment based on the specific circumstances. Increasingly, projects and organizations that collect personal data from people need to demonstrate that it is protected from unauthorized

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access. For example, the European Union's General Data Protection Regulation (GDPR) came into force in May 2018. It applies to all EU organizations and offers the individual unprecedented control over their personal data.

For more information about GDPR and data protection law in Europe and the United Kingdom, see:

<https://ico.org.uk/for-organisations/guide-to-the-general-data-protection-regulation-gdpr/>

Incentives to take part in data gathering sessions may also be needed. For example, if there is no clear advantage to the respondents, incentives may persuade them to take part; in other circumstances, respondents may see it as part of their job or as a course requirement to take part. For example, if support sales executives are asked to complete a questionnaire about a new mobile sales application, then they are likely to agree if the new device will impact their day-to-day lives. In this case, the motivation for providing the required information is clear. However, when collecting data to understand how appealing a new interactive app is for school children, different incentives would be appropriate. Here, the advantage for individuals to take part is not so obvious.

8.2.4 Triangulation

Triangulation is a term used to refer to the investigation of a phenomenon from (at least) two different perspectives (Denzin, 2006; Jupp, 2006). Four types of triangulation have been defined (Jupp, 2006).

- Triangulation of data means that data is drawn from different sources at different times, in different places, or from different people (possibly by using a different sampling technique).
- Investigator triangulation means that different researchers (observers, interviewers, and so on) have been involved in collecting and interpreting the data.
- Triangulation of theories means the use of different theoretical frameworks through which to view the data or findings.
- Methodological triangulation means to employ different data gathering techniques.

The last of these is the most common form of triangulation—to validate the results of some inquiry by pointing to similar results yielded through different perspectives. However, validation through true triangulation is difficult to achieve. Different data gathering methods result in different kinds of data, which may or may not be compatible. Using different theoretical frameworks may or may not result in complementary findings, but to achieve theoretical triangulation would require the theories to have similar philosophical underpinnings. Using more than one data gathering technique, and more than one data analysis approach, is good practice because it leads to insights from the different approaches even though it may not be achieving true triangulation.

Triangulation has sometimes been used to make up for the limitations of another type of data collection (Mackay and Anne-Laure Fayard, 1997). This is a different rationale from the original idea, which has more to do with the verification and reliability of data. Furthermore,

a kind of triangulation is being used increasingly in crowd sourcing and other studies involving large amounts of data to check that the data collected from the original study is real and reliable. This is known as checking for “ground truth.”

For an example of methodological triangulation, see:

<https://medium.com/design-voices/the-power-of-triangulation-in-design-research-64a0957d47d2>

For more information about ground truth and how ground truth databases are used to check data obtained in autonomous driving, see “The HCI Bench Mark Suite: Stereo and Flow Ground Truth with Uncertainties for Urban Autonomous Driving” at <https://ieeexplore.ieee.org/document/7789500/>.

8.2.5 Pilot Studies

A pilot study is a small trial run of the main study. The aim is to make sure that the proposed method is viable before embarking on the real study. For example, the equipment and instructions can be checked, the questions for an interview or in a questionnaire can be tested for clarity, and an experimental procedure can be confirmed as viable. This can identify potential problems in advance so that they can be corrected. Distributing 500 questionnaires and then being told that two of the questions were very confusing wastes time, annoys participants, and is an expensive error that could be avoided by doing a pilot study.

If it is difficult to find participants or access to them is limited, asking colleagues or peers to participate can work as an alternative for a pilot study. Note that anyone involved in a pilot study cannot be involved in the main study itself. Why? Because they will know more about the study and this can distort the results.

BOX 8.2

Data, Information, and Conclusions

There is an important difference between raw data, information, and conclusions. Data is what you collect; this is then analyzed and interpreted and conclusions drawn. Information is gained from analyzing and interpreting the data and conclusions represent the actions to be taken based on the information. For example, consider a study to determine whether a new screen layout for a local leisure center has improved the user’s experience when booking a swimming lesson. In this case, the data collected might include a set of times to complete the booking, user comments regarding the new screen layout, biometric readings of the user’s

(Continued)

heart rate while booking a lesson, and so on. At this stage, the data is raw. Information will emerge once this raw data has been analyzed and the results interpreted. For example, analyzing the data might indicate that users who have been using the leisure center for more than five years find the new layout frustrating and take longer to book, while those who have been using it for less than two years find the new layout helpful and can book lessons more quickly. This indicates that the new layout is good for newcomers but not so good for long-term users of the leisure center; this is information. A conclusion from this might be that a more extensive help system is needed for more experienced users to become used to the changes. ■

8.3 Data Recording

Capturing data is necessary so that the results of a data gathering session can be analyzed and shared. Some forms of data gathering, such as questionnaires, diaries, interaction logging, scraping, and collecting work artifacts, are self-documenting and no further recording is necessary. For other techniques, however, there is a choice in recording approaches. The most common of these are taking notes, photographs, or recording audio or video. Often, several data recording approaches are used together. For example, an interview may be voice recorded, and then to help the interviewer in later analysis, a photograph of the interviewee may be taken to remind the interviewer about the context of the discussion.

Which data recording approaches are used will depend on the goal of the study and how the data will be used, the context, the time and resources available, and the sensitivity of the situation; the choice of data recording approach will affect the level of detail collected and how intrusive the data gathering will be. In most settings, audio recording, photographs, and notes will be sufficient. In others, it is essential to collect video data so as to record in detail the intricacies of the activity and its context. Three common data recording approaches are discussed next.

8.3.1 Notes Plus Photographs

Taking notes (by hand or by typing) is the least technical and most flexible way of recording data, even if it seems old-fashioned. Handwritten notes may be transcribed in whole or in part, and while this may seem tedious, it is usually the first step in analysis, and it gives the analyst a good overview of the quality and contents of the data collected. Tools exist for supporting data collection and analysis, but the advantages of handwritten notes include that using pen and paper can be less intrusive than typing and is more flexible, for example, for drawing diagrams of work layouts. Furthermore, researchers often comment that writing notes helps them to focus on what is important and starts them thinking about what the data is telling them. The disadvantages of notes include that it can be difficult to capture the right highlights, and it can be tiring to write and listen or observe at the same time. It is easy to lose concentration, biases creep in, handwriting can be difficult to decipher, and the speed of writing is limited. Working with a colleague can reduce some of these problems while also providing another perspective.

If appropriate, photograph(s) and short videos (captured via smartphones or other handheld devices) of artifacts, events, and the environment can supplement notes and hand-drawn sketches, providing that permission has been given to collect data using these approaches.

8.3.2 Audio Plus Photographs

Audio recording is a useful alternative to note-taking and is less intrusive than video. During observation, it allows observers to focus on the activity rather than on trying to capture every spoken word. In an interview, it allows the interviewer to pay more attention to the interviewee rather than trying to take notes as well as listening. It isn't always necessary to transcribe all of the data collected—often only sections are needed, depending on the goals of the study. Many studies do not need a great level of detail, and instead recordings are used as a reminder and as a source of anecdotes for reports. It is surprising how evocative audio recordings of people or places from the data session can be, and those memories provide added context to the analysis. If audio recording is the main or only data collection technique, then the quality needs to be good; performing interviews remotely, for example using Skype, can be compromised because of poor connections and acoustics. Audio recordings are often supplemented with photographs.

8.3.3 Video

Smartphones can be used to collect short video clips of activity. They are easy to use and less obtrusive than setting up sophisticated cameras. But there are occasions when a video is needed for long periods of time or when holding a phone is unreliable, for example, recording how designers collaborate together in a workshop or how teens interact in a “makerspace,” in which people can work on projects while sharing ideas, equipment, and knowledge. For these kinds of sessions, more professional video equipment that clearly captures both visual and audio data is more appropriate. Other ways of recording facial expressions together with verbal comments are also being used, such as GoToMeeting, which can be operated both in-person and remotely. Using such systems can create additional planning issues that have to be addressed to minimize how intrusive the recording is, while at the same time making sure that the data is of good quality (Denzin and Lincoln, 2011). When considering whether to use a camera, Heath et al. (2010) suggest the following issues to consider:

- *Deciding whether to fix the camera's position or use a roving recorder.* This decision depends on the activity being recorded and the purpose to which the video data will be put, for example, for illustrative purposes only or for detailed data analysis. In some cases, such as pervasive games, a roving camera is the only way to capture the required action. For some studies, the video on a smartphone may be adequate and require less effort to set up.
- *Deciding where to point the camera in order to capture what is required.* Heath and his colleagues suggest carrying out fieldwork for a short time before starting to video record in order to become familiar with the environment and be able to identify suitable recording locations. Involving the participants themselves in deciding what and where to record also helps to capture relevant action.
- *Understanding the impact of the recording on participants.* It is often assumed that video recording will have an impact on participants and their behavior. However, it is worth taking an empirical approach to this issue and examining the data itself to see whether there is any evidence of people changing their behavior such as orienting themselves toward the camera.

ACTIVITY 8.1

Imagine that you are a consultant who is employed to help develop a new augmented reality garden planning tool to be used by amateur and professional garden designers. The goal is to find out how garden designers use an early prototype as they walk around their clients' gardens sketching design ideas, taking notes, and asking the clients about what they like and how they and their families use the garden. What are the advantages and disadvantages of the three approaches (note-taking, audio recording with photographs, and video) for data recording in this environment?

Comment

Handwritten notes do not require specialized equipment. They are unobtrusive and flexible but difficult to do while walking around a garden. If it starts to rain, there is no equipment to get wet, but notes may get soggy and difficult to read (and write!). Garden planning is a highly visual, aesthetic activity, so supplementing notes with photographs would be appropriate.

Video captures more information, for example, continuous panoramas of the landscape, what the designers are seeing, sketches, comments, and so on, but it is more intrusive and will also be affected by the weather. Short video sequences recorded on a smartphone may be sufficient as the video is unlikely to be used for detailed analysis. Audio may be a good compromise, but synchronizing audio with activities such as looking at sketches and other artifacts later can be tricky and error prone. ■

8.4 Interviews

Interviews can be thought of as a “conversation with a purpose” (Kahn and Cannell, 1957). How much like an ordinary conversation the interview will be depends on the type of interview. There are four main types of interviews: open-ended or unstructured, structured, semi-structured, and group interviews (Fontana and Frey, 2005). The first three types are named according to how much control the interviewer imposes on the conversation by following a predetermined set of questions. The fourth type, which is often called a *focus group*, involves a small group guided by a facilitator. The facilitation may be quite informal or follow a structured format.

The most appropriate approach to interviewing depends on the purpose of the interview, the questions to be addressed, and the interaction design activity. For example, if the goal is first to gain impressions about users’ reactions to a new design concept, then an informal, open-ended interview is often the best approach. But if the goal is to get feedback about a particular design feature, such as the layout of a new web browser, then a structured interview or questionnaire is often better. This is because the goals and questions are more specific in the latter case.

8.4.1 Unstructured Interviews

Open-ended or unstructured interviews are at one end of a spectrum of how much control the interviewer has over the interview process. They are exploratory and are similar to conversations around a particular topic; they often go into considerable depth. Questions posed by

the interviewer are open, meaning that there is no particular expectation about the format or content of answers. For example, the first question asked of all participants might be: “What are the pros and cons of having a wearable?” Here, the interviewee is free to answer as fully or as briefly as they want, and both the interviewer and interviewee can steer the interview. For example, often the interviewer will say: “Can you tell me a bit more about . . .” This is referred to as *probing*.

Despite being unstructured and open, the interviewer needs a plan of the main topics to be covered so that they can make sure that all of the topics are discussed. Going into an interview without an agenda should not be confused with being open to hearing new ideas (see section 8.4.5, “Planning and Conducting an Interview”). One of the skills needed to conduct an unstructured interview is getting the balance right between obtaining answers to relevant questions and being prepared to follow unanticipated lines of inquiry.

A benefit of unstructured interviews is that they generate rich data that is often interrelated and complex, that is, data that provides a deep understanding of the topic. In addition, interviewees may mention issues that the interviewer has not considered. A lot of unstructured data is generated, and the interviews will not be consistent across participants since each interview takes on its own format. Unstructured interviews can be time-consuming to analyze, but they can also produce rich insights. Themes can be identified across interviews using techniques from grounded theory and other analytic approaches, as discussed in Chapter 9, “Data Analysis, Interpretation, and Presentation.”

8.4.2 Structured Interviews

In structured interviews, the interviewer asks predetermined questions similar to those in a questionnaire (see section 8.5, “Questionnaires”), and the same questions are used with each participant so that the study is standardized. The questions need to be short and clearly worded, and they are typically closed questions, which means that they require an answer from a predetermined set of alternatives. (This may include an “other” option, but ideally this would not be chosen often.) Closed questions work well if the range of possible answers is known or if participants don’t have much time. Structured interviews are useful only when the goals are clearly understood and specific questions can be identified. Example questions for a structured interview might be the following:

- “Which of the following websites do you visit most frequently: Amazon.com, Google.com, or msn.com?”
- “How often do you visit this website: every day, once a week, once a month, less often than once a month?”
- “Do you ever purchase anything online: Yes/No? If your answer is Yes, how often do you purchase things online: every day, once a week, once a month, less frequently than once a month?”

Questions in a structured interview are worded the same for each participant and are asked in the same order.

8.4.3 Semi-structured Interviews

Semi-structured interviews combine features of structured and unstructured interviews and use both closed and open questions. The interviewer has a basic script for guidance so that the same topics are covered with each interviewee. The interviewer starts with preplanned

questions and then probes the interviewee to say more until no new relevant information is forthcoming. Here's an example:

Which music websites do you visit most frequently?

Answer: Mentions several but stresses that they prefer hottestmusic.com

Why?

Answer: Says that they like the site layout

Tell me more about the site layout.

Answer: Silence, followed by an answer describing the site's layout

Anything else that you like about the site?

Answer: Describes the animations

Thanks. Are there any other reasons for visiting this site so often that you haven't mentioned?

It is important not to pre-empt an answer by phrasing a question to suggest that a particular answer is expected. For example, "You seemed to like this use of color . . ." assumes that this is the case and will probably encourage the interviewee to answer that this is true so as not to offend the interviewer. Children are particularly prone to behave in this way (see Box 8.3, "Working with different kinds of users.") The body language of the interviewer, for example whether they are smiling, scowling, looking disapproving, and so forth, can have a strong influence on whether the interviewee will agree with a question, and the interviewee needs to have time to speak and not be rushed.

Probes are a useful device for getting more information, especially neutral probes such as "Do you want to tell me anything else?" and prompts that remind interviewees if they forget terms or names help to move the interview along. Semi-structured interviews are intended to be broadly replicable, so probing and prompting aim to move the interview along without introducing bias.

BOX 8.3

Working with Different Kinds of Users

Focusing on the needs of users and including users in the design process is a central theme of this book. But users vary considerably based on their age, educational, life, and cultural experiences, and physical and cognitive abilities. For example, children think and react to situations differently than adults. Therefore, if children are to be included in data gathering sessions, then child-friendly methods are needed to make them feel at ease so that they will communicate with you. For very young children of pre-reading or early reading age, data gathering sessions need to rely on images and chat rather than written instructions or questionnaires. Researchers who work with children have developed sets of "smileys," such as those shown in Figure 8.2, so that children can select the one that most closely represents their feelings (see Read et al., 2002).



Figure 8.2 A smileyometer gauge for early readers

Source: Read et al. (2002)

Similarly, different approaches are needed when working with users from different cultures (Winschiers-Theophilus et al., 2012). In their work with local communities in Namibia, Heike Winschiers-Theophilus and Nicola Bidwell (2013) had to find ways of communicating with local participants, which included developing a variety of visual and other techniques to communicate ideas and collect data about the collective understanding and feelings inherent in the local cultures of the people with whom they worked.

Laurianne Sitbon and Shanjana Farhin (2017) report a study in which researchers interacted with people with intellectual disabilities, where they involved caregivers who knew each participant well and could appropriately make the researchers' questions more concrete. This made it more understandable for the participants. An example of this was when the interviewer assumed that the participant understood the concept of a phone app to provide information about bus times. The caregiver made their questions more concrete for the participant by relating the concept of the phone app to familiar people and circumstances and bringing in a personal example (for instance, "So you don't have to ring your mom to say 'Mom, I am lost'").

Another group of technology users are studied by the field of Animal-Computer Interaction (Mancini et al., 2017). Data gathering with animals poses additional and different challenges. For example, in their study of dogs' attention to TV screens, Ilyena Hirschyj-Douglas et al. (2017) used a combination of observation and tracking equipment to capture when a dog turns their head. But interpreting the data, or checking that the interpretation is accurate, requires animal behavior expertise. ■

The examples in Box 8.3 demonstrate that technology developers need to adapt their data collection techniques to suit the participants with whom they work. As the saying goes, "One size doesn't fit all."

8.4.4 Focus Groups

Interviews are often conducted with one interviewer and one interviewee, but it is also common to interview people in groups. One form of group interview that is sometimes used in interaction design activities is the focus group. Normally, three to ten people are involved, and the discussion is led by a trained facilitator. Participants are selected to provide a representative sample of the target population. For example, in the evaluation of a university website, a group of administrators, faculty, and students may form three separate focus groups because they use the web for different purposes. In requirements activities, a focus group may be held in order to identify conflicts in expectations or terminology from different stakeholders.



Source: Mike Baldwin / Cartoon Stock

The benefit of a focus group is that it allows diverse or sensitive issues to be raised that might otherwise be missed, for example in the requirements activity to understand multiple points within a collaborative process or to hear different user stories (Unger and Chandler, 2012). The method is more appropriate for investigating shared issues rather than individual experiences. Focus groups enable people to put forward their own perspectives. A preset agenda is developed to guide the discussion, but there is sufficient flexibility for the facilitator to follow unanticipated issues as they are raised. The facilitator guides and prompts discussion, encourages quiet people to participate, and stops verbose ones from dominating the discussion. The discussion is usually recorded for later analysis, and participants may be invited to explain their comments more fully at a later date.

Focus groups can be useful, but only if used for the right kind of activities. For a discussion of when focus groups don't work, see the following links:
<https://www.nomensa.com/blog/2016/are-focus-groups-useful-research-technique-ux>
<http://gerrymcgovern.com/why-focus-groups-dont-work/>

The format of focus groups can be adapted to fit within local cultural settings. For example, a study with the Mbeere people of Kenya aimed to find out how water was being used, any plans for future irrigation systems, and the possible role of technology in water management (Warrick et al., 2016). The researcher met with the elders from the community, and the focus group took the form of a traditional Kenyan “talking circle,” in which the elders sit in a circle and each person gives their opinions in turn. The researcher, who was from the Mbeere community, knew that it was impolite to interrupt or suggest that the conversation needed to move along, because traditionally each person speaks for as long as they want.

8.4.5 Planning and Conducting an Interview

Planning an interview involves developing the set of questions or topics to be covered, collating any documentation to give to the interviewee (such as consent form or project description), checking that recording equipment works, structuring the interview, and organizing a suitable time and place.

Developing Interview Questions

Questions may be open-ended (or open) or closed-ended (or closed). Open questions are best suited where the goal of the session is exploratory; closed questions are best suited where the possible answers are known in advance. An unstructured interview will usually consist mainly of open questions, while a structured interview will usually consist of closed questions. A semi-structured interview may use a combination of both types.

DILEMMA

What They Say and What They Do

What users say isn't always what they do. People sometimes give the answers that they think show them in the best light, they may have forgotten what happened, or they may want to please the interviewer by answering in the way they think will satisfy them. This may be problematic when the interviewer and interviewee don't know each other, especially if the interview is being conducted remotely by Skype, Cisco Webex, or another digital conferencing system.

For example, Yvonne Rogers et al. (2010) conducted a study to investigate whether a set of twinkly lights embedded in the floor of an office building could persuade people to take the stairs rather than the lift (or elevator). In interviews, participants told the researchers that they did not change their behavior but logged data showed that their behavior did, in fact, change significantly. So, can interviewers believe all of the responses they get? Are the respondents telling the truth, or are they simply giving the answers that they think the interviewer wants to hear?

It isn't possible to avoid this behavior, but an interviewer can be aware of it and reduce such biases by choosing questions carefully, by getting a large number of participants, or by using a combination of data gathering techniques. ■

The following guidelines help in developing interview questions (Robson and McCartan, 2016):

- Long or compound questions can be difficult to remember or confusing, so split them into two separate questions. For example, instead of "How do you like this smartphone app compared with previous ones that you have used?" say, "How do you like this smartphone app?" "Have you used other smartphone apps?" If so, "How did you like them?" This is easier for the interviewee to respond to and easier for the interviewer to record.
- Interviewees may not understand jargon or complex language and might be too embarrassed to admit it, so explain things to them in straightforward ways.
- Try to keep questions neutral, both when preparing the interview script and in conversation during the interview itself. For example, if you ask "Why do you like this style of interaction?" this question assumes that the person does like it and will discourage some interviewees from stating their real feelings.

ACTIVITY 8.2

Several devices are available for reading ebooks, watching movies, and browsing photographs (see Figure 8.3). The design differs between makes and models, but they are all aimed at providing a comfortable user experience. An increasing number of people also read books and watch movies on their smartphones, and they may purchase phones with larger screens for this purpose.



Figure 8.3 (a) Sony's eReader, (b) Amazon's Kindle, (c) Apple's iPad, and (d) Apple's iPhone
Source: (a) Sony Europe Limited, (b) Martyn Landi / PA Archive / PA Images, (c) Mark Lennihan / AP Images, and (d) Helen Sharp

The developers of a new device for reading books online want to find out how appealing it will be to young people aged 16–18, so they have decided to conduct some interviews.

1. What is the goal of this data gathering session?
2. Suggest ways of recording the interview data.

3. Suggest a set of questions for use in an unstructured interview that seeks to understand the appeal of reading books online to young people in the 16–18 year old age group.
4. Based on the results of the unstructured interviews, the developers of the new device have found that an important acceptance factor is whether the device can be handled easily. Write a set of semi-structured interview questions to evaluate this aspect based on an initial prototype and run a pilot interview with two of your peers. Ask them to comment on your questions and refine them based on their comments.

Comment

1. The goal is to understand what makes devices for reading books online appealing to people aged 16–18.
2. Audio recording will be less cumbersome and distracting than taking notes, and all important points will be captured. Video recording is not needed in this initial interview as it isn't necessary to capture any detailed interactions. However, it would be useful to take photographs of any devices referred to by the interviewee.
3. Possible questions include the following: Why do you read books online? Do you ever read print-based books? If so, what makes you choose to read online versus a print-based format? Do you find reading a book online comfortable? In what way(s) does reading online versus reading from print affect your ability to become engrossed in the story you are reading?
4. Semi-structured interview questions may be open or closed-ended. Some closed-ended questions that you might ask include the following:
 - Have you used any kind of device for reading books online before?
 - Would you like to read a book online using this device?
 - In your opinion, is the device easy to handle?Some open-ended questions, with follow-on probes, include the following:
 - What do you like most about the device? Why?
 - What do you like least about the device? Why?
 - Please give me an example of where the device was uncomfortable or difficult to use. ■

It is helpful when collecting answers to closed-ended questions to list possible responses together with boxes that can be checked. Here's one way to convert some of the questions from Activity 8.2:

1. Have you used a device for reading books online before? (Explore previous knowledge.)
Interviewer checks box: Yes No Don't remember/know
2. Would you like to read a book using a device designed for reading online? (Explore initial reaction; then explore the response.)
Interviewer checks box: Yes No Don't know
3. Why?
If response is "Yes" or "No," interviewer asks, "Which of the following statements represents your feelings best?"

For “Yes,” interviewer checks one of these boxes:

- I don’t like carrying heavy books.
- This is fun/cool.
- My friend told me they are great.
- It’s the way of the future.
- Another reason (interviewer notes the reason).

For “No,” interviewer checks one of these boxes:

- I don’t like using gadgets if I can avoid it.
- I can’t read the screen clearly.
- I prefer the feel of paper.
- Another reason (interviewer notes the reason).

4. In your opinion, is the device for reading online easy to handle or cumbersome?

Interviewer checks one of these boxes:

- Easy to handle
- Cumbersome
- Neither

Running the Interview

Before starting, make sure that the goals of the interview have been explained to the interviewee and that they are willing to proceed. Finding out about the interviewee and their environment before the interview will make it easier to put them at ease, especially if it is an unfamiliar setting.

During the interview, it is better to listen more than to talk, to respond with sympathy but without bias, and to appear to enjoy the interview. The following is a common sequence for an interview (Robson and McCartan, 2016):

1. An introduction in which the interviewer introduces themselves and explains why they are doing the interview, reassures interviewees regarding any ethical issues, and asks if they mind being recorded, if appropriate. This should be exactly the same for each interviewee.
2. A warm-up session where easy, nonthreatening questions come first. These may include questions about demographic information, such as “What area of the country do you live in?”
3. A main session in which the questions are presented in a logical sequence, with the more probing ones at the end. In a semi-structured interview, the order of questions may vary between participants, depending on the course of the conversation, how much probing is done, and what seems more natural.
4. A cooling-off period consisting of a few easy questions (to defuse any tension that may have arisen).
5. A closing session in which the interviewer thanks the interviewee and switches off the recorder or puts their notebook away, signaling that the interview has ended.

8.4.6 Other Forms of Interview

Conducting face-to-face interviews and focus groups can be impractical, but the prevalence of Skype, Cisco WebEx, Zoom, and other digital conferencing systems, email, and phone-based interactions (voice or chat), sometimes with screen-sharing software, make remote interviewing a good alternative. These are carried out in a similar fashion to face-to-face sessions, but poor connections and acoustics can cause different challenges, and participants may be tempted to multitask rather than focus on the session at hand. Advantages of remote focus groups and interviews, especially when done through audio-only channels, include the following:

- The participants are in their own environment and are more relaxed.
- Participants don't have to travel.
- Participants don't need to worry about what they wear.
- For interviews involving sensitive issues, interviewees can remain anonymous.

In addition, participants can leave the conversation whenever they want to by just cutting the connection, which adds to their sense of security. From the interviewer's perspective, a wider set of participants can be reached easily, but a potential disadvantage is that the facilitator does not have a good view of the interviewees' body language.

For more information and some interesting thoughts on remote usability testing, see <http://www.uxbooth.com/articles/hidden-benefits-remote-research/>.

Retrospective interviews, that is, interviews that reflect on an activity or a data gathering session in the recent past, may be conducted with participants to check that the interviewer has correctly understood what was happening. This is a common practice in observational studies where it is sometimes referred to as *member checking*.

8.4.7 Enriching the Interview Experience

Face-to-face interviews often take place in a neutral location away from the interviewee's normal environment. This creates an artificial context, and it can be difficult for interviewees to give full answers to the questions posed. To help combat this, interviews can be enriched by using props such as personas prototypes or work artifacts that the interviewee or interviewer brings along, or descriptions of common tasks (examples of these kinds of props are scenarios and prototypes, which are covered in Chapter 11, "Discovering Requirements," and Chapter 12, "Design, Prototyping, and Construction"). These props can be used to provide context for the interviewees and help to ground the data in a real setting. Figure 8.4 illustrates the use of personas in a focus group setting.



Figure 8.4 Enriching a focus group with personas displayed on the wall for all participants to see

As another example, Clara Mancini et al. (2009) used a combination of questionnaire prompts and deferred contextual interviews when investigating mobile privacy. A simple multiple-choice questionnaire was sent electronically to the participants' smartphones, and they answered the questions using these devices. Interviews about the recorded events were conducted later, based on the questionnaire answers given at the time of the event.

8.5 Questionnaires

Questionnaires are a well-established technique for collecting demographic data and users' opinions. They are similar to interviews in that they can have closed or open-ended questions, but once a questionnaire is produced, it can be distributed to a large number of participants without requiring additional data gathering resources. Thus, more data can be collected than would normally be possible in an interview study. Furthermore, participants who are located in remote locations or those who cannot attend an interview at a particular time can be involved more easily. Often a message is sent electronically to potential participants directing them to an online questionnaire.

Effort and skill are needed to ensure that questions are clearly worded and the data collected can be analyzed efficiently. Well-designed questionnaires are good for getting answers to specific questions from a large group of people. Questionnaires can be used on their own

or in conjunction with other methods to clarify or deepen understanding. For example, information obtained through interviews with a small selection of interviewees might be corroborated by sending a questionnaire to a wider group to confirm the conclusions.

Questionnaire questions and structured interview questions are similar, so which technique is used when? Essentially, the difference lies in the motivation of the respondent to answer the questions. If their motivation is high enough to complete a questionnaire without anyone else present, then a questionnaire will be appropriate. On the other hand, if the respondents need some persuasion to answer the questions, a structured interview format would be better. For example, structured interviews are easier and quicker to conduct if people will not stop to complete a questionnaire, such as at a train station or while walking to their next meeting.

It can be harder to develop good questionnaire questions compared with structured interview questions because the interviewer is not available to explain them or to clarify any ambiguities. Because of this, it is important that questions are specific; when possible, ask closed-ended questions and offer a range of answers, including a “no opinion” or “none of these” option. Finally, use negative questions carefully, as they can be confusing and may lead to false information. Some questionnaire designers, however, use a mixture of negative and positive questions deliberately because it helps to check the users’ intentions.

8.5.1 Questionnaire Structure

Many questionnaires start by asking for basic demographic information (gender, age, place of birth) and details of relevant experience (the number of hours a day spent searching on the Internet, the level of expertise within the domain under study, and so on). This background information is useful for putting the questionnaire responses into context. For example, if two responses conflict, these different perspectives may be because of their level of experience—a group of people who are using a social networking site for the first time are likely to express different opinions than another group with five years’ experience of using such sites. However, only contextual information that is relevant to the study goal needs to be collected. For example, it is unlikely that a person’s height will provide relevant context to their responses about Internet use, but it might be relevant for a study concerning wearables.

Specific questions that contribute to the data-gathering goal usually follow these demographic questions. If the questionnaire is long, the questions may be subdivided into related topics to make it easier and more logical to complete.

The following is a checklist of general advice for designing a questionnaire:

- Think about the ordering of questions. The impact of a question can be influenced by question order.
- Consider whether different versions of the questionnaire are needed for different populations.
- Provide clear instructions on how to complete the questionnaire, for example, whether answers can be saved and completed later. Aim for both careful wording and good typography.
- Think about the length of the questionnaire, and avoid questions that don’t address the study goals.
- If the questionnaire has to be long, consider allowing respondents to opt out at different stages. It is usually better to get answers to some sections than no answers at all because of dropout.
- Think about questionnaire layout and pacing; for instance, strike a balance between using white space, or individual web pages, and the need to keep the questionnaire as compact as possible.

8.5.2 Question and Response Format

Different formats of question and response can be chosen. For example, with a closed-ended question, it may be appropriate to indicate only one response, or it may be appropriate to indicate several. Sometimes, it is better to ask users to locate their answer within a range. Selecting the most appropriate question and response format makes it easier for respondents to answer clearly. Some commonly used formats are described next.

Check Boxes and Ranges

The range of answers to demographic questions is predictable. Nationality, for example, has a finite number of alternatives, and asking respondents to choose a response from a predefined list makes sense for collecting this information. A similar approach can be adopted if details of age are needed. But since some people do not like to give their exact age, many questionnaires ask respondents to specify their age as a range. A common design error arises when the ranges overlap. For example, specifying two ranges as 15–20 and 20–25 will cause confusion; that is, which box do people who are 20 years old check? Making the ranges 15–19 and 20–24 avoids this problem.

A frequently asked question about ranges is whether the interval must be equal in all cases. The answer is no—it depends on what you want to know. For example, people who might use a website about life insurance are likely to be employed individuals who are 21–65 years old. The question could, therefore, have just three ranges: under 21, 21–65, and over 65. In contrast, to see how the population's political views vary across generations might require 10-year cohort groups for people over 21, in which case the following ranges would be appropriate: under 21, 21–30, 31–40, and so forth.

Rating Scales

There are a number of different types of rating scales, each with its own purpose (see Oppenheim, 2000). Two commonly used scales are the Likert and semantic differential scales. Their purpose is to elicit a range of responses to a question that can be compared across respondents. They are good for getting people to make judgments, such as how easy, how usable, and the like.

Likert scales rely on identifying a set of statements representing a range of possible opinions, while semantic differential scales rely on choosing pairs of words that represent the range of possible opinions. Likert scales are more commonly used because identifying suitable statements that respondents will understand consistently is easier than identifying semantic pairs that respondents interpret as intended.

Likert Scales

Likert scales are used for measuring opinions, attitudes, and beliefs, and consequently they are widely used for evaluating user satisfaction with products. For example, users' opinions about the use of color in a website could be evaluated with a Likert scale using a range of numbers, as in question 1 here, or with words as in question 2:

1. The use of color is excellent (where 1 represents strongly agree and 5 represents strongly disagree):

1	2	3	4	5
<input type="checkbox"/>				

- 2.** The use of color is excellent:

Strongly agree	Agree	OK	Disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Strongly disagree	
		<input type="checkbox"/>	

In both cases, respondents would be asked to choose the right box, number, or phrase. Designing a Likert scale involves the following steps:

1. *Gather a pool of short statements about the subject to be investigated.* Examples are “This control panel is clear” and “The procedure for checking credit rating is too complex.” A brainstorming session with peers is a good way to identify key aspects to be investigated.
 2. *Decide on the scale.* There are three main issues to be addressed here: How many points does the scale need? Should the scale be discrete or continuous? How can the scale be represented? See Box 8.4 What Scales to Use: Three, Five, Seven, or More? for more on this.
 3. *Select items for the final questionnaire, and reword as necessary to make them clear.*

In the first example above, the scale is arranged with 1 as the highest choice on the left and 5 as the lowest choice on the right. The logic for this is that first is the best place to be in a race and fifth would be the worst place. While there is no absolute right or wrong way of ordering the numbers other researchers prefer to arrange the scales the other way around with 1 as the lowest on the left and 5 as the highest on the right. They argue that intuitively the highest number suggests the best choice and the lowest number suggests the worst choice. Another reason for going from lowest to highest is that when the results are reported, it is more intuitive for readers to see high numbers representing the best choices. The important thing is to be consistent.

Semantic Differential Scales

Semantic differential scales explore a range of bipolar attitudes about a particular item, each of which is represented as a pair of adjectives. The participant is asked to choose a point between the two extremes to indicate agreement with the poles, as shown in Figure 8.5. The score for the investigation is found by summing the scores for each bipolar pair. Scores are then computed across groups of participants. Notice that in this example the poles are mixed so that good and bad features are distributed on the right and the left. In this example, there are seven positions on the scale.

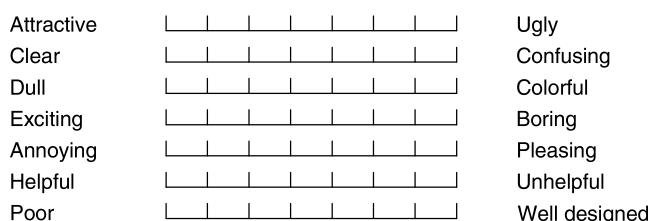


Figure 8.5 An example of a semantic differential scale

BOX 8.4

What Scales to Use: Three, Five, Seven, or More?

Issues to address when designing Likert and semantic differential scales include the following: how many points are needed on the scale, how should they be presented, and in what form?

Many questionnaires use seven- or five-point scales, and there are also three-point scales. Some even use nine-point scales. Arguments for the number of points go both ways. Advocates of long scales argue that they help to show discrimination. Rating features on an interface is more difficult for most people than, say, selecting among different flavors of ice cream, and when the task is difficult, there is evidence to show that people “hedge their bets.” Rather than selecting the poles of the scales if there is no right or wrong, respondents tend to select values nearer the center. The counterargument is that people cannot be expected to discern accurately among points on a large scale, so any scale of more than five points is unnecessarily difficult to use.

Another aspect to consider is whether to give the scale an even or odd number of points. An odd number provides a clear central point, while an even number forces participants to decide and prevents them from sitting on the fence.

We suggest the following guidelines:

How many points on the scale?

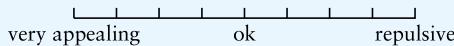
Use a small number, three, for example, when the possibilities are very limited, as in Yes/No type answers.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yes	Don't know	No

Use a medium-sized range, five, for example, when making judgments that involve like/dislike or agree/disagree statements.

<input type="checkbox"/>				
Strongly agree	Agree	OK	Disagree	Strongly disagree

Use a longer range, seven or nine, for example, when asking respondents to make subtle judgments, such as when asking about a user experience dimension such as “level of appeal” of a character in a video game.



Discrete or continuous?

Use boxes for discrete choices and scales for finer judgments.

What order?

Decide which way to order the scale, and be consistent. ■

ACTIVITY 8.3

Spot four poorly designed features in the excerpt from a questionnaire in Figure 8.6.

The figure shows a portion of a questionnaire with the following content:

2. State your age in years
3. How many hours a day do you spend searching online?

<input type="checkbox"/>	<1 hour
<input type="checkbox"/>	1–3 hours
<input type="checkbox"/>	3–5 hours
<input type="checkbox"/>	>5 hours
4. Which of the following do you do online?

purchase goods	<input type="checkbox"/>
send e-mail	<input type="checkbox"/>
visit chatrooms	<input type="checkbox"/>
use bulletin boards	<input type="checkbox"/>
find information	<input type="checkbox"/>
read the news	<input type="checkbox"/>
5. How useful is the Internet to you?

Figure 8.6 A questionnaire with poorly designed features

Comment

Some of the features that could be improved upon include the following:

- Question 2 requests an exact age. Many people prefer not to give this information and would rather position themselves within a range.
- In question 3, the number of hours spent searching is indicated with overlapping scales, that is, 1–3 and 3–5. How would someone answer if they spend 3 hours a day searching online?
- For question 4, the questionnaire doesn't say how many boxes to check.
- The space left for people to answer open-ended question 5 is too small, which will annoy some people and deter them from giving their opinions.

Many online survey tools prevent users from making some of these design errors. It is important, however, to be aware of such things because paper is still sometimes used. ■

8.5.3 Administering Questionnaires

Two important issues when using questionnaires are reaching a representative sample of participants and ensuring a reasonable response rate. For large surveys, potential respondents need to be selected using a sampling technique. However, interaction designers commonly use a small number of participants, often fewer than 20 users. Completion rates of 100 percent are often achieved with these small samples, but with larger or more remote populations, ensuring that surveys are returned is a well-known problem. A 40 percent return is generally acceptable

8 DATA GATHERING

for many surveys, but much lower rates are common. Depending on your audience, you might want to consider offering incentives (see section 8.2.3, “Relationship with Participants”).

While questionnaires are often online, paper questionnaires may be more convenient in some situations, for example, if participants do not have Internet access or if it is expensive to use. Occasionally, short questionnaires are sent within the body of an email, but more often the advantages of the data being compiled automatically and either partly or fully analyzed make online questionnaires attractive. Online questionnaires are interactive and can include check boxes, radio buttons, pull-down and pop-up menus, help screens, graphics, or videos (see Figure 8.7). They can also provide immediate data validation; for example, the entry must be a number between 1 and 20, and automatically skip questions that are irrelevant to some respondents, such as questions aimed only at teenagers. Other advantages of online questionnaires include faster response rates and automatic transfer of responses into a database for analysis (Toepoel, 2016).

D. Internationally-agreed development goals outlined in the Millennium Declaration :

Is this activity relevant to achieving the MDGs listed below? (see www.un.org/millenniumgoals/ and the targets for each goal) Yes No
If yes, please tick all goals that apply

- Eradicate poverty and hunger
- Achieve Universal Primary Education
- Promote gender equality & empower women
- Reduce child mortality
- Improve maternal health
- Combat HIV/AIDS, Malaria and other diseases
- Ensure environmental sustainability
- Develop a global partnership for development

E. More Information :

Please provide a website for this activity
Website (URL) : http://www.ethiopia.child_mortality

F. Geographical Coverage* :

Please tick a box to indicate the geographical coverage
 Local National Regional International
Please specify coverage : Ethiopia/Eritrea

G. Timescale * :

Please tick a box to indicate the timescale of the activity
 Completed Planned for future Ongoing
Specify dates using the format day/month/year (dd/mm/yyyy) :
From: 01/05/2010 To: 30/04/2013

H. Activity Type * :

Please tick one or more boxes to indicate the type of activity described above
 Project Programme WSIS Thematic Meeting Conference Publication Training initiative
 Guidelines Tool-kit Website Database
Other (please specify) : _____

Figure 8.7 An excerpt from a web-based questionnaire showing check boxes, radio buttons, and pull-down menus

The main problem with online questionnaires is the difficulty of obtaining a random sample of respondents; online questionnaires usually rely on convenience sampling, and hence their results cannot be generalized. In some countries, online questions, often delivered via smartphones, are frequently used in conjunction with television to elicit viewers' opinions of programs and political events.

Deploying an online questionnaire involves the following steps (Toepoel, 2016, Chapter 10):

1. *Plan the survey timeline.* If there is a deadline, work backward from the deadline and plan what needs to be done on a weekly basis.
2. *Design the questionnaire offline.* Using plain text is useful as this can then be copied more easily into the online survey tool.
3. *Program the online survey.* How long this will take depends on the complexity of the design, for example, how many navigational paths it contains or if it has a lot of interactive features.
4. *Test the survey, both to make sure that it behaves as envisioned and to check the questions themselves.* This includes getting feedback from content experts, survey experts, and potential respondents. This last group forms the basis of a pilot study.
5. *Recruit respondents.* As mentioned earlier, participants may have different reasons for taking part in the survey, but especially when respondents need to be encouraged, make the invitations intriguing, simple, friendly, respectful, trustworthy, motivating, interesting, informative, and short.

There are many online questionnaire templates available that provide a range of options, including different question types (for example open-ended, multiple choice), rating scales (such as Likert, semantic differential), and answer types (for example, radio buttons, check boxes, drop-down menus).

The following activity asks you to make use of one of these templates. Apart from being able to administer an online questionnaire widely, these templates also enable the questionnaire to be segmented. For example, airline satisfaction questionnaires often have different sections for check-in, baggage handling, airport lounge, inflight movies, inflight food service, and so forth. If you didn't use an airport lounge or check your baggage, you can skip those sections. This avoids respondents getting frustrated by having to go through questions that are not relevant to them. It is also a useful technique for long questionnaires, as it ensures that if a respondent opts out for lack of time or gets tired of answering the questions, the data that has been provided already is available to be analyzed.

ACTIVITY 8.4

Go to questionpro.com, surveymonkey.com, or a similar survey site and design your own questionnaire using the set of widgets that is available for a free trial period.

Create an online questionnaire for the set of questions that you developed for Activity 8.2. For each question, produce two different designs; for example, use radio buttons and drop-down menus for one question, and provide a 10-point semantic differential scale and a 5-point scale for another question.

What differences (if any) do you think the two designs will have on a respondent's behavior? Ask a number of people to answer one or the other of your questions and see whether the answers differ for the two designs.

(Continued)

Comment

Respondents may have used the response types in different ways. For example, they may select the end options more often from a drop-down menu than from a list of options that are chosen via radio buttons. Alternatively, you may find no difference and that people's opinions are not affected by the widget style used. Some differences, of course, may be due to the variation between individual responses rather than being caused by features in the questionnaire design. To tease the effects apart, you would need to ask a large number of participants (for instance, in the range 50–100) to respond to the questions for each design. ■

BOX 8.5**Do people answer online questionnaires differently than paper and pencil? If so, why?**

There has been much research examining how people respond to surveys when using a computer compared with paper and pencil methods. Some studies suggest that people are more revealing and consistent in their responses when using a computer to report their habits and behaviors, such as eating, drinking, and amount of exercise see Luce et al. (2003). Students have also been found to rate their instructors less favorably when online (Chang, 2004).

In a Danish study in which 3,600 people were invited to participate, the researchers concluded that although response rates for web-based invitations were lower, they were more cost-effective (by a factor of 10) and had only slightly lower numbers of missing values than questionnaires sent via paper (Ebert et al., 2018). Similarly, a study by Diaz de Rada and Dominguez-Alvarez (2014), in which the quality of the information collected from a survey given to citizens of Andalusia in Spain was analyzed, several advantages of using online versus paper-based questionnaires were identified. These included a low number of unanswered questions, more detailed answers to open-ended questions, and longer answers to questions in the online questionnaires than in the paper questionnaires. In the five open-ended questions, respondents wrote 63 characters more on average on the online questionnaires than on the paper questionnaires. For the questions in which participants had to select from a drop-down menu, there was a better response rate than when the selection was presented on paper with blank spaces.

One factor that can influence how people answer questions is the way the information is structured, such as the use of headers, the ordering, and the placement of questions. Online questionnaires provide more options for presenting information, including the use of drop-down menus, radio buttons, and jump-to options, which may influence how people read and navigate a questionnaire. But do these issues affect respondents' answers? Smyth et al. (2005) have found that providing forced choice formats results in more options being selected. Another example is provided by Funcke et al. (2011), who found that continuous sliders enabled researchers to collect more accurate data because they support continuous rather than discrete scales. They also encouraged higher response rates. What can be concluded from these investigations is that the details of questionnaire design can impact how respondents react. ■

8.6 Observation

Observation is useful at any stage during product development. Early in design, observation helps designers understand the users' context, tasks, and goals. Observation conducted later in development, for example, in evaluation, may be used to investigate how well a prototype supports these tasks and goals.

Users may be observed directly by the investigator as they perform their activities or indirectly through records of the activity that are studied afterward (Bernard, 2017). Observation may also take place in the field or in a controlled environment. In the former case, individuals are observed as they go about their day-to-day tasks in the natural setting. In the latter case, individuals are observed performing specified tasks within a controlled environment such as a usability laboratory.

ACTIVITY 8.5

To appreciate the different merits of observation in the field and observation in a controlled environment, read the following scenarios and answer the questions that appear after.

Scenario 1 A usability consultant joins a group of tourists who have been given a wearable navigation device that fits onto a wrist strap to test on a visit to Stockholm. After sightseeing for the day, they use the device to find a list of restaurants within 2 kilometers of their current position. Several are listed, and they find the phone numbers of a few, call them to ask about their menus, select one, make a booking, and head off to the restaurant. The usability consultant observes some difficulty operating the device, especially on the move. Discussion with the group supports the evaluator's impression that there are problems with the interface, but on balance the device is useful, and the group is pleased to get a table at a good restaurant nearby.

Scenario 2 A usability consultant observes how participants perform a preplanned task using the wearable navigation device in a usability laboratory. The task requires the participants to find the phone number of a restaurant called Matisse. It takes them several minutes to do this, and they appear to have problems. The video recording and interaction log suggest that the interface is quirky and the audio interaction is of poor quality. This is supported by participants' answers on a user satisfaction questionnaire.

1. What are the advantages and disadvantages of these two types of observation?
2. When might each type of observation be useful?

Comment

1. The advantages of the field study are that the observer saw how the device could be used in a real situation to solve a real problem. They experienced the delight expressed with the overall concept and the frustration with the interface. By watching how the group used the device on the move, they gained an understanding of what the participants liked and what was lacking. The disadvantage is that the observer was an insider in the group,

(Continued)

so how objective could they be? The data is qualitative, and while anecdotes can be very persuasive, how useful are they? Maybe they were having such a good time that their judgment was clouded and they missed hearing negative comments and didn't notice some of the participant's annoyance. Another study could be done to find out more, but it is not possible to replicate the exact conditions of this study. The advantages of the lab study are that it is easier to replicate, so several users could perform the same task, specific usability problems can be identified, users' performance can be compared, and averages for such measures as the time it took to do a specific task and the number of errors can be calculated. The observer could also be more objective as an outsider. The disadvantage is that the study is artificial and says nothing about how the device would be used in the real environment.

2. Both types of study have merits. Which is better depends on the goals of the study. The lab study is useful for examining details of the interaction style to make sure that usability problems with the interface and button design are diagnosed and corrected. The field study reveals how the navigation device is used in a real-world context and how it integrates with or changes users' behavior. Without this study, it is possible that developers might not have discovered the enthusiasm for the device because the reward for doing laboratory tasks is not as compelling as a good meal! In fact, according to Kjeldskov and Skov (2014), there is no definitive answer to which kind of study is preferable for mobile devices. They suggest that the real question is when and how to engage with longitudinal field studies. ■

8.6.1 Direct Observation in the Field

It can be difficult for people to explain what they do or to describe accurately how they achieve a task. It is unlikely that an interaction designer will get a full and true story using interviews or questionnaires. Observation in the field can help fill in details about how users behave and use technology, and nuances that are not elicited from other forms of investigation may be observed. Understanding the context provides important information about why activities happen the way that they do. However, observation in the field can be complicated and harder to do well than at first appreciated. Observation can also result in a lot of data, some of which may be tedious to analyze and not very relevant.

All data gathering should have a clearly stated goal, but it is particularly important to have a focus for an observation session because there is always so much going on. On the other hand, it is also important to be prepared to change the plan if circumstances change. For example, the plan may be to spend one day observing an individual performing a task, but an unexpected meeting crops up, which is relevant to the observation goal and so it makes sense to attend the meeting instead. In observation, there is a careful balance between being guided by goals and being open to modifying, shaping, or refocusing the study as more is learned about the situation. Being able to keep this balance is a skill that develops with experience.

Structuring Frameworks for Observation in the Field

During an observation, events can be complex and rapidly changing. There is a lot for observers to think about, so many experts have a framework to structure and focus their observation. The framework can be quite simple. For example, this is a practitioner's framework for use in evaluation studies that focuses on just three easy-to-remember items:

The person: Who is using the technology at any particular time?

The place: Where are they using it?

The thing: What are they doing with it?

Even a simple framework such as this one based on who, where, and what can be surprisingly effective to help observers keep their goals and questions in sight. Experienced observers may prefer a more detailed framework, such as the following (Robson and McCarten, 2016, p. 328), which encourages them to pay greater attention to the context of the activity:

Space: What is the physical space like, and how is it laid out?

Actors: What are the names and relevant details of the people involved?

Activities: What are the actors doing, and why?

Objects: What physical objects are present, such as furniture?

Acts: What are specific individual actions?

Events: Is what you observe part of a special event?

Time: What is the sequence of events?

Goals: What are the actors trying to accomplish?

Feelings: What is the mood of the group and of individuals?

This framework was devised for any type of observation, so when used in the context of interaction design, it might need to be modified slightly. For example, if the focus is going to be on how some technology is used, the framework could be modified to ask the following:

Objects: What physical objects, in addition to the technology being studied, are present, and do they impact on the technology use?

Both of these frameworks are relatively general and could be used in many different types of study, or as a basis for developing a new framework for a specific study.

ACTIVITY 8.6

1. Find a small group of people who are using any kind of technology, for example, smartphones, household appliances, or video game systems, and try to answer the question, "What are these people doing?" Watch for three to five minutes, and write down what you observe. When finished, note down how it felt to be doing this and any reactions in the group of people observed.
2. If you were to observe the group again, what would you do differently?
3. Observe this group again for about 10 minutes using the detailed framework given above.

(Continued)

Comment

1. What problems did this exercise highlight? Was it hard to watch everything and remember what happened? How did the people being watched feel? Did they know they were being watched? Perhaps some of them objected and walked away. If you didn't tell them that they were being watched, should you have?
2. The initial goal of the observation, that is, to find out what the people are doing, was vague, and chances are that it was quite a frustrating experience not knowing what was significant and what could be ignored. The questions used to guide observation need to be more focused. For example, you might ask the following: What are the people doing with the technology? Is everyone in the group using it? Are they looking pleased, frustrated, serious, happy? Does the technology appear to be central to the users' goals?
3. Ideally, you will have felt more confident this second time, partly because it is the second time doing some observation and partly because the framework provided a structure for what to look at. ■

Degree of Participation

Depending on the type of study, the degree of participation within the study environment varies across a spectrum, which can be characterized as insider at one end and outsider at the other. Where a particular study falls along this spectrum depends on its goal and on the practical and ethical issues that constrain and shape it.

An observer who adopts an approach right at the outsider end of the spectrum is called a *passive observer*, and they will not take any part in the study environment at all. It is difficult to be a truly passive observer in the field, simply because it's not possible to avoid interacting with the activities. Passive observation is more appropriate in lab studies.

An observer who adopts an approach at the insider end of this spectrum is called a *participant observer*. This means that they attempt, at various levels depending on the type of study, to become a member of the group being studied. This can be a difficult role to play since being an observer also requires a certain level of detachment, while being a participant assumes a different role. As a participant observer, it is important to keep the two roles clear and separate so that observation notes are objective while participation is also maintained. It may not be possible to take a full participant observer approach for other reasons. For example, the observer may not be skilled enough in the task at hand, the organization/group may not be prepared for an outsider to take part in their activities, or the timescale may not provide sufficient opportunity to become familiar enough with the task to participate fully. Similarly, if observing activity in a private place such as the home, full participation would be difficult even if, as suggested by some researchers (for example, Bell et al., 2005), you have spent time getting to know the family before starting the study. Chandrika Cycil et al. (2013) overcame this issue in their study of in-car conversations between parents and children by traveling with the families initially for a week and then asking family members to video relevant episodes of activity. In this way, they had gained an understanding of the context and family dynamics and then collected more detailed data to study activity in depth.

Planning and Conducting an Observation in the Field

The frameworks introduced in the previous section are useful for providing focus and also for organizing the observation and data gathering activity. Choosing a framework is important, but there are other decisions that need to be made, including the level of participation to adopt, how to make a record of the data, how to gain acceptance in the group being studied, how to handle sensitive issues such as cultural differences or access to private spaces, and how to ensure that the study uses different perspectives (people, activities, job roles, and so forth).

One way to achieve this last point is to work as a team. This can have several benefits.

- Each person can agree to focus on different people or different parts of the context, thereby covering more ground.
- Observation and reflection can be interwoven more easily when there is more than one observer.
- More reliable data is likely to be generated because observations can be compared.
- Results will reflect different perspectives.

Once in the throes of an observation, there are other issues that need to be considered. For example, it will be easier to relate to some people more than others. Although it will be tempting to pay attention to them more than others, attention needs to be paid to everyone in the group. Observation is a fluid activity, and the study will need to be refocused as it progresses in response to what is learned. Having observed for a while, interesting phenomena that seem relevant will start to emerge. Gradually, ideas will sharpen into questions that guide further observation.

Observing is also an intense and tiring activity, but checking notes and records and reviewing observations and experiences at the end of each day is important. If this is not done, then valuable information may be lost as the next day's events override the previous day's findings. Writing a diary or private blog is one way of achieving this. Any documents or other artifacts that are collected or copied (such as minutes of a meeting or discussion items) can be annotated, describing how they are used during the observed activity. Where an observation lasts several days or weeks, time can be taken out of each day to go through notes and other records.

As notes are reviewed, separate personal opinion from observation and mark issues for further investigation. It is also a good idea to check observations and interpretations with an informant or members of the participant group for accuracy.

DILEMMA

When to Stop Observing?

Knowing when to stop doing any type of data gathering can be difficult for novices, but it is particularly tricky in observational studies because there is no obvious ending. Schedules often dictate when your study ends. Otherwise, stop when nothing new is emerging. Two indications of having done enough are when similar patterns of behavior are being seen and when all of the main stakeholder groups have been observed and a good understanding of their perspectives has been achieved. ■

Ethnography

Ethnography has traditionally been used in the social sciences to uncover the organization of societies and their activities. Since the early 1990s, it has gained credibility in interaction design, and particularly in the design of collaborative systems; see Box 8.6, “Ethnography in Requirements” and Crabtree (2003). A large part of most ethnographic studies is direct observation, but interviews, questionnaires, and studying artifacts used in the activities also feature in many ethnographic studies. A distinguishing feature of ethnographic studies compared with other data gathering is that a situation is observed without imposing any *a priori* structure or framework upon it, and everything is viewed as “strange.” In this way, the aim is to capture and articulate the participants’ perspective of the situation under study.

BOX 8.6

Ethnography in Requirements

The MERboard is a tool scientists and engineers use to display, capture, annotate, and share information in support of the operation of two Mars Exploration Rovers (MERs) on the surface of Mars. The MER (see Figure 8.8) acts like a human geological explorer by collecting and analyzing samples and then transmitting the results to the scientists on Earth. The scientists and engineers collaboratively analyze the data received, decide what to study next, create plans of action, and send commands to the robots on the surface of Mars.



Figure 8.8 Mars Exploration Rover

Source: NASA Jet Propulsion Laboratory (NASA-JPL)

The requirements for MERboard were identified partly through ethnographic field-work, observations, and analysis (Trimble et al., 2002). The team of scientists and engineers ran a series of field tests that simulated the process of receiving data, analyzing it, creating plans, and transmitting them to the MERs. The main problems they identified stemmed from the scientists’ limitations in displaying, sharing, and storing information (see Figure 8.9a).



Figure 8.9 (a) The situation before MERboard; (b) a scientist using MERboard to present information

Source: Trimble et al. (2002)

These observations led to the development of MERboard (see Figure 8.9b), which contains four core applications: a whiteboard for brainstorming and sketching, a browser for displaying information from the web, the capability to display personal information and information across several screens, and a file storage space linked specifically to MERboard. ■

Ethnography has become popular within interaction design because it allows designers to obtain a detailed and nuanced understanding of people's behavior and the use of technology that cannot be obtained by other methods of data gathering (Lazar et al., 2017). While there has been much discussion of how big data can address many design issues, big data is likely to be most powerful when combined with ethnography to explain how and why people do what they do (Churchill, 2018).

The observer in an ethnographic study adopts a participant observer (insider) role as much as possible (Fetterman, 2010). While participant observation is a hallmark of ethnographic studies, it is also used within other methodological frameworks such as action research (Hayes, 2011), where one of the goals is to improve the current situation.

Ethnographic data is based on what is available, what is "ordinary," what it is that people do, say, and how they work. The data collected therefore has many forms: documents, notes taken by the observer(s), pictures, and room layout sketches. Notes may include snippets of conversations and descriptions of rooms, meetings, what someone did, or how people reacted to a situation. Data gathering is opportunistic, and observers make the most of opportunities as they present themselves. Often, interesting phenomena do not reveal themselves immediately but only later, so it is important to gather as much as possible within the framework of observation. Initially, spend time getting to know people in the participant group and bonding with them. Participants need to understand why the observers are there, what they hope

8 DATA GATHERING

to achieve, and how long they plan to be there. Going to lunch with them, buying coffee, and bringing small gifts, for example, cookies, can greatly help this socialization process. Moreover, key information may be revealed during one of these informal gatherings.

It is important to show interest in the stories, gripes, and explanations that are provided and to be prepared to step back if a participant's phone rings or someone else enters the workspace. A good tactic is to explain to one of the participants during a quiet moment what you think is happening and then let them correct any misunderstandings. However, asking too many questions, taking pictures of everything, showing off your knowledge, and getting in their way can be very off-putting. Putting up cameras on tripods on the first day may not be a good idea. Listening and watching while sitting on the sidelines and occasionally asking questions is a better approach.

The following is an illustrative list of materials that might be recorded and collected during an ethnographic study (adapted from Crabtree, 2003, p. 53):

- Activity or job descriptions
- Rules and procedures (and so on) that govern particular activities
- Descriptions of activities observed
- Recordings of the talk taking place between parties involved in observed activities
- Informal interviews with participants explaining the detail of observed activities
- Diagrams of the physical layout, including the position of artifacts
- Photographs of artifacts (documents, diagrams, forms, computers, and so on) used in the course of observed activities
- Videos of artifacts as used in the course of observed activities
- Descriptions of artifacts used in the course of observed activities
- Workflow diagrams showing the sequential order of tasks involved in observed activities
- Process maps showing connections between activities

Traditionally, ethnographic studies in this field aim to understand what people do and how they organize action and interaction within a particular context of interest to designers. However, recently there has been a trend toward studies that draw more on ethnography's anthropological roots and the study of culture. This trend has been brought about by the perceived need to use different approaches because the computers and other digital technologies, especially mobile devices, are embedded in everyday activity, and not just in the workplace as in the 1990s.

BOX 8.7

Doing Ethnography Online

As collaboration and social activity online have increased, ethnographers have adapted their approach to study social media and the various forms of computer-mediated communication (Rotman et al., 2013; Bauwens and Genoud, 2014). This practice has various names, the most common of which are online ethnography (Rotman et al., 2012), virtual ethnography (Hine, 2000), and netnography (Kozinets, 2010). Where a community or activity has both an online and offline presence, it is common to incorporate both online and offline techniques within the data gathering program. However, where the community or activities of interest exist almost exclusively online, then mostly online techniques are used and virtual ethnography becomes central.

Why is it necessary to distinguish between online and face-to-face ethnography? It is important because interaction online is different from interaction in person. For example, communication in person is richer (through gesture, facial expression, tone of voice, and so on) than online communication, and anonymity is more easily achieved when communicating online. In addition, virtual worlds have a persistence, due to regular archiving, that does not typically occur in face-to-face situations. This makes characteristics of the communication different, which often includes how ethnographers introduce themselves to the community, how they act within the community, and how they report their findings. For these reasons, some researchers who work primarily online also try to meet with some of the participants face-to-face, particularly when working on sensitive topics (Lingel, 2012).

Special tools may be developed to support ethnographic data collection. Mobilab is an online collaborative platform that was developed for citizens living in Switzerland to report and discuss their daily mobility during an eight-week period using their mobile phones, tablets, and computers (Bauwens and Genoud, 2014). Mobilab enabled the researchers to more easily engage in discussion with participants on a variety of topics, including trucks parking on a bikeway.

For observational studies in large social spaces, such as digital libraries or Facebook, there are different ethical issues to consider. For example, it is unrealistic to ask everyone using a digital library to sign any kind of form agreeing to be involved in the study, yet participants do need to understand the observer's role and the purpose of their study. The presentation of results needs to be modified too. Quotes from participants in the community, even if anonymized in the report, can easily be attributed by a simple search of the community archive or the IP address of the sender, so care is needed to protect their privacy. ■

8.6.2 Direct Observation in Controlled Environments

Observing users in a controlled environment may occur within a purposely built usability lab, but portable labs that can be set up in any room are quite common. Portable laboratories can mean that more participants take part because they don't have to travel away from their normal environment. Observation in a controlled environment inevitably takes on a more formal character than observation in the field, and the user may feel more apprehensive. As with interviews, it is a good idea to prepare a script to guide how the participants will be greeted, be told about the goals of the study and how long it will last, and have their rights explained. Use of a script ensures that each participant will be treated in the same way, which brings more credibility to the results obtained from the study.

The same basic data recording techniques are used for direct observation in the laboratory and field studies (that is, capturing photographs, taking notes, collecting video, and so on), but the way in which these techniques are used is different. In the lab the emphasis is on the details of what individuals do, while in the field the context is important, and the focus is on how people interact with each other, the technology, and their environment.

The arrangement of equipment with respect to the participant is important in a controlled study because details of the person's activity need to be captured. For example, one camera might record facial expressions, another might focus on mouse and keyboard activity, and another might record a broad view of the participant and capture body language. The stream of data from the cameras can be fed into a video editing and analysis suite where it is co-ordinated and time-stamped, annotated, and partially edited.

The Think-Aloud Technique

One of the problems with observation is that the observer doesn't know what users are thinking and can only guess from what they see. Observation in the field should not be intrusive, as this will disturb the context the study is trying to capture. This limits the questions being asked of the participant. However, in a controlled environment, the observer can afford to be a little more intrusive. The think-aloud technique is a useful way of understanding what is going on in a person's head.

Imagine observing someone who has been asked to evaluate the interface of the web search engine Lycos.com. The user, who does not have much experience of web searches, is told to look for a phone for a 10-year-old child. They are told to type www.lycos.com and then proceed however they think best. They type the URL and get a screen similar to the one in Figure 8.10.



Figure 8.10 Home page of Lycos search engine

Source: <https://www.lycos.com>

Next, they type **child's phone** in the search box. They get a screen similar to the one shown in Figure 8.11. They are silent. What is going on? What are they thinking? One way around the problem of knowing what they are doing is to collect a think-aloud protocol, a technique developed by Anders Ericsson and Herbert Simon (1985) for examining people's problem-solving strategies. The technique requires people to say out loud everything that they are thinking and trying to do so that their thought processes are externalized.

So, let's imagine an action replay of the situation just described, as follows, but this time the user has been instructed to think aloud:

"I'm typing in www.lycos.com, as you told me." <types>

"Now I am typing child's phone and then clicking the search button.

<pause and silence>

"It's taking a few seconds to respond."

"Oh! Now I have a choice of other websites to go to. Hmm, I wonder which one I should select. Well, it's for a young child so I want a 'child-safe phone.' This one mentions safe phones <He clicks on 7 Best Cell Phones for Kids - Mashable>

"Gosh, there's a lot more models to select from than I expected! Hmm, some of these are for older children. I wonder what I do next to find one for a 10-year-old."

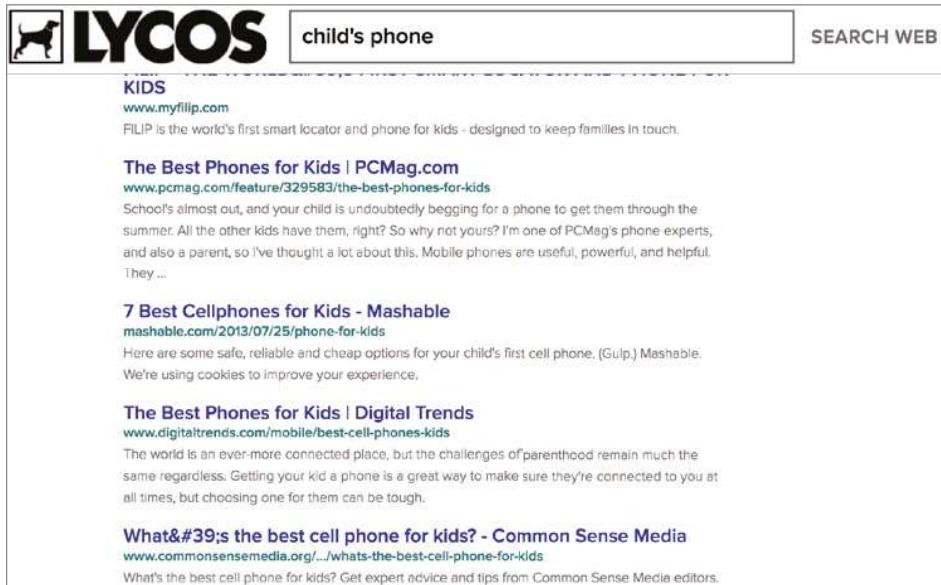


Figure 8.11 The screen that appears in response to searching for “child’s phone”

Source: <https://www.lycos.com>

<pauses and looks at the screen>

*I guess I should scroll through them and identify those that might be appropriate.”
<silence . . . >*

Now you know more about what the user is trying to achieve, but they are silent again. They are looking at the screen, but what are they thinking now? What are they looking at?

The occurrence of these silences is one of the biggest problems with the think-aloud technique.

ACTIVITY 8.7

Try a think-aloud exercise yourself. Go to a website, such as Amazon or eBay, and look for something to buy. Think aloud as you search and notice how you feel and behave.

Afterward, reflect on the experience. Was it difficult to keep speaking all the way through the task? Did you feel awkward? Did you stop talking when you got stuck?

Comment

Feeling self-conscious and awkward doing this is a common response, and some people say they feel really embarrassed. Many people forget to speak out loud and find it difficult to do so when the task becomes difficult. In fact, you probably stopped speaking when the task became demanding, and that is exactly the time when an observer is most eager to hear what's happening.

(Continued)

If a user is silent during a think-aloud protocol, the observer could interrupt and remind them to think out loud, but that would be intrusive. Another solution is to have two people work together so that they talk to each other. Working with another person (called *constructive interaction* [Miyake, 1986]) is often more natural and revealing because participants talk in order to help each other along. This technique has proved to be particularly successful with children, and it also avoids possible cultural influences on concurrent verbalization (Clemmensen et al., 2008). ■

8.6.3 Indirect Observation: Tracking Users' Activities

Sometimes direct observation is not possible because it is too intrusive or observers cannot be present over the duration of the study, and so activities are tracked indirectly. Diaries and interaction logs are two techniques for doing this.

Diaries

Participants are asked to write a diary of their activities on a regular basis, including things like what they did, when they did it, what they found hard or easy, and what their reactions were to the situation. For example, Sohn et al. (2008) asked 20 participants to record their mobile information needs through text messages and then to use these messages as prompts to help them answer six questions on a website at the end of each day. From the data collected, they identified 16 categories of mobile information needs, the most frequent of which was “trivia.”

Diaries are useful: when participants are scattered and unreachable in person; when the activity is private, for example, in the home; or when it relates to feelings, for instance, emotions or motivation. For example, Jang et al. (2016) used diaries with interviews to collect data about users’ experiences with smart TVs in the home as compared to within a controlled lab setting. The study in the home was conducted over several weeks during which participants were asked to keep a diary of their experiences and feelings. Surveys were also collected. This mixed-methods study informed the user experience design of future systems.

Diaries have several advantages: they do not take up much researcher time to collect data; they do not require special equipment or expertise; and they are suitable for long-term studies. In addition, templates, like those used in open-ended online questionnaires, can be created online to standardize the data entry format so that the data can be entered directly into a database for analysis. However, diary studies rely on participants being reliable and remembering to complete them at the assigned time and as instructed, so incentives may be needed, and the process has to be straightforward.

Determining how long to run a diary study can be tricky. If the study goes on for too long, participants may lose interest and need incentives to continue. In contrast, if the study is too short, important data may be missed. For example, in a study of children’s experiences of a game, Elisa Mekler et al. (2014) used diaries to collect data after each gaming session in a series. After the first few sessions, all of the children in the study showed loss of motivation for the game. However, by the end of the study, those who completed the game were more motivated than those who did not complete the game. Had the data been collected only once, the researchers may not have observed the impact of game completion on the children’s motivation.

Another problem is that the participants' memories of events may be exaggerated or detail is forgotten; for example, they may remember them as better or worse than they really were or as taking more or less time than they actually did take. One way of mitigating this problem is to collect other data in diaries (such as photographs including selfies, audio and video clips, and so on). Scott Carter and Jennifer Mankoff (2005) considered whether capturing events through pictures, audio, or artifacts related to the event affects the results of the diary study. They found that images resulted in more specific recall than other media, but audio was useful for capturing events when taking a photo was too awkward. Tangible artifacts, such as those shown in Figure 8.12, also encouraged discussion about wider beliefs and attitudes.



Figure 8.12 Some tangible objects collected by participants involved in a study about a jazz festival
Source: Carter and Mankoff (2005). Reproduced with permission of ACM Publications

The experience sampling method (ESM) is similar to a diary in that it relies on participants recording information about their everyday activities. However, it differs from more traditional diary studies because participants are prompted at random times via email, text message, or similar means to answer specific questions about their context, feelings, and actions (Hektner et al., 2006). These prompts have the benefit of encouraging immediate data capture. Niels van Berkel et al. (2017) provide a comprehensive survey of ESM and its evolution, tools, and uses across a wide range of studies.

Interaction Logs, Web Analytics, and Data Scraping

Interaction logging uses software to record users' activity in a log that can be examined later. A variety of actions may be recorded, such as key presses and mouse or other device movements, time spent searching a web page, time spent looking at help systems, and task flow

through software modules. A key advantage of logging activity is that it is unobtrusive provided system performance is not affected, but it also raises ethical concerns about observing participants if this is done without their knowledge. Another advantage is that large volumes of data can be logged automatically. Visualization tools are therefore helpful for exploring and analyzing this data quantitatively and qualitatively. Algorithmic and statistical methods may also be used.

Examining the trail of activity that people leave behind when they are active on websites, Twitter, or Facebook is also a form of indirect observation. You can see an example of this by looking at a Twitter feed to which you have access, for example, that of a friend, president, prime minister, or some other leader. These trails allow examination of discussion threads on a particular topic, such as climate change, or reactions to comments made by a public figure or to a topic that is trending today. If there are just a few posts, then it is easy to see what is going on, but often the most interesting posts are those that generate a lot of comments. Examining thousands, tens of thousands, and even millions of posts requires automated techniques. Web analytics and data scraping are discussed further in Chapter 10.

8.7 Choosing and Combining Techniques

Combining data gathering techniques into a single data gathering program is common practice, for example, when collecting case study data (see Box 8.8). The benefit of using a combination of methods is to provide multiple perspectives. Choosing which data gathering techniques to use depends on a variety of factors related to the study goals. There is no right technique or combination of techniques, but some will undoubtedly be more appropriate than others. The decision about which to use will need to be made after taking all of the factors into account.

Table 8.1 provides an overview to help choose a set of techniques for a specific project. It lists the kind of information obtained (such as answers to specific questions) and the type of data (for example, mostly qualitative or mostly quantitative). It also includes some advantages and disadvantages for each technique. Note that different modalities can be used for some of these techniques. For example, interviews and focus groups can be conducted face-to-face, by phone, or through teleconferencing, so when considering advantages and disadvantages of the techniques, this should also be taken into account.

In addition, technique choice is influenced by practical issues.

- *The focus of the study.* What kind of data will support the focus and goal of the study? This will be influenced by the interaction design activity and the level of maturity of the design.
- *The participants involved.* Characteristics of the target user group including their location and availability.
- *The nature of the technique.* Does the technique require specialist equipment or training, and do the investigators have the appropriate knowledge and experience?
- *Available resources.* Expertise, tool support, time, and money.

Technique	Good for	Kind of data	Advantages	Disadvantages
Interviews	Exploring issues	Some quantitative but mostly qualitative	Interviewer can guide interviewee if necessary. Encourages contact between developers and users.	Artificial environment may intimidate interviewee. It also removes them from the environment where work is typically being done.
Focus groups	Collecting multiple viewpoints	Some quantitative but mostly qualitative	Highlights areas of consensus and conflict. Encourages contact between developers and users.	Possibility of dominant characters.
Questionnaires	Answering specific questions	Quantitative and qualitative	Can reach many people with low resource requirements.	The design is key. Response rates may be low. Unless carefully designed, the responses may not provide suitable data.
Direct observation in the field	Understanding context of user activity	Mostly qualitative	Observing gives insights that other techniques don't provide.	Very time-consuming. Huge amounts of data are produced.
Direct observation in a controlled environment	Capturing the detail of what individuals do	Quantitative and qualitative	Can focus on the details of a task without interruption.	Results may have limited use in the normal environment because the conditions were artificial.
Indirect observation	Observing users without disturbing their activity; data captured automatically	Quantitative (logging) and qualitative (diary)	User doesn't get distracted by the data gathering; automatic recording means that it can extend over long periods of time.	A large amount of quantitative data needs tool support to analyze (logging); participants' memories may exaggerate (diary).

Table 8.1 Overview of data gathering techniques and their use

BOX 8.8**Collecting case study data**

Case studies often use a combination of methods, for example, direct and indirect observations and interviews. Although people frequently use the term *case study* colloquially to refer to a study that they are using as a case example, there is also a case study methodology that collects field study data over days, months, or even years. There is a body of literature that provides advice on how to do good case studies. Robert Yin (2013), for example, identifies these data collection sources: documentation, archival records, interviews, direct observations, participant observation, and physical artifacts. Case studies are good for integrating multiple perspectives, for example, studying new technology in the wild, and for giving meaning to first impressions. The data collection process tends to be intensive, concurrent, interactive, and iterative.

In a study of how local communities organize and adapt technology for managing their local rivers and streams, approaching it as a case study allowed a detailed contextual analysis of events and relationships that occurred over multiple groups of volunteers during a two-year period (Preece et al., 2019). From this study, the researchers learned about the volunteers' needs for highly flexible software to support the diverse groups of participants working on a wide range of water-related topics. ■

ACTIVITY 8.9

For each of the following products, consider what kinds of data gathering would be appropriate and how to use the different techniques introduced earlier. Assume that product development is just starting and that there is sufficient time and resources to use any of the techniques.

1. A new software app to support a small organic produce shop. There is a system running already with which the users are reasonably happy, but it is looking dated and needs upgrading.
2. An innovative device for diabetes sufferers to help them record and monitor their blood sugar levels.
3. An ecommerce website that sells fashion clothing for young people.

Comment

1. As this is a small shop, there are likely to be few stakeholders. Some period of observation would be important to understand the context of the new and the old systems. Interviewing the staff rather than giving them questionnaires is likely to be appropriate because there aren't very many of them, and this will yield richer data and give the developers a chance to meet the users. Organic produce is regulated by a variety of laws, so looking at this documentation will help you understand any legal constraints that have to be taken into account. This suggests a series of interviews with the main users to understand the positive and negative features of the existing system, a short observation session to understand the context of the system, and a study of documentation surrounding the regulations.
2. In this case, the user group is quite large and spread out geographically, so talking to all of them is not feasible. However, interviewing a representative sample of potential users,

possibly at a local diabetic clinic, is feasible. Observing current practices to monitor blood sugar levels will help you understand what is required. An additional group of stakeholders would be those who use or have used the other products on the market. These stakeholders can be questioned about their experience with their existing devices so that the new device can be an improvement. A questionnaire sent to a wider group in order to confirm the findings from the interviews would be appropriate, as might a focus group where possible.

3. Again, the user group is quite large and spread out geographically. In fact, the user group may not be very well defined. Interviews backed up by questionnaires and focus groups would be appropriate. In this case, identifying similar or competing sites and evaluating them will help provide information for an improved product. ■

In-Depth Activity

The aim of this in-depth activity is to practice data gathering. Assume that you have been employed to improve the user experience of an interactive product such as a smartphone app, a digital media player, a Blu-ray player, computer software, or some other type of technology. This existing product may be redesigned, or a completely new product may be created. To do the assignment, find a group of people or a single individual prepared to be the user group. These could be your family, friends, peers, or people in a local community group.

For this assignment:

- (a) Clarify the basic goal of improving the product by considering what this means in your circumstances.
- (b) Watch the group (or person) casually to get an understanding of any issues that might create challenges for this activity and any information to help refine the study goals.
- (c) Explain how you would use each of the three data gathering techniques: interview, questionnaire, and observation in your data gathering program. Explain how your plan takes account of triangulation.
- (d) Consider your relationship with the user group and decide if an informed consent form is required. (Figure 8.1 will help you to design one if needed.)
- (e) Plan your data gathering program in detail.
 - Decide what kind of interview to run and design a set of interview questions. Decide how to record the data, then acquire and test any equipment needed and run a pilot study.
 - Decide whether to include a questionnaire in your data gathering program, and design appropriate questions for it. Run a pilot study to check the questionnaire.
 - Decide whether to use direct or indirect observation and where on the outsider/insider spectrum should the observers be. Decide how to record the data, then acquire and test any equipment needed and run a pilot study.
- (f) Carry out the study, but limit its scope. For example, interview only two or three people or plan only two half-hour observation periods.
- (g) Reflect on this experience and suggest what you would do differently next time. Keep the data gathered, as this will form the basis of the in-depth activity in Chapter 9.

Summary

This chapter has focused on three main data gathering methods that are commonly used in interaction design: interviews, questionnaires, and observation. It has described in detail the planning and execution of each. In addition, five key issues of data gathering were presented, and how to record the data gathered was discussed.

Key Points

- All data gathering sessions should have clear goals.
- Depending on the study context, an informed consent form and other permissions may be needed to run the study.
- Running a pilot study helps to test out the feasibility of a planned data gathering session and associated instruments such as questions.
- Triangulation involves investigating a phenomenon from different perspectives.
- Data may be recorded using handwritten notes, audio or video recording, a camera, or any combination of these.
- There are three styles of interviews: structured, semi-structured, and unstructured.
- Questionnaires may be paper-based, via email, or online.
- Questions for an interview or questionnaire can be open or closed-ended. Closed-ended questions require the interviewee to select from a limited range of options. Open-ended questions accept a free-range response.
- Observation may be direct or indirect.
- In direct observation, the observer may adopt different levels of participation, ranging from insider (participant observer) to outsider (passive observer).
- Choosing appropriate data gathering techniques depends on the focus of the study, participants involved, nature of the technique, and resources available.

Further Reading

FETTERMAN, D. M. (2010). *Ethnography: Step by Step* (3rd ed.) Applied Social Research Methods Series, Vol. 17. Sage. This book introduces the theory and practice of ethnography, and it is an excellent guide for beginners. It covers both data gathering and data analysis in the ethnographic tradition.

FULTON SURI, J. (2005) *Thoughtless Acts?* Chronicle Books, San Francisco. This intriguing little book invites you to consider how people react to their environment. It is a good introduction to the art of observation.

HEATH, C., HINDMARSH, J. AND LUFT, P. (2010) *Video in Qualitative Research: Analyzing Social Interaction in Everyday Life*. Sage. This is an accessible book that provides practical advice and guidance about how to set up and perform data gathering using video recording. It also covers data analysis, presenting findings, and potential implications from video research based on their own experience.