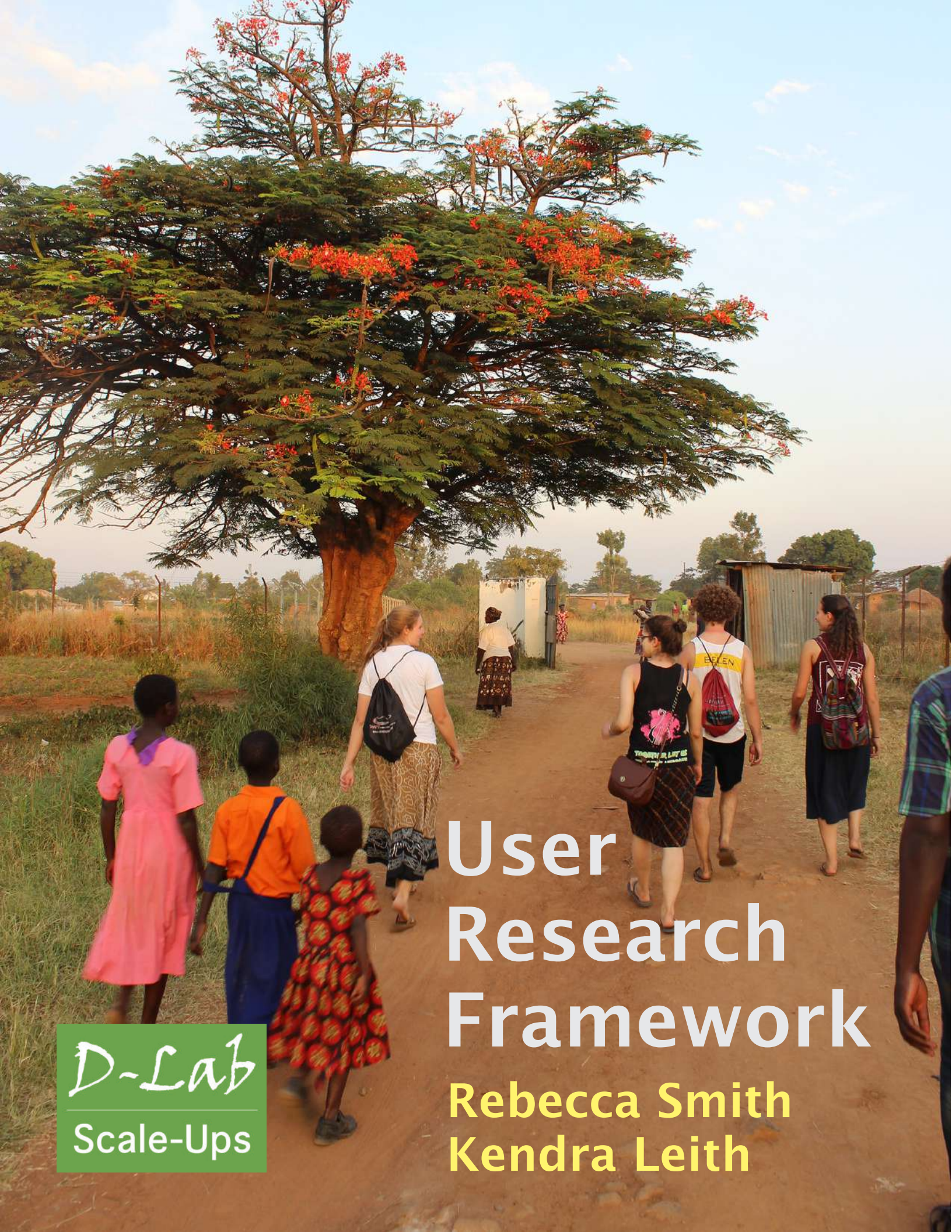




User Research Framework

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D-Lab
Scale-Ups

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Cover photo: D-Lab students and community members in Uganda.

Introduction

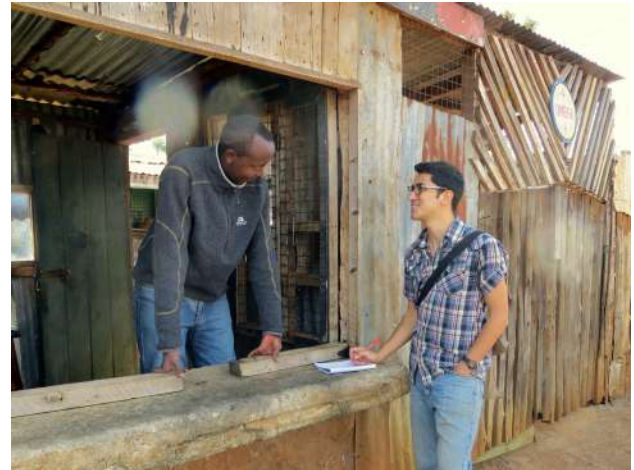
D-Lab at the Massachusetts Institute of Technology is building a global network of innovators to design and disseminate technologies that meaningfully improve the lives of people living in poverty. The program was founded in 2002 and has long focused on hands-on, experiential learning and community-led development. We believe that designing with, rather than for, people will result in better outcomes. Supporting beneficiaries to design their own solutions is sometimes an even more effective approach. With the creation of the Scale-Ups program in D-Lab in 2011, reflection on how to have larger-scale impact led to a renewed focus on the early-stage design process. We believe that a strong understanding of user and customer needs, their context, and factors in decision making will better inform later-stage design work and increase the potential for positive impact. The outputs of qualitative user research—prioritized needs, insights, user and customer profiles, and design requirements—will provide a strong foundation for the design phase of your project and inform subsequent ideas and decisions.

In the field of international development, many designers are creating products or services for populations of which they are not native members and areas in which resources are very limited or constrained. Within this context, it is important to spend sufficient time researching the needs, values, and dreams of users. A deep, real understanding of the problem is a key part of reaching a better solution; how can you solve a problem if you do not understand it?

As user experience designer Steve Baty writes:

Design has two important goals: delivering a good solution—getting the *design* right—and solving a significant and meaningful problem—getting the *right* design...Time and time again, you'll see organizations that are good at getting the design right, but implement products or services that fall flat as far as customer adoption and utilization are concerned...There are several ways you can tackle this problem, but they all come down to this: find a way to understand your potential customers. Understand them as deeply as you can. What motivates them? What are their needs? What is the physical context in which they live, work, and play; the culture within which they sit? (Baty 2012).

This document, the Scale-Ups User Research Framework, has been written to help individuals and organizations effectively plan and conduct qualitative research in the field. We provide guidance on how to plan user research, explore key qualitative research methods in depth, and share how to turn research outputs into actionable insights that will lead you into the next phase of design. Throughout, we share examples and tips that draw on



D-Lab Field Coordinator Benji Moncivaiz (r) speaks with a water vendor in Kenya

D-Lab's previous learnings and exemplify our approach. We focus on qualitative research because of the richness of information that can result, the benefits of building empathy through first-hand experiences, and the ability to quickly adapt the methods and still effectively collect information. Quantitative research methods may also have a place in your early-stage design work, but they are not a focus in this resource.

The framework is a guide to get you started: these are recommendations and theories, not strict rules. Follow your instincts, try new methods, and please share what you learn. Our hope is that you learn about needs firsthand and use your rich insights to develop solutions that meet users' needs, appeal to users and customers on multiple levels, and improve lives.

What is user research?

User research is an approach used to illuminate needs of stakeholders, and may also be referred to as needs assessment or design research. It has origins in research methods drawn from sociology and anthropology, such as ethnography (Laurel 2003, p. 32). While anthropologists might study a community by living within it for years, a needs assessment yields information about a target market for a project or innovation over a shorter timeline and with a wide range of activities and methods (Vergara and Ray, p. 1). A rich understanding of people's behavior, interactions, and environmental conditions is developed: needs are uncovered and new solutions inspired. Through immersive, in-depth research, designers may become embedded in the lives of the people they are designing with, learn from their behaviors, and propose solutions based on that knowledge (IDEO 2011, p. 32). Design researchers learn to see more than is visible, and to learn more than can be heard. Design research is an act of imagination, grounded in evidence (Laurel 2003, p. 39).

Users and customers

Your end-user may not be the same person as your customer; for example, a husband may purchase a stove that his wife will ultimately use, or an NGO may select a solar lantern that they will distribute to beneficiaries. Understanding this distinction is important, and learning the respective needs, desires, and decision-making processes for the two groups will be critical. A technology may be well designed for the end-user, but will never reach him or her if the customer does not choose to purchase it. The customer's ability and desire to purchase a technology will depend on factors including the supply chain, business model, price and financing options, marketing, and branding.

We will frequently refer to *user* research in this document, but the information should apply to qualitative research in general, whether engaging potential users, customers, or other stakeholders. Broadly, the methods presented can be used to understand needs of users and decision-making processes of customers, and to determine diverse product requirements that stakeholders may desire. Another tool that allows for comprehensive identification of pertinent stakeholders, their relationships to each other, and their role in the product's life cycle is Customer Value Chain Analysis (Donaldson et al. 2006), discussed in the Scale-Ups Market Research Framework.¹

Why user research?

The qualitative research methods presented in this framework can be used to understand social phenomena from the perspectives of those involved and to frame individual behaviors in the context and community that surrounds them (Glesne and Peshkin 1992, 4–5). These methods enable a design team to develop empathy for the people who they are designing for and with, to question assumptions, and to gain inspiration for new solutions. Qualitative research can help designers identify user needs, gain insights and develop a solution that meets these needs.

At the early stages of the needfinding process, research is largely generative: engaging stakeholders in a way that facilitates expression of their ideas and inspiring and informing intuition about new opportunities and ideas. For instance, through interviews with individuals in Kenya about their water collection and storage practices and their desired changes, we discovered an unexpected need for larger storage containers. In later phases, research is largely evaluative²: used to learn quickly about people's response to ideas and proposed solutions.

¹ The Scale-Ups Market Research Framework is an additional resource, focusing on methods for determining product viability and available by request from Scale-Ups staff; contact Kendra Leith, kleith@mit.edu.

² A future resource, the Scale-Ups User Feedback Framework, will address evaluative research in greater detail.

Products are used in a variety of contexts that revolve around a set of values, beliefs, and norms. Design research, if done well, should illuminate cultural differences and highlight features or characteristics of a potential solution that have special significance to users.

When Whirlpool designed the World Washer, a stripped-down washing machine platform for emerging markets, it accommodated slight feature design and styling modifications in the launch locations of Brazil, Mexico, China, and India to reflect local tastes. For example, exterior accents were added to the model in China, where washing machines sit in the living room, and the machine's "Delicate" mode was relabeled "Sari Cycle" in India. The product did very well, except in India. A team sent to India to investigate the issue found that the traditional, fine sari material was getting caught, entangled, and shredded in the millimeter-wide gap between the machine's agitator and drum. "Because its designers did not broadly, deeply, and fundamentally understand specific target markets, the World Washer failed to live up to its name. The basic mistake Whirlpool made...was to assume that needs are the same across emerging markets" (Chavan et al. 2009). A new washing machine had to be designed for India, the business model was restructured, and it took the company years to recoup losses and regain significant market share. Additional research with potential users may have prevented the misstep.

Case study

Throughout the document, we will share examples of how the concepts being discussed can be applied. Often, we will come back to a 2014 Scale-Ups research project, set in Kenya and focused on water transport and storage. We will share information on the research plan for the project, the methods used, how they were carried out, and how collected information was processed. Look for this box for the case examples.

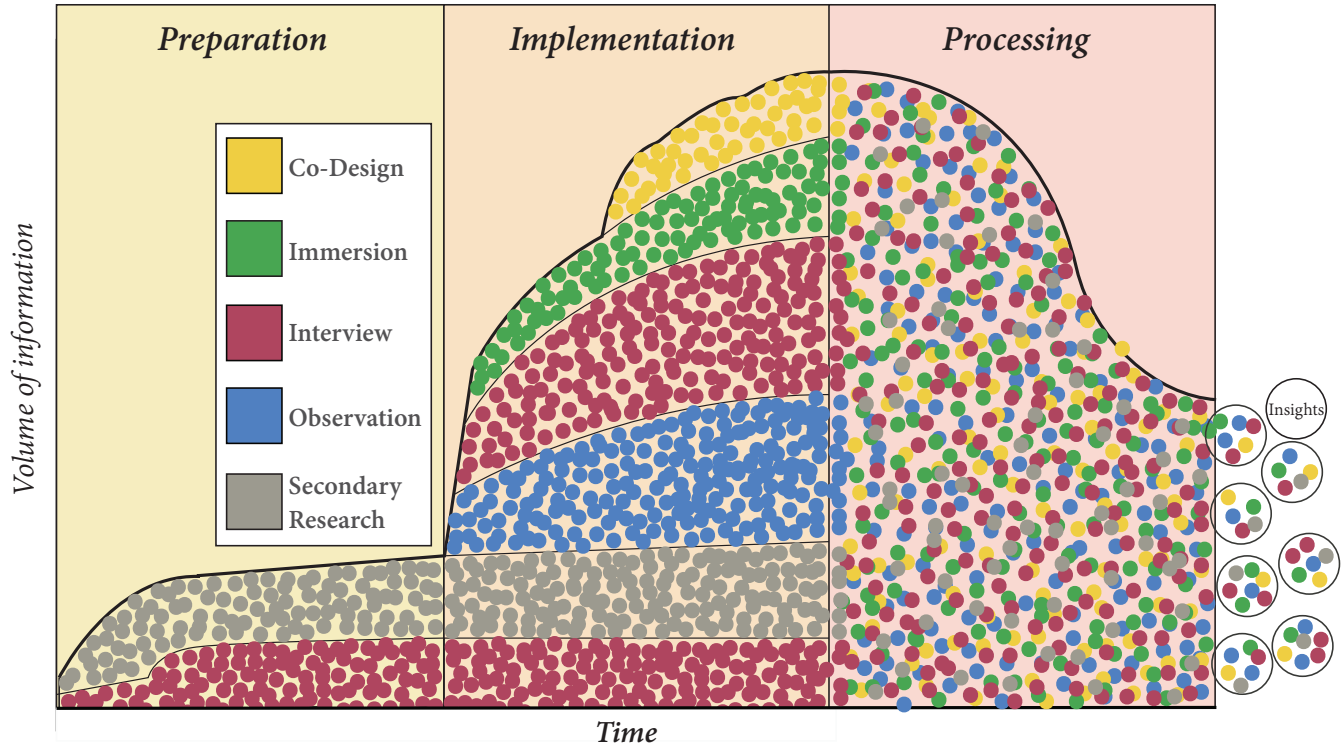


Tools for water transportation in rural Kenya.

The graphic below shows the volume of data (not to scale) that may be collected over the course of your research project based on the proposed process in this framework. As your work begins and you complete your preparation, including secondary research and expert or key informant interviews, the volume of information increases. It then sharply spikes as the research

plan is implemented in the field with various methods, used at different times, adding to the overall set of data. Finally, through processing, the data is combined to form insights and other communication tools for the design phase. Insights are often drawn from many pieces of data, each resulting from a different method. This process is also summarized in the table at bottom.

Volume and sources of needs assessment data over time.



User research steps.

Preparation						
• Determine research focus • Conduct background research • Identify stakeholders • Choose research methods • Create research materials • Complete ethical review process • Practice research methods • Plan fieldwork schedule						
Implementation						
Observation	Interviewing		Immersion	Co-Design		
	Individual	Group				
Processing						
Content Analysis	Affinity Diagramming	Mind Maps	2 × 2 Matrices	Personas	Journey Maps	Design Requirements

Quick-Start Guide

This document contains detailed information on creating a qualitative research plan, preparing for fieldwork, carrying out research methods, and processing collected data. On a typical research timeline, you should take at least two months to plan and prepare (although a longer process may be required), ideally at least a month to carry out, and *at least* another month to process. We encourage you to do rigorous, well-planned research whenever possible, but acknowledge that the audience for this resource may have a limited timeline and be looking to do research *quickly*. We don't want to tell you that you can't do that, so here is our quick-start guide: reference this when you only have a short period of time to plan and prepare (but please visit the pages noted for more detail).

Preparation

1. **Determine your research focus** with a reasonable scope for the time you have (page 10). Understand the outputs you expect to get from your research. Are you looking to get design inspiration, inform a more in-depth future study, or collect specific information? Knowing what you expect to get out of the research is critical for effective planning.

2. **Do your background research:** If you don't have the recommended 20–80 hours (page 10), consider holding several key informant or expert interviews to quickly bring yourself up to speed. Seek out survey-type papers that compile previous research and provide a good overview of relevant information. Validate that your research focus is important and that there is a need for this work and get feedback on whether you can make progress toward an understanding of the problem in the time that you have.

3. **Identify your stakeholders** (page 11) based on your understanding of the problem and input from partners and key informants. Prioritize whom to speak to in your limited time: consider stakeholders' potential influence and ability to be affected.

4. **Choose your research methods and aim for triangulation:** collecting similar sets of information in a variety of ways, so that you can compare and contrast what you learn from each method. If you only have a short period of time (on the order of days or a couple of weeks), prioritize semi-structured interviews and observation. Use observation, group interviews, and key informant interviews in the field to build up a good initial understanding of the context; gain in-depth information through further interviews. If possible, include an immersion activity (page 32) to gain first-hand experience and build empathy.

Significantly more planning and preparation is needed for focus groups (page 30) and co-design sessions (page 34); only use these methods if you have additional time and you already have the necessary capacity on your team (members experienced with facilitation or teaching the design process, respectively).

5. For each method, complete at least the following preparation:

a. Interviews: Write a list of questions (page 27) for a semi-structured interview, have the questions reviewed by a peer or mentor, and practice asking them in advance. If your time in the field is limited, practice with a friend or team member before leaving or a partner upon arrival. If you can conduct a practice interview with someone from your target group, that's even better (and ideal)!

i. If you will need to use an interpreter while in the field, recruit for the position ahead of time if possible and send research materials in advance so they are able to familiarize themselves with the work (Appendix A, page 48). (For a limited time in the field, you may be able to use your partner's help, but be aware of potential bias due to their interests and status.) Practice with your interpreter as soon as possible after arrival, and try to identify any potential issues early so that they can be discussed and worked through.

b. Observation: Determine the most relevant observation locations for your research topic. For each location, **make a list of qualitative and quantitative observation prompts**. See page 20 (case box) for examples.

c. Immersion: **Determine relevant immersion activities** and get permission to participate. Schedule a time that is convenient for your host, and prepare to mindfully participate: you will want to observe how others behave and reflect on your own experiences and reactions.

6. If necessary, complete a formal **ethical review process** from your institution and in-country entities (page 19). There is often an expedited option for exempt research at universities, resulting in approval within two weeks, but in-country processes may take several months. Be sure to understand these timelines as early as possible. Create an **informed consent** form (page 25) that conveys all necessary information about your work in a clear, accessible way. Whether or not it is required, use an informed consent process to ensure that potential participants understand your work and their role and that they are comfortable participating.

7. Work with your community partner or collaborator to develop a rough schedule for your time in the field. **Schedule meetings and activities in advance** when possible (as this can take some time to do), based on your participants' availability. Think creatively about how to make the most of your time, and **keep a list of activities that can fill free time**, in case you find yourself with a gap in your schedule (observation, informal conversations, etc.).

Implementation

1. If this is your first time in an area, you want to acclimate yourself and get a better firsthand understanding of the context upon arrival. A **group interview** with members of your partner organization and a **community meeting** (a gathering of community

members, introducing themselves and their work and interests, and an opportunity to introduce yourself and your work) will be helpful first steps. You may also hold a group interview with a relevant community-based organization or committee. During the same period, schedule a few **observation activities** with a “cultural translator.” You can compare your observations with this person, to ensure that your takeaways are accurate and valid in the local context. While observing, you may also engage in **informal conversation** with individuals or groups to learn more about what they are doing. As you engage people in your work, make sure to be clear about who you are, what you are doing, and what you are asking potential participants to commit to, as part of the informed consent process. Will people who participate in interviews be compensated for their time? How long do you wish to engage them? Do you have their permission to take notes, photographs, or audio recordings?

Documentation: While these activities are primarily for building context, you will also want to document what you are hearing and seeing. Take notes during the group interviews and community meetings, and take notes during or after observations. You can also document with photographs (with people’s permission), or try to sketch a scene.

2. Follow up on your group interviews and observation activities with **semi-structured individual interviews** with a variety of stakeholders. Hold interviews in quiet, private locations if possible, and try to speak with more than one member of each stakeholder group so that you have information to compare. Given your limited time, adjust questions quickly if you do not feel that you are getting desired or accurate information; you may need to change wordings to make questions more clear, or adjust the scope of your questions as you become aware of new information.

Documentation: As you may need to process your information quickly, taking good written notes is critical. If possible (with consent), you can also record your interviews, but you may have limited time to transcribe the recording. As such, try to take good notes and consider the recording as a check or backup, but not the initial or primary source of information. Take relevant photos, with permission.

3. As you gain a greater understanding of the context and make connections with stakeholders, consider if there is a relevant activity that you may be able to participate in to get a firsthand understanding of some thing(s) you have heard about. For building more empathy in general, are you able to do a homestay in the community? Consult your partner to find out if this is appropriate and if they can recommend a possible host. As you enter into any **immersion activity**, take a more reflective mindset and be aware of your own reactions and observations.

Documentation: Gauge whether it would be disruptive to take notes during an immersion activity. As you want to remain engaged, you should not take extensive notes while participating but rather short notes (if any) that will trigger your memory as

you flesh them out after the activity. You may also take photographs, with permission, as an additional memory aid and to share with others on your team who were not present.

4. Throughout your fieldwork, recall the goal of **triangulation**: Are you speaking with more than one person from the same stakeholder or segment group? Are you asking similar questions of stakeholders so that you can compare and contrast answers? Given limited time, try to collect information that will help you feel more confident in your conclusions.

Processing

Return to the desired outputs that you identified. Your method(s) of processing will change depending on the outputs you plan to create, but here are some general recommendations:

1. To use your time most efficiently, try to **begin processing the information as you continue collecting**. You don’t want to jump to any conclusions without a (more) complete picture of the situation, but you do want to **identify areas where you wish to collect additional information** while in the field or stakeholder groups to engage to a greater extent. In order to find areas with gaps or conflicting information, consider using the **affinity diagramming** (page 41) approach: following an activity, go through your notes and write pieces of data on paper or sticky notes (something that can be moved), with the source referenced, and as you conduct more activities, **begin to sort the data into themes or groups**. Are there outliers in the data? Are there conflicting themes? Is information from different stakeholders matching or not? Document your insights and questions as you go through the process. You may also consider doing **content analysis and coding** (page 39) with the data.

2. Make sure you have a good understanding of the behaviors, attitudes and goals of your users or other key stakeholders. **Create a persona** (page 44) for each segment or group that is important to your project. This profile can help to keep the team grounded throughout the project and serve as a powerful communication tool. To go into more detail on a particular process of your user or other stakeholder, **create a journey map** (page 43). Decide on the level of detail that is useful and describe or illustrate the steps taken by the group to complete the process. Where is there room for improvement? Where might you change or affect this process?

3. Document the **qualitative and quantitative needs and design requirements** you are hearing from stakeholders. Are there specific metrics that a new design should meet? Are there features that are desired? Do you have a sense for the type of experience that a user is looking for? Keep track, separately, of what you are hearing from participants and what you are extrapolating from your interactions.

4. Identify areas for future work and research. Note your remaining questions, what you wish you had more information about, outlier responses that you would like to delve deeper into, and any other topics to focus on with future work. Reflect on the information you gained from various methods and consider how you may change or continue to use these methods.

Getting Started: Creating a User Research Plan

In this section, we share the essential elements of a qualitative user research plan. We've discussed the "why" and given you a quick introduction, and now we will explore in greater detail the who, what, where, when, and how of user research and how to communicate these decisions internally and externally.

What: Determining research scope and conducting secondary research

What will the focus of your research be? What is prompting you to consider doing user research? We will assume that, whether the motivation is personal, academic, professional, or something else, you have already narrowed the scope and target location to some extent, likely based on strategy, interest, and constraints. You may have felt or seen a problem yourself or been told about a problem that you wish to investigate further. Secondary research will be essential at this early stage of your work, to discover existing information relevant to the problem and to confirm that this is an appropriate topical and geographic focus. If there has already been extensive, similar research done or the affected population is very small, another focus may make more strategic sense. If there are assumptions built into your determination of scope, be sure to acknowledge and check these. More information on selecting research locations is found on page 16.

Defining your research goals and design challenge

In order to proceed with your research planning, you must define your research goals or design challenge. Research goals state what you hope to learn and gain from your research, while design challenges focus and frame an identified problem. At the earlier stages of work you will likely have a broader scope, and defining your research goals will be more appropriate. The output of your work can then be framed as one or more design challenges. Whether broad or narrow, confirm that your research focus is also important to relevant stakeholders: is this something they care about?

Case Study: Research Goals

With the research project in Kenya, the team knew they wanted to learn about water transport and storage, but for their first trip, it was important to keep a wide scope. Instead of a design challenge, they instead stated their research goals:

- Understand current practices and potential needs around water transport, storage and treatment in Kenya.
- Understand use and impact thus far of a relevant technology, and solicit feedback on the technology.
- Gain inspiration for potential design phase or other future work.

A good design challenge will be framed in human terms (rather than technology, product, or service functionality), broad enough to allow you to discover areas of unexpected value, and narrow enough to make the topic manageable (IDEO 2011, p. 34). Be aware of how you choose to frame your problem, as this framing will limit the set of solutions that you consider. For example, organizers at a design conference in Ghana presented a group with the challenge of developing a tool or process to remove stones from rice. After firsthand observation of how people processed rice, the group determined that the key problem was actually preventing stones from getting in the rice in the first place!

In one or two sentences, you should be able to describe what it is that you want to understand through your research: this is your research statement or design challenge. The research statement should be focused and concisely state a problem.

For example:

Brick makers in rural Zambia currently have issues producing high-quality bricks by hand. They wish to increase quality and efficiency of their production.

A cooperative in rural Nicaragua that makes solar panels has been unable to laminate the panels without introducing air bubbles, which decreases their functionality. They wish to find a more reliable lamination method.

Clearly stated goals and motivations will help to ensure a shared understanding of the project among team members and stakeholders; the specific format you use is less important.

Secondary research

Once the design challenge or research goals have been identified and you have a preliminary target market, background research is necessary. Studying established data and speaking with domain experts is an important step for grounding in the subject, providing you with a basic knowledge of the customer's situation and helping to demonstrate credibility to partners and other stakeholders during your research (Patnaik and Becker 1999, p. 38). Additionally, you do not want to spend valuable (and likely limited) resources to rediscover information that has already been found and/or published. You should plan to spend approximately 20 to 80 hours on this stage of the research, but this will depend on the project needs, your access to information, and your existing knowledge. The literature review process may continue throughout the data collection and analysis, especially as your fieldwork leads you in new directions.

Familiarize yourself with the topic and understand existing knowledge; consider contacting academics or practitioners to talk about their work and experiences. Key informants, those doing related

work or with significant relevant experience, can provide valuable insights, context and direction. Look to established sources such as national statistics databases, topic-specific World Bank resources and academic and practitioner journals (see list of recommended sources below), and search online for similar projects from other universities or organizations. It can be beneficial to cast a wider net during the research phase, looking to other disciplines or interconnected topics to gather information from different perspectives. For example, in the case of our water transport research, looking at methods of or technologies for transporting things other than water exposed us to other ideas and considerations. Similarly, looking at technologies designed for the same needs in other (geographic or economic) markets may provide insight into features to explore further with users. Organizations doing related work in or near your target market may also have some experience with the sector or specific need you are focusing on.

As you conduct your secondary research and gather information, be mindful of biases that existing research could bring to your work. Before taking some of the findings as fact, you will want to verify any such assumptions in your research location and plan questions in such a way that you may hear information that you do not expect, including information that may contradict previous findings.

The following resources are good sources for secondary research:

- World Bank: <http://data.worldbank.org>
- CIA World Factbook: <https://www.cia.gov/library/publications/the-world-factbook/> (country demographic information)
- International Monetary Fund (IMF): <http://www.imf.org/external/data.htm>
- IMF data mapper: <http://www.imf.org/external/datamapper/>
- Google visualization of different datasets: <http://www.google.com/publicdata/directory>
- United Nations: <http://data.un.org/> and data sources from its organizations. For example,
 - Food and Agriculture Organization: <http://faostat3.fao.org/>
 - World Health Organization: <http://www.who.int/en/>
 - UNESCO: <http://www.uis.unesco.org>
- International Labour Organization: <http://www.ilo.org/global/>
- Organisation for Economic Co-operation and Development: <http://stats.oecd.org/>
- Demographic and Health Surveys: <http://dhsprogram.com>
- National census data and national income accounting data (may be published on public websites). For example:
 - Ghana: <http://www.statsghana.gov.gh>
 - Brazil: <http://www.ibge.gov.br/english/>
- Peer-reviewed journals

Note that countries may have different definitions for some metrics, so be careful when making comparisons across countries. IMF, World Bank, and CIA datasets often include corrections for these differences.

Who: Stakeholders and research participants

Now that you have done secondary research to learn more about your research focus area and confirmed that it is a meaningful topic, you can start getting into the details of planning your research. Key next steps are determining your stakeholders and whom you wish to engage in your research.

Stakeholder analysis

At this point, it is important to identify the people and groups that are—or should be—engaged in your research and may influence your work: stakeholder analysis time! Stakeholders and influencers are key people, groups, or institutions that have a significant interest in and may influence, or be influenced by, the project. When conducting a stakeholder analysis, you will identify these groups, assess their level of influence or impact, and develop strategies to engage them (Morra and Rist 2009, 147–148). Consider creating a stakeholder map, shown on the next page for the Kenya case study, to visualize the relative size of groups' influence and their interactions.

Steps of a stakeholder analysis include the following:

1. Brainstorm with colleagues and collaborators to identify people, groups, and institutions that will affect or be affected by the project. You can also use a “snowball” approach with your identified stakeholders: speak to a select number of key stakeholders and ask them whom they see as other stakeholders.
2. Identify the specific interests each stakeholder has in the project. Consider potential benefits to the stakeholder, changes that the stakeholder may need to make because of the project, and any other effects they may feel.
3. Identify the level of influence of the stakeholders and how their interests may influence the success or failure of the project.
4. Consider how to engage the stakeholders in your research plan in order to better understand their interests and how they will potentially influence your project moving forward.

Think carefully about the possible reach of the project, in case there are more tangential groups that will be influenced or be influential. The list does not need to be final at this point: it may evolve as you carry out your fieldwork and learn more about the local context and players.

Case Study: Stakeholders

Going back to our water carrying example, for the distribution of a new technology, stakeholders included water collectors (users: commonly women and children but potentially men as well); household leaders (represented as recipients); water point owners and workers (could be individuals, NGOs, etc.); local government officials; national government officials; people or organizations making, selling, supporting and distributing this technology and the products it competes with. Stakeholders could be impacted by a new water carrying solution in different ways and have varying influences on its introduction. The size of potential influences is represented in the map below (by the size of the oval), as well as relationships between the stakeholders (denoted by a line between). The research plan included means of learning this information.



Determining number of participants

With a better sense of the stakeholders for your project focus, it is time to determine whom you will engage in your research and how you will do so. In the “how” section we will talk more about methods of engagement, and in this section we will discuss some of the theory behind selecting your participants and strategies for doing so.

Given the set of project stakeholders and their relative influence, you want to consider which groups to engage while in the field and how many people in each group to include in order to feel confident in your understanding of their role and their needs. We can draw from social science theory to help determine how many people to include in the research and how to select specific participants from the larger group.

For less influential or smaller stakeholder groups, a handful of participants may be sufficient, depending on the methods used. For larger stakeholder groups, such as the target user and customer, the number of participants may be on the order of 10–30 per segment group. A segment group may be broken up

by age, sex, occupation, or other relevant criteria. Your research goals and outputs will also influence this number: do you aim to publish your research, or will the results be primarily for internal use? How broad is your research question?

Key Output Considerations

With research questions and goals in mind, consider which research outputs will be most useful in moving your project forward. Are the results for internal use only? Will you need to report to funders? Understanding this early on will help you determine which research methods to include, which information to capture during the research, and how much time to budget for analysis and processing. Possible deliverables may include internal and external reports (of varying lengths or levels of detail), customer or user personas, a set of design requirements, or other outputs customized to your project.

Ultimately, the ideal number of people to engage has more to do with the content of the interactions than reaching an absolute number. As sociologist Howard S. Becker writes,

How many qualitative interviews is enough? Every experienced researcher knows this question has no reasonable answer, no magic number you can do and then you're out of danger. The only possible answer is to have enough interviews to say what you think is true and not to say things you don't have that number for. The kinds of things you might want to say take a lot of forms and so require varying numbers of interviews (Baker and Edwards 2012, p. 15).

A representative sample size, more commonly used in *quantitative* research to draw generalizations from a large sample, will typically be on the order of several hundred to several thousand participants if you want to be reasonably certain that the outcome can be generalized to the whole population. However, our studies generally engage 50–100 individuals from across several segment and stakeholder groups.

Selecting participants

Once you have determined how many people you wish to speak with, consider using a selection strategy to determine who should participate in your study. Keeping in mind your goals, sample accordingly. While randomly selecting members of a population to determine a representative sample is often used in quantitative research, other strategies will be more appropriate for identifying needs using *qualitative* methods, particularly given limited time and budget. There are a variety of sampling strategies: each can lead you to learn different things about your topic (Glesne and Peshkin 1992, 34–35). Purposeful sampling is one technique that selects participants for specific reasons, relevant to criteria that fit the research questions: Patton (2002) identifies 16 purposeful sampling strategies. The table below describes several sampling

strategies, purposeful and not, with information on how and when to use each. Ultimately, refer to your research goals and desired outputs to inform an appropriate participant selection approach. You may also seek out expert recommendations or use results of a pilot study to inform your selection rationale.

A suggestion in IDEO's *Human Centered Design Toolkit* is to recruit 1/3 "ideal constituents" (people who are successful, adopt new technologies quickly, and/or exhibit desirable behaviors), 1/3 individuals at the opposite extreme (very poor, resistant to new technologies, and/or exhibit problematic behaviors), and 1/3 representing more "average" people (IDEO 2011, 40–41).

As carefully as you plan your sampling strategy, you may need to adapt it in the field: partners may be using other methods for reaching constituents, specific user segments may be harder to reach, and scheduling may be challenging. Ultimately, be flexible while trying to maintain commitment to your plan. You may need to strike a careful balance between upholding sound research principles and not pushing your partner to work in a way that is too unusual or unnatural for them. You can learn from each other's approaches. If you work with a sample different from what was originally identified, acknowledge any potential biases this may have led to in the analysis of the results.

Case Study: Sampling Strategy

During D-Lab's water-related research in Kenya, the team engaged individuals from several geographically diverse areas, holding semi-structured interviews with 53 rural, peri-urban, and urban water collectors. Community members were also engaged in focus groups (34 participants) and co-design sessions (39 participants), as well as observation (13 water sources) and informal conversation at water collection points. The aim was to speak with a sample of users and non-users of a relevant technology intervention, roughly representing the population in terms of age (excluding children), sex, geographic location, type of water source (tap, kiosk, delivery, or natural sources), and distance to water source.

In practice, carrying out the strategy was challenging at times. It was difficult to get local demographic information ahead of time, and external constraints limited the team's ability to schedule research activities with ample advance notice for potential participants. However, community liaisons were very helpful in identifying individuals who met the selection criteria (although they were not randomly selected), and ultimately a relatively balanced sample was achieved.

Common sampling strategies.

<i>Sampling strategy</i>	<i>How to use</i>	<i>When to use</i>	<i>Limitations</i>
Snowball sampling	Existing study subjects recommend future subjects from among their acquaintances	Early stages of research; when you are struggling to find the participants you want	You may get respondents who are overly similar to each other; not sufficient for rigorous research
Extreme case sampling	Identify individuals who are unusual or special in some way. You may, for example, find out who has invested in a new technology, who is a particularly successful farmer, who travels very far for water collection, etc.	When seeking to discover unarticulated behaviors, desires and needs that may be applicable to the larger user group; extreme users may be easier to observe and identify	Extreme cases may not always be applicable to the larger population
Typical case sampling	Search for "normal" or typical respondents	When looking to describe what is typical or normal; when key informants can help to identify what is typical	Provides an illustrative but not definitive sample: does not permit generalizations
Homogenous sampling	Select and engage similar cases, such as single mothers under the age of 25	When you wish to learn about a specific subgroup in depth	Cannot generalize results to other parts of the population
Quota sampling	Determine how many people with given characteristics (such as age, gender, profession, etc.) to include in your research, and recruit people who meet these criteria until you meet your quota	When wishing to focus on people that you think are likely to experience, know about, or have insights into your research topic	Quota selection may utilize non-random selection: thus, there may be bias in the sample and results may be unreliable

How: Methods, team, location, timing, and budget

The decisions you make as you plan your research will be very interconnected. The details of how to actually carry out your plan—how to reach the number and type of people you have determined is appropriate, how to fit the work into the amount of time you have allotted, and who on your team will do what—are highly nuanced and will influence other parts of the plan. Keep in mind that the balancing and revisiting of decisions will be needed along the way.

Selecting research methods

A good research plan will use a variety of methods, helping the team to learn from users in different ways and compare the findings. Triangulation—the process of combining several different research methods to examine the same topic—should be part of your plan.

This approach can help you to find both convergence (where results from different methods agree) and divergence. Convergence adds credibility to qualitative research: by finding the same result with multiple methods, the researcher can overcome threats to validity inherent with each specific method (Visocky O’Grady and Visocky O’Grady 2006, p. 76). Divergence among different sources of data may mark unrecognized or unarticulated needs and should also be paid close attention to. While patterns that describe a majority of people are important, understanding exceptions to the dominant patterns provides additional insights. Contradictory information often indicates that there is segmentation in the population you’re working with (Laurel 2003, p. 174).

Sociologist Jonathan Bradshaw (Bradshaw 1972) advocated identifying four types of need in a community as part of a needs assessment. He believed that the presence of all types of need would signify a “real” need and serve as a triangulation approach. The types of need are as follows:

- **Normative:** What expert opinion, based on research, defines as need.
- **Felt:** What people in a community say they want or feel they need. (This is likely to be subjective and limited by individual perceptions and knowledge of services.)
- **Expressed:** What can be inferred about the need of a community based on observation of their behavior and use of services. (However, expressed need can be misinterpreted: for example, if no service exists to meet the need.)
- **Comparative:** Determined from comparing the current situation with the situation of others (for example, examining services provided to one population in one area and using this as a basis for services required in a different area with a similar population).

Different research methods may elicit different types of needs and minimize the threats to validity or accuracy inherent in each method. On the next page is a table summarizing the key qualitative research methods that we will discuss in more detail throughout the document.

When choosing techniques, consider 1) which are most likely to elicit information that will allow you to gain understanding on your topic, 2) which will draw out different perspectives on the issue, and 3) which will make effective use of the time and resources available (Glesne and Peshkin 1992, p. 36).

As you design your methodology, consider seeking advice from domain experts, partners, and stakeholders. Talk to a handful of experts who know the topics you are studying and speak with the people who are likely to use the research outputs to verify that the plan will allow you to produce the desired outputs. If possible, engage partners and stakeholders in the research design to ensure that you are doing work that they support and find meaningful.

Review your methodology plan against your list of hypotheses, and make sure the chosen methods address all areas that need to be verified (Laurel 2003, p. 173). Create necessary supporting material, such as interview guides; this will be discussed in more detail in method sections.



D-Lab Research Associate Belinda Richardson (r) visits a farmer in Morocco

Overview: Qualitative research methods.

<i>Research method</i>	<i>How to use</i>	<i>When to use</i>	<i>Limitations</i>
Observation (page 20)	Determine an appropriate observer role and observation location, find willing participants, observe with minimal intrusion, and ask questions to gain additional insights and understanding	When trying to understand needs that are not easily stated or understood; to expand knowledge of context; to compare actual behavior with reported behavior	Your presence may influence the activities and behavior you are observing; your analysis of observations may be biased; appropriate timing (providing an accurate view of a given situation) will be important
Individual interviewing (page 23)	Select individuals with whom you wish to have in-depth conversations, determine the appropriate level of structure and plan questions accordingly, and carry out in a comfortable setting	When seeking to gather in-depth information from someone with direct experience and knowledge of a topic	Participants may not be willing to disclose certain information; translation, if needed, may introduce challenges
Focus groups (page 24)	Gather a group of 6–8 participants to discuss a topic together, agree on ground rules, and utilize an experienced facilitator to manage the conversation	When you want participants to engage in a dialogue and build on each other's ideas	May require additional time to organize; may be challenging to engage all participants effectively if group is too large or power/status issues arise
Immersion (page 32)	Take advantage of opportunities to gain firsthand experience (such as homestays, technology trials, and helping with work), get permission to participate, and be flexible and respectful	To gain a firsthand understanding of a situation and build empathy; to convey genuine interest in learning more about a person or an activity; to compare actual behavior with described behavior	People may be resistant to your participation; personal safety considerations may arise
Co-design (page 33)	Organize a day-long engagement in which community members are introduced to the design process and prompted to brainstorm ideas and build prototypes in small groups	When trying to identify key design features for a technology and offer an alternative way for participants to express needs; when participants are open to trying new activities and are able to commit to a longer engagement	Time commitment may limit some people's ability to participate; material selection will limit potential outputs; well-facilitated debrief is critical to understand design decisions and how they express needs; group dynamics need to be managed for balanced engagement; facilitator should have experience with the design process

Building the team

We recommend working with others for your project: there is great value in being part of a diverse team, and different people will be better suited for specific roles that will need to be filled. Consider the capacity you already have within your group or organization and what capacity you need in order to carry out the fieldwork you are planning. Utilize existing capacity as much as possible, or build up capacity on the ground if it does not already exist. Expanding the research team with local capacity should be less expensive than adding international members and can facilitate parts of the work (as foreigners may attract extra attention or change others' behavior). Local NGOs or universities may be able to provide logistical support, connect you with communities, and contribute to research activities.

Distribute responsibilities among team members. In the field, responsibilities likely include the following:

- Coordinating logistics (housing, transportation, and accessing funds)
- Liaising with the community (scheduling research activities and managing expectations)
- Leading interviews
- Documenting (photographing, videotaping, and writing notes)
- Translating/interpreting, if necessary
- Facilitating focus groups and/or co-design sessions
- Acquiring the necessary research approvals

A given team member may take on a variety of roles, but be sure there is a clear understanding among all members as to who is responsible and who is accountable for each task.

The team members conducting interviews and leading focus groups should have experience with these research methods and a strong understanding of the techniques that result in accurate and rich data. Team members who have less experience may initially observe or take notes during these activities. Explore other opportunities to build up capacity of less experienced teammates, such as collaborating on writing interview questions, conducting practice interviews, or taking a class such as IDEO and Acumen's free online course "Human-centered design for social innovation³."

When carrying out research activities, aim to have two (not more than three) team members attend each activity. With more than one person present, you will be able to compare takeaways and reactions; you may find that each person picks up on different pieces of information or aspects of the interaction. More than two or three people, however, can overwhelm the participant. A group of that size may also be difficult to accommodate in a home or workplace. Only one person should lead each interview, and if another team member is present, the additional person can focus on observing the interaction and taking notes. However, one person may need to fill both roles, particularly if translation is needed and the interpreter and interviewer are the two people who are able to attend. As you select your team and assign roles, be aware of gender roles in the community: it may not be culturally acceptable, for example, for a male researcher to interview a female in her home. Seek out advice from your community partner or a local contact and plan accordingly.

As you form your team and pair members for activities, do not underestimate the importance of having a good rapport and complementary work style. If tensions exist between team members, research participants may pick up on these and be affected by them. An established rapport will also make for more effective debriefing and other collaborative activities.

Utilizing interpreters or project assistants

Early on in your project planning, find out the local language of the community or communities you plan to work in. While English may be spoken in the country you are working in, community members may be more comfortable speaking in a different language, and in rural areas you may find that tribal or local languages are prevalent. If translation is needed, invest time and effort into finding and training great interpreters or project assistants. See Appendix A (page 48) for D-Lab's resource on working with interpreters, with recommendations on finding and training local team members. The importance of working with skilled and experienced interpreters cannot be understated,

as the quality of information that is collected can be negatively impacted by bias, lack of accuracy in interpretation, or lack of understanding of the research goals.

Case Study: Project Assistants and Interpreters

When carrying out research activities in Kenya, the team from D-Lab consisted of a project lead and two supporting researchers, with a local team of two full-time project assistants, specializing in interviews and focus groups, and one part-time project assistant, focusing on co-design sessions and focus groups. Staff from a local NGO coordinated community visits, provided transportation and assisted with some interpretation. Community leaders helped to connect the team with users from target segment groups and also assisted with interpretation as needed. The project assistants were recruited through the International Development Innovation Network and selected based on previous research experience and motivation. Once in the field, project assistants worked with D-Lab staff to familiarize themselves with the research materials and practice sessions before fieldwork for data collection began.

In the local communities, tribal languages were preferred for communication. This sometimes meant that two sets of translation were needed: English to Swahili by project assistants and Swahili to Kikuyu by local community health workers. This added significant time to the interviews and meant that there was greater potential for loss of information from the respondent. With more accurate information on language usage in advance, interpreters with knowledge of the local languages could have been specifically targeted.

Where: Selecting location(s)

You likely already have a research location in mind or at least a target region. Often, this selection is based on existing relationships or previous work. Having a good relationship with a local community partner will make many aspects of the research process easier. Partners can provide demographic information that will inform your research plan and selection strategy, facilitate connections with community members, help to organize logistics, and provide other advice and support.

However, the locations where you have the strongest connections may not be the best for researching a particular topic. For example, an MIT alumna started a company in Tanzania based around a technology to process a common grain; the company was based in the north of the country, where strong connections existed, while most of the grain production was in the south. This disconnect severely slowed the take-up of the technology.

Secondary research should also inform location selection, allowing you to understand which areas the problem is particularly prevalent in. For instance, if you are researching water transportation needs, you might select locations where residents are traveling long distances to collect water.

3 <http://plusacumen.org/courses/hcd-for-social-innovation/>

Your initial research location does not need to be the same as your eventual pilot location, but there should be enough similarities that the initial research findings will still be relevant. For this reason, you may try to meet users in a few geographically distinct areas (urban and rural, for example), so that you are able to speak to a more diverse set of users and compare the insights you gain from each.

Plan to hold your research in the users' environment: you will obtain the richest information on needs by observing and interviewing users firsthand. Ideal locations are relevant to the research topic and to users' day-to-day lives: their homes, workplaces, water sources, etc. You can then directly see many small but important details about the users' activities and the context in which they occur: details that wouldn't be available outside of that context. By observing users' activities, you minimize reliance on their memory, descriptive ability, or awareness of a need. This interest also shows respect for their work. A relevant location facilitates communication by allowing both the user and researcher to refer to and use objects in the environment during the discussion (Patnaik and Becker 1999, p. 38).

When interviewing an animal breeder in Morocco in an office setting, the D-Lab research team learned that he raised cows and sheep and about the constraints that he faced. However, it was not until the team traveled to his house that they learned that he also grew wheat, and faced additional challenges related to processing the wheat. This visit revealed an additional set of needs that would not have been as easily identified in the office setting.

When: Determining research timeline

General scheduling considerations

To determine when and for how long you will conduct your fieldwork, refer back to your secondary research and your desired number of research participants. Are there any factors that influence the time of year when you should conduct your research, such as whether it is the rainy or dry season or whether certain crops are being harvested? Plan to do your research at the most relevant time(s) of year, but also try to get a good understanding of how behavior may change throughout the year.

The fieldwork for a solar lantern technology evaluation project in Morocco was planned to take place before, during and after the month of Ramadan to accommodate behavior changes during this time. However, upon recognizing the challenges of completing work during Ramadan, the team decided to limit their work in order to respect participants' (and Muslim team members') schedules. This was also an opportunity for all team members to regroup and prepare for the second phase of data collection.

Working back from any such timing constraints, plan on a lead time of *at least* two months to prepare for your fieldwork (to develop your research plan and materials, apply for and receive ethical approval, and figure out logistics for the trip).



A D-Lab project assistant (left) speaks to a solar light user in Morocco.

When possible, order your research activities logically. Begin with observation activities and interviews with specific groups and individuals to build up your understanding of the context. Having begun to form relationships with stakeholders, follow with immersion activities and more interviews to deepen your understanding. Consider scheduling focus groups and co-design activities later in your timeline, to allow for recruitment of good participants, gathering of necessary materials and training of facilitators.

Key Timeline Considerations

- Does your area of focus experience seasonal changes?
- When are your stakeholders available to be engaged in research? (time of year, time of day)
- How many research activities can you realistically complete per working day? (Don't forget to consider transportation times, any necessary setup, etc.)
- Have you worked in adequate preparation or pilot time?
- Can your schedule accommodate delays or changes to the research plan that may arise?
- Have you budgeted enough time for data processing and analysis?

Preparation and pilot testing: 1–2 weeks

Work in time (we recommend a week) at the beginning of your fieldwork plan for preparation that must be done in country, such as training interpreters and acquiring local materials. If you will be working with interpreters, use the preparation time to share your interview techniques and approaches, get feedback on interview questions, practice interviewing together, and build rapport. By getting to know your interpreters on a professional as well as a personal level and understanding their motivation and working style, you can develop an informed strategy for working together effectively. Building a good working

relationship early on should make the rest of the trip significantly more pleasant and effective, and allow you to honestly discuss any issues that may arise. Having a good understanding of the research plan and goals will allow interpreters to become more engaged members of the team, translating questions creatively and effectively to collect the desired information. If you have more than one interpreter, ask them to translate some of the interview questions during the preparation period and compare the translations. Some words or phrases may not exist in the local language; the interpreters can discuss how to best ask questions that will solicit the desired information.

Plan to pilot test your research methods with people similar to your planned research participants; ideally they will be the same. However, testing with different audiences (even your friends) before fieldwork will still allow you to learn, practice, and identify potential issues. The primary goal of the testing is not to collect data but to gather feedback on your research plan and practice. Piloting your questions and methods can allow you to test the effectiveness of your question phrasing, the length of your interviews, the clarity of the introduction to your study, how well you are able to take notes, and how comfortable people seem to be during the interviews or observations. You will quickly learn if interview questions should be changed or added. The tests can also help you learn how your team works together and how you work with an interpreter, if applicable. You may ask pilot participants for feedback on the process and suggestions for improvements.

Depending on your time, resources available, and access to participants, you may not be able to carry out a formal pilot study but rather a period of pilot testing at the beginning of your research with your actual stakeholders. In this case, be sure to plan less activity for your first few days in the field. Test unknowns and things you are particularly concerned about, and be open to adjusting your research statement or plan, interview questions, or your personal approach, based on the success or challenges you face during the testing.

Research implementation: 4 weeks or more

When planning our research at D-Lab, we typically assume that a research team member will be able to complete an average of four semi-structured interviews per day, or twenty per week⁴. (While the interview should be no longer than an hour in general, it is best to budget extra time for transportation in between participant locations, equipment setup, and finishing notes and debriefing after each interview). Find out when it is appropriate to meet with your stakeholders: will they be working (and thus unavailable) during the day? We schedule no more than two or three focus groups (depending on the length) per facilitator per

day or one co-design session per day. For the set of activities proposed in this framework, we have found approximately four to eight weeks of time in the field to be sufficient to carry out the work, although more time may be required depending on the number of stakeholders, segments and sample size.

Build enough time (and budget) into your plan to allow the team to absorb their learning experiences and adapt the plan during the fieldwork if needed. Changes to initial hypotheses or methods may be necessary as information starts to come in. Delays are also unfortunately very common in development work: inclement weather may wash out a road; an introduction from a government official may take longer than planned; people may take hours to gather for a community meeting. Assume that you will encounter delays, and budget time for them.

Analysis and synthesis: 4–8 weeks (depending on length of field work)

In your timeline, data analysis and synthesis (to produce the deliverables that will assist your project in moving forward) should receive at least as much time as data collection: it is generally easier to collect data than it is to shape them satisfactorily (Glesne and Peshkin 1992, 39–40). If you are transcribing notes or recordings, allow time for checking transcriptions before processing. Processing is discussed in greater detail starting on page 38.

Budgeting resources

Your available budget may also have a large influence on your project timeline. Sometimes the available budget will only cover part of the desired work. Accurate estimations will allow for better planning and less surprises in the field. As you create your research budget, keep in mind the following:

- **Participant compensation:** Be sure to reimburse any travel expenses that research participants may incur, and consider if there are other ways that you can compensate without causing bias or creating problems between those who are and are not selected for participation. Reasonable payment may be provided for the time and trouble associated with participating in a study, but the payment should not be coercive: the monetary compensation may have an inappropriate influence on someone's willingness or motivation to participate in research activities. In some cases, another form of compensation may be suitable. Small items such as a pen or a notebook may be appreciated, as well as a soda or snack. Consult with local partners and advisors to determine what is appropriate and what is customary.
- **Research materials:** Do you need to purchase materials for focus groups or co-design sessions? Will you need to print locally? Budget time and money for material costs and time to collect.
- **Transcription:** Do you need to transcribe your interviews? If so, budget \$1-3 per minute of recording.

⁴ Generally, Sunday is a day of rest for all, but it may be appropriate to continue research work on Saturdays.

- **Safe transportation and housing:** Everyone will have different preferences for amenities, but do not compromise safety for budget. Use recommendations to select housing and drivers.
- **Interpreter or research assistant expenses:** Expect to pay a daily rate and cover related transportation, housing, and food costs.
- **Research approval fees:** Depending on the country, these fees range from a couple hundred to a thousand dollars.

Unexpected expenses may arise in the field, so leave space in the budget to accommodate potential changes.

Communicating the plan

Having worked through many of the details of your research plan, you will want to effectively communicate the plan internally and externally. This may take the form of ethical research approval applications, internal documents and tools for feedback.

Ethical research approval

It is likely that you will need to seek official approval to conduct your proposed research. This may be through your institution as well as in-country entities (such as MIT's Committee on the Use of Humans as Experimental Subjects or the National Council for Science and Technology in Kenya). These organizations exist to ensure that research involving human subjects is conducted in accordance with basic ethical principles. Fundamental principles, identified in the Belmont report⁵, are as follows:

- **Respect for persons:** Individuals should be treated as autonomous agents, and persons with diminished self-autonomy are subject to protection.
- **Beneficence:** Do no harm, maximize potential benefits, and minimize potential harms.
- **Justice:** To each person an equal share according to individual need, individual effort, societal contribution, and merit.

Research the ethical review process and deadlines early, as review committees may not meet frequently and the process may delay your planned fieldwork, particularly if it is difficult to find up-to-date information and navigate the process remotely. Remember to budget for any fees associated with the approval. If you have a connection to a local institution in your research location, consider partnering for your work: among many benefits, you may be able to use their existing research permit.

A critical part of carrying out your research in an ethical way is obtaining informed consent from research participants before beginning your research activities. More information on this process can be found on page 25.

Research plan document

Bring the details of your research plan together in a document to be shared among your team and with partners. The research plan document will be helpful for soliciting feedback and keeping people on the same page throughout the research process. The written plan should include the following components:

- Problem statement or design challenge
- Context and background information you have collected, including a summary of your secondary research
- Purpose of your research and important research questions
- Information on the research team and partners
- Stakeholders and segment groups you have identified (who you would like to participate in your research and why, and rough numbers of participants for each group)
- Research locations
- Descriptions of the methods you plan to use, and for each method:
 - The activities involved
 - Drafts of research tools (such as interview guides or observation sheets)
 - Who will be engaged (participants and team members) and number of participants for each activity
 - How you will document the interaction(s)
 - Consent forms (different versions may be needed for different activities)
- A rough timeline of the ordering of the different methods and calendar of your time in the field
- Project budget
- Research deliverables and timeline for producing them

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In the next section, you will find more information on specific research methods, including tips. These are not all hard-and-fast rules; they should be adapted as necessary and as you learn what works well for you and your project and setting.

There are also a variety of other methods you can use in combination in your research that we will not discuss, such as a mock shop, self-documentation, and projective methods. For more information on mock shop and self-documentation, see IDEO's *Human Centered Design Toolkit* (IDEO 2011, p. 50 and 63), and for more information on projective methods, see the Scale-Ups Market Research Framework⁶ and a brief overview on page 31.

5 <http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.html>

6 Available by request from Scale-Ups staff; contact Kendra Leith, kleith@mit.edu.

Observation

In everyday life, we observe people, interactions, and events. In a research setting, a researcher carefully observes, experiences and records a specific situation in detail.

Why it is important and when to use

Observation facilitates understanding of a research setting, its participants, and their behaviors. It is a powerful tool for understanding needs that are not easily stated or necessarily recognized and expanding your knowledge base. Observation is very useful in the early stages of the design process when you are trying to gain a clearer understanding of the local context and of situations that are relevant to the problem you are addressing. Observation may expose you to specific things that you wish to explore further through your research. In situations where there is a language barrier, observation can still be an effective research method, although some information may be lost without an interpreter.

If a topic is taboo or embarrassing, it may be difficult to elicit a truthful answer in a conversation, but observation of behavior may provide more accurate information. For example, MIT start-up Sanergy set out to understand frequency and timing of toilet usage in slums. They found that observations of stalls was often more accurate than information shared in interviews, in which people were understating their actual use.

Utilizing a combination of observation and other methods may bring to light inconsistencies in information: people's actions and words may disagree. People are often so accustomed to certain parts of their lives—problems, workarounds, and habits—that they can become oblivious to them and may fail to mention these unconscious behaviors when questioned. Humans are generally aspirational, and what they say they do may not necessarily be what they actually do (M. Cliver, personal correspondence, July 11, 2014).

Challenges

Observation has a number of nuances. You want to observe without being overly conspicuous and influencing the activities with your presence (as this may cause a change in behavior), and you should try to capture information in a natural and effective way. You will need to experiment with observation activities and see what seems most comfortable for you and the person or people you are observing. In addition, you should be aware of how you are analyzing your observation and if any personal bias is influencing what you are learning.

Observation alone cannot tell researchers everything they want to know. Observation generally does not give clear access to

Case Study: Observation



In Kenya, the D-Lab team used participant observation and non-participant observation techniques, with both providing different insights. When observing people at public water sources in rural areas, the team saw a number of men collecting water, even though they had been told that women typically collect water. Through informal conversations, they learned that men tend to collect water for commercial purposes rather than for the household. This information then informed the research design for the planned co-design sessions, as the team recognized a need for groups of men to participate as well.

During the observations, qualitative and quantitative notes were taken. Some of the quantitative information collected at the water sources included how long it took a person to fill their water container, how many people were at the source at various times, how many containers were left at the source waiting to be filled, and what size containers were being used.

people's reasoning and emotions. To better understand these motivating factors, you can interview people after the observed activities have been completed to understand the context in which those activities just occurred and the internal processes that led to the actions (Patnaik and Becker 1999, p. 39).

When undertaking observation activities, you must consider the appropriate timing and setting: Are there cycles or seasons of activity? Are there episodic occasions that affect what goes on? If so, observation may be more or less informative—or perhaps misleading—if it is not aligned with the activity timing. (Do most people collect water early in the morning or in the early evening? Don't show up in the middle of the day and draw your conclusions from only this time.) Keep these factors in mind when scheduling activities and choosing locations.

Planning and carrying out

Talk to your team and partners about which observable activities and locations are relevant to your design challenge and will increase your understanding of the context and which stakeholders may be accessible through observation activities. Generate a list of topics you would like to observe, such as interactions, behaviors, and activities, and develop an observation plan or guide to facilitate capturing the desired information. Review the guide with your team and partners. Consider including both qualitative and quantitative observation prompts; what is measurable?

Participant observation

The most common observer role is as a participant observer, or recognized outsider: you observe people while interacting with them. If the observation is not taking place in a public place, you will likely need to identify yourself and request consent to observe the individual or group. As a recognized outsider, you may face behavior change issues: people may act differently because you are there.

Participant observation will likely be the most appropriate approach for your research and the most comfortable for you and your stakeholders. It allows you to learn firsthand how individuals' actions correspond to their words, to experience the unexpected (as well as the expected), and to develop trust. Interview questions that develop as a result of participant observation activities are connected to known behavior, allowing the answers to be better interpreted in this context. Participant observation will ideally continue throughout the research process, but it is especially important in the early stages because of its role in informing you about appropriate areas of research and in developing a strong researcher-participant relationship (Glesne and Peshkin 1992, p. 49). Of course, there are many places you can fall along the participant-observer spectrum throughout your research; your role will depend on what you want to learn, the types of activities you plan to observe, and the comfort level of stakeholders as well as yourself.

Select participants

Most importantly, the “right” people to participate are those who are willing to have you observe them! You will want to be upfront about your desired activities so that no one feels like they are being watched without their permission. (In public spaces, of course, it is natural to observe what is happening around you, but this observation is best used for building context and not as a data collection method. If you see something you wish to learn more about, you can approach the individual to see if they are willing to speak with you.) Identify stakeholders who you would like to observe, and reach out to them to try to schedule a time that you can spend with them. Be clear about your intended activities and get their consent to participate. Your wish to observe may be a strange idea for them, so explain that watching will help you learn more than just asking questions (Kolko 2011, chapter 4).

Ideally, you will be able to observe a number of people who may respond to similar activities in different ways, allowing you to compare across groups. As in other qualitative methods, you may learn different information or glean different insights from average users as well as extreme users, so try to include both. Extreme users may be those who “break the rules,” take shortcuts, and imagine different ways of doing things.

Tips for observing⁷

- Initially, observe with a local collaborator or partner and debrief after the interaction to compare your respective observations and takeaways. Your partner can act as a cultural translator of sorts if you see something that you are confused by or are not sure you understand correctly. Budget time for debriefing in your schedule.
- Be aware of your biases. The goal is to suspend judgment, assumptions, and bias during the observation period and simply attempt to understand the world of the subject being observed. Common biases that may affect observations include the following:
 - Selective perception: a tendency to observe what is expected
 - Halo effect: a tendency for a person's positive or negative trait in one area to influence others' perceptions of their traits in other areas
 - Projection bias: a tendency to unconsciously assign one's thoughts, values, and emotions onto others
- Avoid intrusions as you observe; try to keep the behavior natural. Studying people's activities inherently changes their behavior: when they know they're being observed, they may alter their natural actions because they want to make a good impression. Additionally, interruptions during an activity can change people's workflow, and questions can make them reconsider their actions. Try to minimize these effects and keep participants' behavior as natural as possible, by limiting intrusions and interruptions. If asking questions during an activity will be disruptive, be sure to note (mentally or otherwise) anything that you are surprised or confused by, and defer your questions until after the activities have been completed. If not disruptive, it may be natural to ask a few “why” questions during the activity, rather than deferring all questions until the end.
- To better understand people's reasoning and emotions, you will often want to follow up with them after the observed activities have been completed. Answers to questions and further discussions can give insight into why a person acted

⁷ An overview of observation applied to product design is given in the *Harvard Business Review* article “Spark innovation through empathic design,” by Leonard and Rayport (November 1997), available for purchase: <http://hbr.org/1997/11/spark-innovation-through-empathic-design/ar/1>.

in a certain way and what he or she felt during the observed situation. This is crucial information for determining people's needs (Patnaik and Becker 1999, p. 39). Ultimately, a mix of observation and interviewing should be very informative: observation will allow you to “see” the answers, and

questioning to follow up may help you to understand what you have observed. If there is a conflict between what is observed and what's said, put more trust in the observation (Laurel 2003, p. 174), but consider following up with the individual or exploring this conflict with others.

Interviewing

Interviewing encompasses a number of more direct (compared to the observation or immersion approaches) ways of gathering information from stakeholders. Interviewing methods can include interviews with one person or many people, with varying degrees of structure to the interaction.

Why it is important and when to use

Interviewing is an effective technique to collect a wide variety of needs from an individual or group. The varying degrees of structure in interviewing allow you to collect specific sets of information or explore new directions.

Use interviewing whenever you wish to gather in-depth information and when you may be able to directly obtain the data you seek from someone. Interviewing is particularly useful when you can speak to someone about topics that they have first-hand experience and knowledge of: for example, speaking to a woman about her water collection behaviors, rather than having her husband tell you about her collection practices, or interviewing a water committee about their activities in the community.

Types of interviews

Choose an appropriate level of structure when holding individual or group interviews with a variety of stakeholders.

Structured

In structured interviews, procedures and protocols are determined before the interaction. The data are collected the same way every time. Surveys (questionnaires with a specific set of questions and ordering) fall into this category. Typical question types in surveys are closed ended and include yes/no, multiple choice, rating, and ranking. While more narrow in scope than other types of interviews, surveys can be much cheaper to code, faster to process, and allow you to draw inferences about your target population. You may use surveys to measure mean rates of a problem as part of a needs assessment. To measure population averages and distributions, you will need a representative sample. Achieving this may be expensive and time consuming; the size of such a sample may be on the order of several hundred to several thousand participants to generalize results to the population. Surveys can also be used to test hypotheses that have been identified through other means.



D-Lab Research Scientist Dan Sweeney (l) speaks to a woman about cooking fuel in Guatemala

Shorter surveys will allow you to reach more people, particularly if many in your target population are time constrained, and may result in more accurate data as the quality and accuracy of responses may decrease over the course of a longer survey (Vergara and Ray, p. 2).

Semi-structured

Semi-structured interviews are the most common interviewing method in typical user-centered research, as they enable dialogue and fairly deep engagement with participants while retaining focus on a particular topic. These interviews follow the same general procedures as structured interviews, but the data are not collected the same way every time. The research team will have a list of questions that they wish to ask, but the interview is more of a free-flowing conversation and the questions may be brought up in different ways or at different times. The semi-structured interview format provides flexibility to follow up on interesting or unexpected topics that may arise.

Unstructured

The data are collected using a method that is appropriate for the given situation without a preconceived plan or procedure. This is often used in collaboration with the observation method and can be useful for gathering general information about the context. It is generally not considered a rigorous method for collecting data.

Individual interviews

Individual interviews—one-on-one or one-on-two conversations—allow you to get a deep and rich view into the behavior, reasoning and life of a person. If possible, hold the interview in a relevant and familiar location, such as one's home or workplace, so that s/he can use the objects and the space to further explain his/her activities.

The interviewing format can allow you to build up a rapport with the interviewee and, without others present who may influence their answers, you may be able to discuss sensitive topics more easily. Be aware of who is and is not in the room during an interview and what influence that may have on your conversation.

Challenges

Interviews are limited by the knowledge of the participants and their willingness to disclose it. Subconscious information may be challenging to understand in an interview. Interviews may be difficult when there is a significant psychological distance between the interviewer and the participant, such as when they are from different cultures or have different languages, education, and life experiences. Translation during interviews may create an awkward or uncomfortable environment for the participants. When the topic is sensitive or when the goal is to get below the surface and discuss values, motivation, and emotion, breaking up the conversation for translation may make the flow less natural and the interviewee feel less comfortable. Instead, consider training your interpreter as an interviewer so that they may collect the information directly. Direct observation and focus groups may also be employed for sensitive topics.

The importance of working with skilled and experienced interpreters cannot be understated, as the quality of information that is collected can be negatively impacted by bias, lack of accuracy in translation, lack of understanding of the research goals, and more. Further discussion of this topic can be found on page 29 and in Appendix A (page 48).

Expert interviews

Expert interviews are a type of individual interview used to gain in-depth and technical information, potentially providing a large amount of information in a short amount of time. They are helpful for understanding the lay of the land early in a project. Good uses of expert interviews are, for example, learning about the history of a particular community or topic; understanding regulations that might affect design and implementation of solutions; and gathering information about new technologies related to the design challenge (IDEO 2011, p. 55). Potential experts may include other researchers or practitioners, government officials, and key informants in the communities you are working in.

Identify the areas or topics that you would like to talk to experts about and determine who has the appropriate background and

may be available. Find and recruit these experts by telling them about your project and the intended length of time you will speak with them. Create a list of questions that you wish to ask ahead of time, and consider sharing these in advance.

During your interaction, ask for recommendations of other people to speak to about your work. Conclude by thanking the interviewee and finding out if s/he is open to being contacted again: you may wish to follow up with this person when you have ideas to get feedback on or to get more information.

Challenges

Without effective planning and preparation, expert interviews can consume a lot of time without resulting in much new information. You can check that you have identified the right person to speak with by giving them an idea of the interview content in advance and verifying that s/he can provide the information you are looking for. This also allows the interviewee to better prepare for the interview and can result in a more productive interaction. Do your research ahead of time and don't ask questions that you could easily find the answers to through secondary research.

Information from experts should be taken with a grain of salt: some experts may overstate their expertise or pass on their biases and assumptions. Like with other methods, you will ideally speak to several people with overlapping areas of expertise (but different points of view) in order to balance out biases. Expert interviews cannot substitute for primary research with the people you are designing for and with, but rather should serve as additional sources of information on specific topics, helping to put into context what you hear from users and customers.

Group interviews

Group interviews are a valuable way to learn about community life and dynamics and general community issues quickly. They may be particularly useful at the start of your fieldwork to get a general sense of the landscape and build rapport with stakeholders and partners: consider holding a community meeting or having a group discussion with staff members at a local NGO. Group interviews can also be a way to identify participants for individual interviews or other research activities, if individuals seem particularly engaged or interested in your work.

A group interview might involve 7–10 community members of different economic backgrounds, with mixed or same-sex groups (depending on the customs in the community) and mixed age groups (depending on the topic and local context). A good place to hold a group interview is in a neutral shared space; many of D-Lab's interviews have taken place under a mango tree! When organizing for an interview, be clear about its purpose and expectations such as whether there will be any compensation (IDEO 2011, 40–45).



D-Lab Research Project Coordinator Megha Hegde (second from right) has an informal group conversation in Morocco

Challenges

Be aware of who is (and is not) present at group sessions: are any groups excluded? Does the presence of a political heavyweight (such as a village chief) change behavior? Not all community members may be heard in a group interview, so consider following up with some individuals in separate interviews to engage them more closely.

It may be difficult to document discussion well in a group interview due to potentially noisy settings (if recording) and multiple voices. Consider having multiple notetakers in this scenario and comparing notes following the activity.

Focus groups

A focus group is a type of group interview that focuses on a particular topic and/or engages a specific segment of the population. It is an organized discussion with a limited number of participants—6 to 8 generally works well—led by a moderator, with the goal of gaining insight into participants' views on a given topic. Focus groups allow for and encourage interaction and discussion among participants that can lead to new discussion topics originally unforeseen by researchers. Focus groups may be especially useful for collecting new information when starting a project, and for getting feedback from users throughout the design process. Morgan writes in *Focus Groups as Qualitative Research* (Morgan 1997): “The simplest test of whether focus groups are appropriate for a research project is to ask how actively and easily the participants would discuss the topic of interest.”

A key advantage of focus groups is that participants interact with each other and build on each other's ideas. Participants may find the interaction more enjoyable than an individual interview and a rich discussion can result.

Consider using focus groups when one or more of the following situations apply:

- When the psychological distance between interviewer and interviewee is significant, such as when both are from different cultures and languages or have significantly different educational experiences or professional fields: Interactions among participants who share similar life experiences may result in deeper discussions and better understanding.
- When specific knowledge of a subject is required and the participants may otherwise feel compelled to change her or his language or “dumb things down” for the interviewer in a one-on-one interaction (such as in medical, engineering, or law professions): Participants are more likely to discuss issues with depth and appropriate language among peers, who share knowledge of the subject.
- When cultural norms dictate the “right” answer or when interviewees are likely to tell you what you want to hear: In a group setting, peers may challenge each other to provide truthful answers.
- When you want to brainstorm: In this case, participants can listen to others' ideas and build on them to generate new ideas⁸.

Challenges

One disadvantage of focus groups is that they typically require more effort to identify customer needs than one-on-one interviews. In theory, focus groups can be organized relatively quickly, without large demands on time and money. In practice, you may find that it takes more time to identify and gather the right group of people for your purpose. For a given focus, several sessions (made up of different user segments) may be needed in order to get a representative view on the topic. One study (Silver and Thompson 1991) showed that two individual, hour-long interviews were about as effective as one, two-hour-long focus group at identifying needs and that four interviews were slightly more effective than two focus groups.

Small or large group sizes may present additional challenges. The table below compares the pros and cons of the two.

<i>Small focus group (<6 people)</i>
+ More time for each person to talk
- Strong personalities may sway group opinion or dominate the conversation
- May have lower energy, generate fewer needs
<i>Large focus group (>8 people)</i>
- May provide too few opportunities for participants to talk
- Distracting side conversations may occur; difficult to moderate
+ May have higher energy, generate more needs

⁸ Wright, T., K. Leith, J. Hill, and S. Benhayoune (2013). Scale-Ups Market Research Framework. Available by request from Scale-Ups staff; contact Kendra Leith, kleith@mit.edu.

For discussing sensitive topics, individual interviews led by local team members may be more appropriate and effective than focus groups, particularly as confidentiality among focus group participants is not easily enforceable. However, depending on the dynamics of the group, some people may feel comfortable discussing sensitive issues in a focus group setting.

Planning and carrying out

Careful planning, practice, and attention lead to good interviews. Below you will learn about developing and delivering interview questions.

Developing an interview guide

An interview guide will help you to plan your interview approach, develop appropriate wording for questions, and stay on track during interviews. Different types of interviews, focusing on distinct user segments or stakeholder groups, will require different interview guides. For example, a focus group guide will likely have fewer key questions than the guide for an individual interview but will provide direction for a moderator, including suggested ground rules.

Be aware of how many questions you want to ask and how much time this will take. You need to be respectful of interviewees' time and able to provide accurate estimates for how long an interview will take, so that the potential participants are able to decide if they can participate. Too many questions may be fatiguing and frustrating: an hour or less (including the introduction and consent process) is generally considered an appropriate length before seeing diminishing returns on both sides. Even so, be prepared for the circumstance in which you only have 15–30 minutes with a stakeholder. What are the most critical questions you should be sure to ask? Determine these ahead of time, and try to understand your participants' timing constraints as soon as possible in case you need to adapt your plan.

You may also find that some people are able and willing to speak for longer periods of time. An organizer of the International Development Design Summit recalls, "When we were in Tanzania this summer, many people wanted to talk for 90 minutes to two hours because they were so passionate about the topics they were discussing and were so excited to tell their stories. We were skeptical that they had such time to spare, but most of them wanted to share as much detail as possible" (D. Mokrauer-Madden, personal correspondence, September 19, 2014).

Interview structure

Begin by introducing yourself and the project, and then request the interviewee's consent to participate in the interview. Your initial introduction can be a way to build rapport with the participant and put them at ease. Interviews may seem like tests and can cause anxiety in participants, so it is important to stress in your introduction that there are no wrong answers and that they are the experts (Glesne and Peshkin 1992, 40–41).

Obtaining consent

As mentioned previously, a critical part of doing ethically sound research is obtaining informed consent from research participants; a consent form will be required for your institution's ethical review process (and is recommended even if you do not need to go through the process). Many institutions have standard consent forms that you can adapt for your project. The form should include the following information:

- Who you are (name, role, where you are from)
- What you are doing and why
- Clarity that participation is voluntary and the session may be stopped at any time
- What you will do with the results of the work
- How the study site and participants were selected
- Possible benefits and risks to the participant
- Information on confidentiality and anonymity (if applicable)
- How often and for how long you would like to interact with the participant
- Requests to record observations and words (by photographs, notes, voice, or video recording)
- Requests to use quotes, photographs or other information in reports or publications

Use simple and clear language in your presentation of the information, and pause at several points to ask if there are any questions. Answer questions fully before proceeding, and gauge whether the information is being truly understood. It is admittedly an awkward and possibly foreign way to begin an interaction, so try to make the process as unintimidating and conversational as possible.

Do not begin the interview until you have received consent (written or oral, depending on participants' literacy level). Participants should receive their own copy of the consent form, as it will also include information on how to follow up if there are any further questions or concerns. Provide a translated copy if English is not the primary language in your research location.

After you have obtained consent, consider using the following structure for your interview:

- **Open with specific and "easy" questions** to warm up the participant and make them feel comfortable. As the consent process may be confusing or intimidating to participants (although we want to try and minimize this), beginning with straightforward questions can help them to feel more confident and comfortable. Examples of easy questions include experience or behavior questions that allow the interviewee to recount something that they are familiar with. You may ask what a typical day is like for them or ask about a recent, specific day (but recognize that this may not be representative of a typical day: be sure to clarify). It is

often easier to talk about a specific and more recent time than to generalize over a longer period of time. Knowledge questions, on the other hand, are reminiscent of tests and may make the respondent feel embarrassed or uneasy if they don't think they know the ["right"] answer.

- After the opening questions, **dig deeper** on issues specific to your design challenge. The more details you learn, the more likely you may stumble upon unique information. Be sure to gain a clear picture of current behavior related to the design challenge. In the case of water collection, do you know how often they collect water, what containers and modes of transport they use, or how much water they collect per trip/day/week? Consider these types of questions:
 - Ask about sequence. When inquiring about a recent event, understand the order in which activities happen.
 - Ask about quantity: "You keep cows. How many cows do you have?"
 - Ask about exceptions: "Can you tell me about a time when there was a problem at the market?"
 - Ask about relationships: "How do you sell to customers?" (Portugal 2013, p. 90).
- **Go broader**, prompting "bigger" or even aspirational thinking. What are their aspirations for the future? Do they have any ideas for how to address the problems in their community that they have identified?

- Put **sensitive questions** toward the end of the interview, after a rapport has been developed.
- End the interview by **asking if there is anything else they would like to add** or if they have any questions for you.
- Ask if there is **anyone they think you should talk to**.
- Be sure to **thank the interviewee for their help**, and be clear if you would like to potentially reengage them in the future. If so, ask if they are willing to be contacted again and collect their contact information.

In addition to designing your interview to learn specific information, think about how to make the experience engaging, enjoyable or fun. Are there opportunities during the interview to break things up and have a different, more interactive type of activity? This may be a unique opportunity for cross-cultural exchange for you and your interviewees, so they may be curious about how your experiences compare to those that they are sharing. Be prepared to share some of your own stories with the participants.

Interview content

Your research questions will inform your interview questions, but these are not the same: research questions identify what you want to learn, and interview questions are what you ask in order to gain that understanding. Interview questions tend to be more specific and contextual than research questions, and the creation of the interview questions requires creativity, insight and experimentation (Glesne and Peshkin 1992, p. 81).

Case Study: Developing Interview Questions

The primary research questions for the water transport and storage project in Kenya included:

- What are the general water needs of individuals for use at home, in their business, or their organization?
 - What is water used for? What are the water needs?
 - What are users' current water transport practices and needs?
 - What are users' current water storage practices and needs?
 - What are users' current water treatment practices and needs?
 - What are the potential cultural/social implications of a new and "different" technology?

Additional research questions originally included those which, while outside of the water sector focus, were important to understand as part of the longer-term vision for the project:

- What are the mechanisms for selecting and acquiring new technologies for the home?
 - How do potential consumers get information?
 - How do potential customers get [access to] funds?
- What and who typically drives the decisions for technology selection and acquisition?
- Who typically uses and maintains the new technologies?
 - How do gender and other intra-household issues affect demand for or uses of a product or service?

The team then worked to craft interview questions that would get at these pieces of information in open, unbiased ways. The process was highly iterative and required several rounds of careful editing, involving debates on small differences in wording and final review by project mentors. The result was an extensive "question bank," which was then pared down for the interview guide, shown in Appendix B, page 51. Some questions from the bank became prompts for observation instead of being included in the interview guide (such as, "Does anyone accompany you when you collect water?"), as the information could be easily gained through observation, and interview time was limited.

As you create interview guides for different stakeholders, consider including questions that will allow you to verify (or refute) information. For example, when the organization SEED was trying to understand the operational expenses of owning an irrigation pump, they learned when in the growing season pumps were likely to break. When speaking to mechanics, this information was corroborated with their schedule for performing repairs. However, learning of anomalies would have also been informative and suggested that more work was needed to understand the behavior and patterns (M. Gala, personal interview, October 7, 2014).

Writing questions

The question-writing process requires creativity and rigor. Write questions in such a way that they do not influence the answers you receive: they should be as open and unbiased as possible. Below are suggestions on crafting good questions. Seek feedback on your interview guide and be open to adjusting your wording of questions as you try them out and learn the most effective ways to get the information you desire.

- **Ask open-ended and non-leading questions.** These types of questions have the greatest potential for allowing you to learn. Exploratory questions often begin with “what,” “in what way,” “tell me about,” or “why.”
- **Ask questions that allow the respondent to frame their own needs.** For example, “What do you think are the three most important problems facing your community?” (Rather than “Do you think water is a big problem in your community?”)
- **Use appropriate vocabulary in your questions.** Do not use complicated or uncommon words: strive for simplicity and understandability. If your questions are being translated, find out if there will be any difficulty in retaining the essence of the question in the local language.
- **Consider asking questions that create contrasts** in order to uncover frameworks and mental models:
 - Compare processes: “Are there differences between collecting water at the stream or the well?”
 - Compare to others: “Do your neighbors also travel in this way?”
- **Compare across time:** “Have your farming practices changed over the last five years? Do you think they will change over the next five years?” Asking about the future is not meant to draw out accurate predictions but rather to potentially break free from existing constraints and think about what may be possible in the future. Choose an appropriate time horizon that helps people to think beyond incremental change (Portugal 2013, p. 91). **Consider using sacrificial concepts.** Sacrificial concepts are ideas or solutions created to help understand an issue further. They may be used during an interview to make hypothetical or abstract questions more accessible and concrete. You may ask your respondents to

compare your concept to the way they currently do things or present two contrasting concepts that they can compare to each other. If trying to understand water storage and dispensing preferences, you could ask someone if they would prefer to have a 500 L container without a tap or a 250 L container with a tap. A sacrificial concept can be a scenario told verbally, something shown through pictures or drawings, a physical item that can be handled, or an experience to try. A sacrificial concept does not necessarily have to be feasible, viable, or possible since its purpose is to elicit deeper understanding. A good sacrificial concept sparks a conversation, prompts a participant to be more specific in their stories, and helps check and challenge your assumptions (IDEO 2011, 60–61).

- **Consider incorporating “props”** such as card sorts or pictures for stimuli.

More tips on writing interview questions are included on the next page.

Testing questions

Before starting formal research, get feedback on your interview guide from someone with experience in the sector and the target market and someone with qualitative research experience. Your community partner or others with experience in the target market can provide feedback on content and advise on the language and how to ask questions in culturally appropriate ways. They can also provide information on appropriate greetings for interviewees and advice on who should conduct the interviews.

During the pilot period, test your questions with a group of people similar to those whom you will engage in your formal research. Note which questions elicit more interesting and useful responses and which are redundant or confusing. Experiment with different question wordings and adjust the interview guide as you learn which are more effective.

Scheduling interviews (time and location)

Recruit participants according to the sampling strategy or strategies identified in your research plan. Refer back to pages 12–13 for details on sampling strategy.

Try to set up your interviews in advance. Work around the schedules of your desired participants and respect their time. Showing up without an appointment could lead to delays and may also be considered disrespectful, particularly if you are disrupting regular activities. The people you wish to speak with likely will not have much or any spare time; work around their schedules so that they are not unduly inconvenienced. (You can also offer to help with chores or activities to make up any potentially lost time, if they are amenable to that option. In addition, you should appropriately compensate them for the time that you use.) If advance scheduling is infeasible or not a common practice, organize as

Tips for Question Phrasing and Wording

Keep questions short and clear.

No: When you store water in your jerrycan for drinking, cooking, and doing laundry, how long do you leave it in the can between the morning and evening?

Yes: How long do you store water in a jerrycan?

Avoid leading questions.

No: Do you think it is difficult to clean the mouth of the jerrycan because it is so narrow?

Yes: What is the most difficult part of cleaning the jerrycan?

Yes: [Or] Do you find anything difficult about cleaning the jerrycan?

Avoid assuming questions. Open-ended questions can get you the same information, and perhaps more.

No: What kind of soap do you use to clean your jerrycan?

Yes: Do you clean your jerrycan?

Yes: [If yes] How do you clean it?

Yes: [Better yet] Can you show me how you clean it?

Yes: [If they mention a product] What kind of [this type of product] do you use?

Ask about one idea at a time.

No: What factors contributed to your decision to purchase a jerrycan and cart?

Yes: What factors contributed to your decision to purchase a jerrycan?

Yes: What factors contributed to your decision to purchase a cart?

Be specific about times and places.

No: Have you been to the market?

Yes: During the last 7 days, did you go to the market?

Yes: [If yes] Which market did you go to?

Yes: [If yes] How many times did you go to that market in the last 7 days?

Yes: What did you do at the market during each trip?

much of your work as possible beforehand but be prepared to adapt on the fly as you attempt to carry out your interviews. You may only have a short period of time to complete an interview, encounter more than one person in a location together, or not find your “ideal” interviewees.

If possible, arrange to meet the participant at his or her home or workplace or another quiet, convenient location. In-context interviews give the participant greater ease and allow the researcher to see the objects, spaces, and people that the interviewee talks about during the interview (IDEO 2011, p. 42). Some people may alternatively prefer a common meeting place: “Some of our interview subjects seemed interested in talking in a bar or café. Part of this was probably because their workplace was loud and crowded, and they also seemed appreciative of a snack or meal” (D. Mokrauer-Madden, personal correspondence, September 19, 2014). If you are recording the interview, be mindful of background noise and the appropriate placement of the recorder. Ideally you can conduct the interview without an audience; the presence of neighbors, friends, or others can influence what the person says and what they are comfortable revealing.

Debriefing

Budget time in your schedule for debriefing after each interview

or activity. In addition to capturing and expanding upon the raw notes, document your own reflection on the activity, including initial thoughts, surprises, and changes you may wish to make for subsequent interviews (Portugal 2013, p. 115). While the data will, in many ways, speak for themselves, there is a lot of value in understanding initial reactions to the interaction. Debrief prompts could include a description of the interviewee (information that may not come across from a transcript but could help to put responses into context), when s/he seemed most animated, anything that surprised you, and insights on the interviewing process.

As part of your interview guide, consider including a debrief sheet to facilitate and capture this reflection. A sample is shown in Appendix C, page 53.

If time allows, you can also have your other team members interview you (and your interpreter) about the interaction in the period soon after: ideally within 24 hours. As they ask you questions about the interview content and peripheral information, you may be reminded of information that has not yet been captured in your notes and they may pick up on new insights (M. Gala, personal interview, October 7, 2014).

Interviewing approach

Good interviewing solicits relevant information from interviewees while engaging them like a curious friend. Writing good questions is critical, but how you implement them and guide the conversation will greatly influence the data that you collect. You want the interviewee to feel comfortable and able to share honest answers, and to have a positive overall experience. Remember to smile and make eye contact (if culturally appropriate) and be present, genuine, respectful, and gracious. As you practice and gain more experience, your comfort with interviewing should grow⁹. Some approaches to keep in mind when interviewing include the following:

- **Listen carefully and mindfully;** avoiding assumptions is as much about listening as it is about questioning. Listen for what is important to the person answering. Listen for what is not being said. To prompt a speaker to continue, ask them to elaborate: “Can you tell me more about that?”
- Express interest in the responses, but **try to remain neutral.** You want to be encouraging and grateful, but do your best not to comment on how “good” or “correct” an answer is. There are no right or wrong answers, and saying “that’s great” as opposed to a more neutral “thank you” or “that’s interesting” may make the interviewee feel like the answers are being judged or that you want to hear certain information. This is a fine balance to strike.
- **Be patient.** Don’t be afraid of silences or pauses. Give people time to formulate their response and choose their words. If you pause before going on to the next question, they may elaborate on what they have just said¹⁰.
- **Never assume answers.** Ask open-ended questions, and ask for clarification if any responses are not clear. Probe gently if it seems that something may have been left unsaid:
 - If a phrase is used that you are not familiar with, ask what it means.
 - Ask a follow-up question if there is an emotional cue: “Why do you laugh when you mention your son’s school?”
 - Probe without presuming; ask questions as neutrally as possible: “Some people are unhappy with their community health worker’s services, while others are happy with them. What do you think?” This more easily allows the interviewee to associate themselves with a generic group (Portigal 2013, p. 91).
- **“Parrot back”** to confirm information. For important topics, repeat back what you think you have heard: you may be corrected if you have misinterpreted what was said, or you may get a second, more developed answer (Constable 2014, p. 56).

- You can **include participants in the analysis** by sharing some information you have already heard and asking for their opinion on the matter: “We’ve heard people say ‘____.’ What do you think?”
- Try to **draw out rich stories.** Some additional approaches you may use include the following (IDEO 2011, p. 65):
 - In a place that is familiar to the participant (such as their home or office), ask them to show you the things they interact with or walk you through a given process.
 - If participants perform a process or execute a task with you, ask them to describe aloud what they are thinking. You may hear more of their motivations, concerns, perceptions, and reasoning.
 - Ask participants to visualize an experience by creating drawings or diagrams.
 - Ask “why?” questions in response to several consecutive answers. This allows people to examine and express underlying reasons for their behavior and attitudes. For instance, if women leave their jerrycans at the water source, why do they leave them there? If the answer is that they have to wait their turn and the line is long, why is the line long? If the answer is that the flow rate of the water is slow, then why is it slow? You learn that during the dry season the flow rate decreases and waiting times increase, and people have devised a system to leave their containers and hold a place in line.
- **Know when to stop.** If your interviewee is showing signs of growing restless, bored, tired, or distracted, you may need to end the interview before you reach the end of your questions. It is important not to overextend your welcome: remember, they are doing you a favor. You may ask to follow up with them if you wish to try finishing the interview at a later time¹⁰.

Working with interpreters

If you are working with interpreters, make sure that all parties agree on the role of the interpreters and the researchers. Stress that you would like the interpreters to translate interviewee *responses* in language as close to the exact words as possible. Reiterate that the goal is to ask non-leading, open-ended questions and not make assumptions about the interviewees or their answers. There may be times when an interpreter changes the wording of a question to make it more clear to the interviewee. This is fine: as an informed member of the team, they should be encouraged to work creatively. A good understanding of the research goals and process allows them to better support the work. To verify their work, you can have someone review the interview recordings and the accuracy of the translations, if you are recording the interactions. See Appendix A, page 48, for additional resources on working with interpreters.

⁹ For more interviewing tips, see the free e-book *Talking to Humans* (2014) by G. Constable: <http://www.talkingtohumans.com>.

¹⁰ Paxson, H. (2013). Top Tips for Interviewing. Available by request from Scale-Ups staff; contact Rebecca Smith, smithra@mit.edu.

Even when using an interpreter, speak directly to the interviewee and, if culturally appropriate, maintain eye contact when asking questions and receiving answers. Address the interviewee with first- and second-person language (“What path do you take to reach the water source?”) rather than the interpreter (“What path does she take to reach the water source?”); do not talk *about* the participant, talk *to* the participant. Request that your interpreter ask questions in the first person: statements in the third person (“She asked what path you take to reach the water source.”) can further separate the interviewer and interviewee.¹¹

Focus groups

At a minimum, a simple focus group (a discussion-based group interview; general plan shown below) will involve participants, a facilitator, and a note taker:

- **Participants:** 6 to 8 people in your target customer segment should be recruited to be part of the focus group. Generally, people with similar characteristics and backgrounds will be more comfortable talking to each other. During recruitment of participants, be clear about the time commitment needed and any compensation that will be provided. As focus groups generally require a longer time commitment than an individual interview and may involve travel to a central location, consider providing snacks and reimbursement for travel expenses.
- The **facilitator** focuses and manages the group. Having a good facilitator is critical for minimizing the challenges inherent to a group discussion. A predetermined discussion

guide is used to manage the topics being discussed and keep attention to time. The desire to ask many questions and foster a rich and productive conversation must be balanced; the facilitator will have to determine when it is more beneficial to shift gears or allow a conversation to carry out. Good facilitators will:

- Practice careful listening, ask open-ended questions without leading, and ask relevant follow-up questions;
- Remain neutral and refrain from providing interpretation;
- Keep participants focused on the questions asked while allowing the conversation to move to other topics if appropriate; and
- Guard and enforce the ground rules of the discussion (see next page for details).

In addition, they should speak the language of the participants and have a good understanding of their backgrounds and culture. It is not recommended to attempt real-time translation during a focus group. If the researcher does not speak the local language, it is strongly preferable to train a local team member to lead the sessions.

- A **note taker** will be responsible for writing down comments from participants that demonstrate the customer’s needs and voices, and noting observations throughout the session. The note taker must therefore be able to understand the subtleties of the focus group (e.g., interactions between participants, nonverbal communication) and the goals of the discussion. Ideally the focus group audio or video will also be recorded. (See the “Recording Information” section, page 36, for more details.)

¹¹ <http://www.uniteforsight.org/research-course/module5b>; <http://englishrussiantranslations.com/resources/WorkingWithInterpreters.html>

Example focus group structure.

Section	Content
Introduction	Thank everyone for his or her time. Introduce research team members and explain the purpose of this focus group. Share brief introductions among participants. Address confidentiality between participants and anonymity of the data. Cover the ground rules and invite comments and additions. Answer any questions and request consent from all participants. Introduce the agenda.
Build rapport	Use appropriate techniques such as icebreakers to start building rapport and trust among participants.
In-depth questions	Follow the discussion guide you prepared, with in-depth questioning on the topic. Ask follow-up questions. Guard the ground rules.
Wrap up	Ask if participants have any additional questions or comments. Remind participants of confidentiality. If there is a follow up session, provide a reminder at this time. Thank everyone for their time and participation.

The purpose of setting ground rules is to create a positive atmosphere in which people feel compelled to share their point of view. Suggested ground rules include the following:

- Confidentiality (between participants): what is said should stay in the room.
- Only one person should speak at a time.
- No one should monopolize the conversation: everyone should have the opportunity to share his/her opinion.
- There are no right or wrong answers; every perspective is important.
- Respect one another.
- Listen to one another.

Facilitators should ask participants if they would like to add any additional ground rules.

A good icebreaker activity may be important: it can make people feel more comfortable sharing ideas with the group, even when their opinion may contradict others, and set the tone for the session. Effective icebreakers include the following:

- **Warm-up questions:** these are open ended, easy, and with no right or wrong answers.
- A **short survey:** the questions in the survey may be the key issues open for discussion. The survey can then be

used both as an agenda and as a conversation starter. For instance, you may start off an interview about agricultural waste charcoal with a short survey on the types of fuel used for cooking and likes and dislikes of each fuel.

- **Quick games:** games in which people collaborate.
- **Projective methods:** consider using indirect, structured ways to ask questions or prompt discussion. You may, for example, provide an ambiguous stimulus and have people work together on completing a story. This may enable the participant to project his/her story on to the stimulus and get at more subconscious needs. Association, completion, construction, and expression questions can all be effective (see table below). A projective question could be used to introduce the topic and start the conversation. Projective methods can also be used in individual interviews.

Another strategy to help participants feel more comfortable is to propose an initial question or provide items for feedback and have the group members take a few minutes to individually think about or write down their thoughts before the discussion begins. (Be sure to understand the literacy level of participants before suggesting this.) Having already thought through and expounded upon their opinion, people are more likely to share or defend their own opinions, rather than fall into “group think” mode (Visocky O’Grady and Visocky O’Grady 2006, 40-41).

Types of projective methods.¹²

<i>Response Type</i>	<i>Stimulus</i>	<i>Questions</i>
Association	Provide one word, a list of words, one picture, or a few pictures	Ask the respondent, what is the first word that comes to your mind?
Construction	Provide a concept, picture, or series of pictures	Have the respondent tell a story that explains the picture(s). Who are the characters, what are they doing, how do they feel, what is important to them, why did they make certain choices, and what did they do just before/after these images?
Expression	Describe a concept or a situation	Ask the respondent to act out or role-play what happened before, during, and after the situation. Have the respondent draw or paint the situation, and then explain the choices made in the painting, what the lines mean, what the colors mean, what’s not in the picture, how do the characters feel and think, and so on.
Completion	An unfinished picture or story	Have the respondent complete the story. Ask why the characters made certain choices, how they felt about it, who did they talk to, what is important to them, and so on.
Ranking and ordering	A set of choices, concepts, products	Ask the respondent to rank items in order of preference. Drill into each choice made and ask why: why is this the top choice, why is a better than b, why is b better than c, why is a better than c, why is this the last choice, and so on.

¹² Wright, T., K. Leith, J. Hill, and S. Benhayoune (2013). Scale-Ups Market Research Framework. Available by request from Kendra Leith, kleith@mit.edu.

When planning the focus group, choose a few key questions to present during the session. As the goal is to facilitate a discussion between participants, be careful not to try to fit in too many topics or questions. The flow of a focus group is similar to an interview, starting with general or broad prompts and then diving deeper, with some modifications to manage interactions among participants.

If you are trying to understand product or feature preferences, you may provide participants with a number of options (physical items to interact with or photographs to look at) to rank and compare, and prompt discussion with questions about others' likes and dislikes of the most or least favorite options. This can be another type of projective method, as participants project their needs onto the products and potentially reveal underlying issues.

Case Study: Focus Groups

During their research in Kenya, D-Lab researchers held focus groups in which a variety of water transport and storage technologies were presented and compared. Some of the technologies were locally available and familiar, while others had been purchased in the US (designed for campers and backpackers) and brought by the team to provide examples of different approaches to solving similar problems. Participants examined the technologies, chose a few of their favorite and least favorite options, and explained their reasoning and discussed features.

Immersion

Immersing yourself in the stakeholder group(s) allows you to gain a rich understanding of the group's needs by experiencing their challenges (Patnaik and Becker 1999, p. 39). You may unearth new insights and unexpected opportunities by participating and meeting people where they live, work, and socialize.

Why it is important and when to use

Putting yourself in others' shoes can enable you to get beyond what they say, to what they think and feel. Immersion helps you to gain empathy and more informed intuition by being with people in their settings and doing the things they normally do (IDEO 2011, 46–47). An honest interest in participating lets users know that you are serious about your desire to learn from them. As trust and mutual understanding are built over time, people may feel more at ease sharing their deeper desires and hopes for the future.

Like observation, immersion can allow you to see discrepancies between what people say and think they do and what they actually do. Your goal should not be to correct or point out any misconceptions but rather to understand the differences, which may highlight new opportunities.

Challenges

You may face resistance to your efforts to participate in activities, or find that some situations are closed to you (whether because of sex, age, being foreign, language, religion, or other reasons). Such resistance could also be due to the potentially unusual nature of this behavior by a foreigner. Depending on where you are doing your research, the community may have previously worked with foreigners who remained more separate. Additionally, people want to be good hosts, which does not typically mean putting

your guests to work. You can try to reassure hosts of your genuine interest in joining them, and also see if your partners may be able to facilitate participation.

When considering firsthand participation in activities, keep personal safety in mind. Be aware of what situations you are comfortable with, what you are prepared for, and what you are capable of. Your partners or hosts may have different safety practices (for example, welding in a workshop without welding goggles) or have a different physical fitness level (for example, they may be able to transport water over greater distances than you reasonably could). Do not put your health or safety at risk, and be respectful and polite if you do not feel comfortable participating in an activity.

Planning and carrying out

The mindset that you take when approaching your fieldwork will facilitate immersion activities: when there is an opportunity to take part in an activity, take advantage of it. As mentioned, not only will you learn something, but you may strengthen relationships with community members. Taking the time to participate shows that you care and that you are serious about your work: consider helping a woman shell peanuts, carrying a water container with a child, or learning how to cook a local dish. Of course, you must first make sure that people are comfortable with you joining or assisting them; you may need to build up more familiarity or trust before they allow you to join them. Once you have reached this point, try to spend a period of a few hours to a few days with a person or group.

A homestay—spending one to a few days with a family—is a great way to learn about family dynamics, roles within a family, and day-to-day activities. Let your partner or primary community liaison advise you as to whether a homestay will be appropriate in

your context. Consider safety, comfort level (you may be sharing a bed, without running water or electricity, etc.), and what burden a homestay may place on the family. Try to set expectations so that your host does not feel that they need to go out of their way to accommodate you. They will likely not accept money from you, but you can offer to pay for ingredients for meals and bring a special treat or gift to share. The opportunity for cross-cultural exchange can also be of great value for your hosts: D-Lab students often travel with a set of photographs so that they can tell hosts about their home and family. If you are able to do a homestay, be very flexible and open and try to participate in the normal routine. Learn how to ask “Can I help you?” in the local language as early as possible!

If your design challenge relates to existing technologies, if you have a prototype, or if you are comparing several technologies, use them and compare to traditional methods. Try out whatever you can before and during your fieldwork. For example, if you are researching lighting and solar lanterns, try out some solar lantern models yourself before leaving, and once in the field, use the solar lanterns at night. What are people currently using for lighting? Try that, too (but again, keep safety in mind: kerosene lamps, for example, can have negative health effects). Do not ask potential users to try something before you do!

Case Study: Immersion



In Kenya, the research team found themselves without water in the tanks at the home base location. Armed with an assortment of technologies that they were showing in focus groups, they decided to try them out, transporting water from the nearby well to the tank. The hour of work quickly made them gain a new appreciation for the task of water transport that our interviewees did nearly every day. The team also gained insight into the differences between the technologies and became aware of the features that we appreciated or disliked.

At left, D-Lab Research Project Coordinator Rebecca Smith uses a Wello WaterWheel in Kenya.

Co-design

Drawing on the Creative Capacity Building (CCB) methodology,¹³ D-Lab researchers have begun to explore using co-design as another technique to understand needs. CCB distills key elements of the design process into a hands-on curriculum that is accessible at any educational level and presents a framework through which anyone can become an active creator of technology, not just a recipient or user. One way CCB is implemented is through village-level trainings, typically at least several days long, in which participants build skills and work collaboratively to develop technologies that address pressing needs.

Co-design as a qualitative research method condenses the content delivered, providing an introduction to the design process and to simple tools and materials that are available. Participants

work in groups to prototype technologies that they could use to address a familiar problem and then share their designs with each other and explain their motivation and reasoning.

Case Study: Co-Design Sessions

Several daylong co-design sessions, with about 20 people broken into 4–5 groups, were included in the recent research in Kenya. Each group was prompted to build something to transport 20 liters of water over a distance of 2 kilometers. The resulting prototypes had a variety of features that expressed different needs for a solution. For example, some designs emphasized stability for filling easily, padded straps for comfort, and use of strong materials for increased durability.

¹³ <http://d-lab.mit.edu/creative-capacity-building>

Why it is important and when to use

The co-design method may be particularly effective for identifying design characteristics or features that are important to users. Outputs of co-design activities will include physical representations of desired features; a well-facilitated discussion on design decisions can elicit a deeper understanding of needs and preferences. In addition, the sessions may be more engaging and enjoyable for participants than other research activities, giving them an opportunity to gain new skills and apply these to solving their own problems.

The effectiveness of co-design as a research method depends on the familiarity of the instructor or facilitator with the design process and how to teach it, the openness of the participants to engage in the activities, the group dynamics, and the ability to understand reasoning behind design decisions. Given the expense and time requirement of co-design sessions, it is important that they are well facilitated and supported in order to maximize the benefit that is gained.

Case Study: Co-Design Session Delivery



Above, project assistant Njeri Kara, an alumna of the International Development Design Summit (IDDS), leads a co-design session in a church in rural Mitaboni, Kenya. A poster illustrating the design process (translated into Swahili) is hung on the wall behind, and materials are displayed at the opposite side of the room.

IDDS is another branch of D-Lab's CCB efforts. Having attended IDDS, Njeri had experienced the curriculum first-hand, in an expanded format. With previous experience leading workshops, and speaking the local language, the delivery of the sessions went well.

Challenges

While novel and exciting, co-design sessions may not be appropriate for all contexts or timelines. The sessions can be costly: you should budget for materials, food, and drink; a per diem to compensate participants for their time; and reimbursement for travel expenses. The more materials provided, the more creative

freedom and inspiration your participants will have, but the higher your cost of materials will be.

A one- or two-day-long session is an ideal co-design session length, but participants may have difficulty taking this much time away from their regular activities. Do your best to facilitate participation in the sessions without compromising the goals.

While there is not a huge amount of content delivered as part of the session, the content that is given provides the foundation for the design activities, so it is critical that all participants are able to understand this and feel engaged. Depending on the area you are working in, multiple languages may be spoken. Your design facilitator should be able to instruct in a shared language of the participants.

Ethical issues may arise as part of the activity. Are participants able to keep the prototype? If there is only one, [how] will they share it? If researchers want to use an idea shared by a participant, are there potential intellectual property conflicts? Consider which consent or release forms are needed for these scenarios.

Planning and carrying out

Find an appropriate location for a co-design session. An ideal location will be convenient and centrally located within the community, and have space and surfaces for teams to work on. The work spaces can be in the same room if spread out enough for each group to have room to work and talk without interrupting other groups or influencing others' ideas. There should be seats that can be moved for group work, tables or desks to display materials and build on, and wall space to hang a poster of the design process.

Case Study: Co-Design Session Setting



In a peri-urban community in Kenya, a co-design session was held in the local health clinic, and teams were able to spread out into different rooms to work on their prototypes. A table with materials displayed is shown above.

Recruit participants for a daylong engagement: get advice from your partner and other community members as to which day of the week will allow more people to participate. Be clear about

expectations and what compensation you can offer. Good potential participants include those with interest in hands-on building and willingness to consider new ideas. You may identify potential participants during group or individual interviews, from recommendations of partners and local liaisons, or through a more open call. Determine how many participants you can have based on budget, size of space available, team members available to support, and your sampling strategy. We recommend forming teams with 3–5 people each, with separate groups for men and women; in mixed-sex groups, men may dominate the activity. Consider your user segment groups and try to recruit at least one team for each primary segment. Plan to have at least one research team member available for every two co-design teams, to facilitate small group discussions and prototyping. A sample structure for the day is found below.

Be sure to understand and record the design criteria determined by each group to narrow and select ideas. Document why the final design was decided upon, including particular features that were important. Create a notes guide for research team members to use to capture the ideas and process they are seeing and

hearing from each group. Examples of questions to include in a documentation guide are:

- What are some of the common ideas you are hearing from the group?
- Are there any different ideas that are particularly surprising or interesting?
- As the group decides on the selection criteria, what are people debating or disagreeing on?
- As the group narrows their ideas, which are the ideas they are talking about a lot?
- What are the most popular materials the team is looking to use?
- Are there any tools or materials that people want but are missing?
- What is the group's reason for choosing an idea as their best idea?
- What is the team spending most of their time or attention building?

If you are not keeping the teams' prototypes, be sure to document their outputs well, with photographs or videos (with permission).

Sample co-design session plan.

<i>Section</i>	<i>Content</i>
Welcome and Introduction	Thank everyone for his or her time. Share introductions (research team and participants). Review goals and expectations. Discuss and receive informed consent. Guide group through icebreaker activity, such as “What is it?” game (see box below).
Introduction to Design	Introduce the design cycle: understand the problem, think of ideas, choose the best idea, work out the details, build, test, and gather feedback. Break group into design teams (based on sex and user segment). Design challenge (if time allows): go through the design cycle to solve a problem, such as raising ears of corn using only two sheets of paper.
Design Project	Introduce the design problem. Teams brainstorm ideas. Teams develop selection criteria and narrow ideas. Present and explain materials and tools available. Teams choose the best idea and build a model of chosen idea.
Design Presentations	Teams prepare a brief presentation of their design, including key features. Teams present to the group and answer any questions. Wrap up as a group: answer any questions, get feedback on the session, and discuss next steps. Take photographs of teams with their prototypes. Thank everyone for his or her participation and distribute per diem and reimbursement.

“What Is It?”

For the “What is it?” game, share an object that could have many uses (such as a bottle cap or a wooden spoon). In small groups, have each person share a different idea about what the object could be. Go around the circle at least three times: the goal is to get people thinking creatively and feeling accomplished.

Further resources on CCB and co-design are available from Scale-Ups staff; contact Rebecca Smith, smithra@mit.edu.

Recording Information

We have discussed how to collect a lot of great information, but this information must be well documented and recorded with appropriate media to be useful to you. Effective documentation should capture the information accurately and not have a negative influence on the interaction, being as minimally intrusive as possible.

Documentation methods

Primary options for documentation include written notes, audio and video recordings, photographs, and drawings; these options are compared in the table on the next page. While the handwriting of notes is very straightforward, it may be difficult to record a large amount of data in a short time, and additional media can help capture information in the user's environment so that the data can be further analyzed and shared later. No video or audio recordings or photographs should be taken without consent given by participants who have a clear understanding of how the materials will be used. For any information that is collected, understand if the participant is comfortable with future use of quotes, photos, or video in presentations or publications, for internal or external use. Each documentation method has its nuances when applied to the different research methods; more detail on how to implement each is found in the table on the following page.

Written notes

No matter your research method, written notes will likely have a role. Ideally, you will be able to record notes right away (such as jotted notes that can be fleshed out after the interaction), but depending on the situation and the user's comfort with how you are recording the information, you may not be able to record during the interaction. If taking notes during the activity could detract from the experience and make your host less comfortable, delay major note taking until you are alone. After the activity, finish filling in your notes before discussing your results and takeaways, as the discussion may modify your original perceptions. Emphasize accurate, raw data over analysis in your notes. Then, speak with other team members to see if there is any additional detail that should be added while the information is fresh in everyone's minds.

The more specific you can be with recording what you see and hear, the better; it may be challenging to get inspiration from general comments or to later remember back to the details, and the respondent's choice of words can carry meaning that may be lost if translated by the note taker. Check your notes for vague adjectives such as "some" or "many" and try to replace them with more descriptive words.

Specific things you may want to record, in addition to what is directly said (Morra and Rist 2009, p. 314):



D-Lab Research Project Coordinator Nadia Elkordy (r) and a project assistant fill in notes in Morocco

- Characteristics of the participants (gender, age, dress, education level, occupation)
- Interactions (who else is in the room/area; interactions with others; potential relationships with others; level of participation, interest; power relationships; level of support; and cooperation with one another)
- Activities occurring (what are people doing)
- Nonverbal behavior (facial expressions, gestures, and postures)
- Cultural context (cultural norms and practices)
- Physical surroundings (rooms, space, and room setup)

When you are in unfamiliar situations, you are often more open to discovery: pay close attention and note your impressions, reactions, problems, and questions, but recognize that the lack of familiarity may be clouding your takeaways or observations. If you are observing or participating in an activity that is taking place in a language that you do not fully understand, listen for common words or phrases or those that seem to elicit strong responses—noting those and later inquiring as to their meaning from a native speaker—and watch carefully for nonverbal communication that takes place.

Capture statements in the exact language used or as close as possible. For a structured or semi-structured interview, the note taker should have a hard copy of the interview questions with spaces to write answers, so that they can fill in answers that roughly correspond to the questions asked. Often in answering the current question, a respondent will address later questions, and the recorder may choose to write these with the current question or in the later space. S/he should use whatever system makes sense for him/her, as long as s/he will remember it and be able to use it appropriately for analysis.

Documentation methods overview.

<i>Documentation method</i>	<i>How to use</i>	<i>When to use</i>	<i>Limitations</i>
Written notes	Jot notes during or after an activity or interaction, focusing on what happens and is said. Document key phrases and denote direct quotes, and separate any analysis that may arise. Record notes in a predetermined guide (such as an interview guide or recording sheet) or in a field notebook (a less formal style).	Written notes will be your most reliable documentation option: use often! They are especially critical for individual and group interviews and observation.	It may be difficult to accurately record a large amount of data in a short time. Be aware of how the act of note taking may influence the participant's comfort: make the note taking as inconspicuous and natural as possible. Scribbling furiously when something is said can suggest that an answer was particularly "good" or "bad" and may create anxiety or confusion for the interviewee.
Photographs	Take pictures during an activity or interaction, capturing images that are harder to describe with notes or that will help to share information about the setting or context with other team members. When processing data, photos can be easily categorized and sorted for comparisons and serve as powerful communication tools.	Take photos whenever possible, especially to capture unique observations, something that is explained in an interview, and co-design session outputs.	Photos may be missing critical context, and situations may be misunderstood or misinterpreted. Technical problems with cameras may occur, such as batteries running out or user error in operating the devices.
Audio recording	Use a portable audio recorder to record the exact dialogue of an interaction and capture environmental sounds. Be aware of proximity of the recorder to the participants, and ambient noise in the area.	Use audio recording whenever possible during interviews. Use it for group interviews and co-design session debrief conversations if possible. It is less appropriate for observation or immersion activities.	Without visual information, audio recordings may be less useful than other methods. Considerable time or money will be needed to transcribe audio recordings. Technical problems may occur, such as batteries running out or user error in operating the recorder.
Video recording	Use a portable video camera to record an activity. Video recording can capture more data than is possible with other methods, combining dialogue, environmental sounds, and visuals. Video recording allows later review of real-time processes in detail.	Video is most useful for focus groups and observation activities.	Videos may lack the contextual data beyond the recording. Some individuals will feel less comfortable if they know they are being recorded (particularly with a conspicuous video recorder), and the quality of information collected may suffer. Technical problems may occur, such as batteries running out or user error in operating the devices.
Drawing	Sketch a scene, or illustrate something that is being described. Drawing can help to visualize a setting, such as whether people's or objects' locations change over time.	Use when photographs or video are not allowed or possible or when details such as obscured features may not be captured with photo or video: may be most relevant for observation activities or interviews with an additional team member.	The effectiveness of a drawing will depend on the drawer's comfort and skill.

Voice or video recordings

When conducting an interview or focus group or debriefing at a co-design session, you will ideally be able to use a voice or video recorder to record the session as it takes place, so that it may be reviewed after. Be sure to receive specific verbal or written consent from the participant(s) before starting any recording. Try to find a quiet place to hold the activity and put the recorder close to the participant. During focus groups, voice recorders may fail to pick up soft voices; two recorders in different locations may be necessary. Recording video of a focus group can also be helpful. Always have extra batteries on hand when planning to record.

Nowadays, digital voice recorders are small, relatively inexpensive and able to store dozens to hundreds of hours of audio: they should be a part of your research toolkit¹⁴. A complementary product is the Livescribe, a note taking and recording pen that allows you to sync the timing of your notes with a recording, more easily locating a specific part of the recording. Even if you are able to record the interaction, however, written notes are still

¹⁴ D-Lab researchers have had good experiences with the Olympus WS-801 voice recorder.

important, because the sound quality of the recording may be poor or equipment may fail. Additionally, it can take up to four hours to transcribe one hour of a recording (or a cost of \$1-3 per minute, if sent out to a transcription service), so you may use your written notes for initial analysis and later transcribe the most useful interviews, or search for specific quotes using the recordings. Of course, written notes will likely not capture all of the interview content, so transcription of recordings will be the best practice, particularly for processing techniques such as content analysis.

Photographs

Consider which photographs are important to try and capture throughout or after the interview. For example, having a clear headshot of an individual will be an effective tool for sharing a profile with the team, and having a picture of the interior or exterior of their home can help to set the context. If you have a clear sense of which photographs the team should be collecting, include a list of the photographs as part of the interview guide, with examples if possible (Portigal 2013, p. 42).



Capturing context in Cusco, Peru

Processing and Visualizing Information

Processing and visualizing the data collected, in all their forms, will be a critical and time-consuming step. Synthesis is often the hardest part of the research process, but careful processing will allow you to capitalize on your hard work and identify and elucidate the needs that you have seen, heard, and experienced. The goal of processing is to organize the research outputs and make sense of what you have learned. This leads to insights, identification of opportunities, and design requirements. From this stage, you can move into the next phase of the design process: beginning to think about how to address the needs you have identified and meet the design requirements you have targeted.

We share several methods for categorizing, synthesizing, and interpreting your data, but many additional methods exist and you should feel free to adapt these or create your own. Consider the desired outputs you identified earlier: the processing may be for your own internal use and inspiration or for a publicly shareable report. Through processing you will create a number of communication tools, such as stories of specific users or use cases with photos and quotes. These can be used to share what you have learned with stakeholders and team members.

At this stage, you are not just looking at what is said or heard; you have to interpret and intuit shades of meaning to discover

underlying motivations or needs (Kelley and Littman 2001, p. 38). Taking your direct quotes, photos, videos, and observations on human behavior (for example, when were people uncomfortable or pausing?), you will “mess around until the ‘Aha!’ moment” (N. Collins, personal interview, December 21, 2012). Seek out insights: revelations that allow you to see the design challenge in a new light, found by combining different research outputs. As you process your findings, push yourself to practice divergent thinking: rather than looking for the “low-hanging fruit”—tracking existing conditions and assumptions—look for what others before have missed. This is the phase where expansive and out-of-the-box thinking should be encouraged (Laurel 2003, 148–149). An example from the *Human Centered Design Toolkit* (IDEO 2011, p. 94) shows a combination of an observation and a quote from an interview to yield a new insight:

- *Observation:* Farmers rely on farming information from their friends and neighbors, though they know this knowledge is limited.
- *Quote:* “If the Privatized Extension Agent lived outside my area, I would want to visit his farm so I could see his production.”
- *Insight:* Trust building and knowledge sharing happens through “seeing is believing.”

Who participates

The team members who collected the data typically analyze the data, given appropriate background and experience, and additional team members who will be engaged with using the results may also benefit from distilling the data. However, it is best to have one person leading the process and reading through all of the information. Different people process information in different ways, so it may be challenging (or ineffective) to split up the analysis for a given method, segment or stakeholder group. The leader can provide oversight in the process so that different pieces of information can be combined to show an accurate conclusion. Be careful of biases when analyzing qualitative data: you may see what you want to see, and thus it is often useful to have another person review the data. It is helpful to engage users or partners in the process as well, at least for feedback, to be sure that the conclusions you are drawing are in line with what they understand. Give stakeholders an opportunity to comment on your findings.

Transcribing and processing data is very time consuming, and the team may need to add extra capacity or outsource some of the work. If your budget allows, strongly consider sending out your recordings for transcription. Good-quality services may charge \$1–\$3 per minute of recording.¹⁵

Methods for processing and visualizing data

A variety of processing methods exist, and you will do well to examine your results through the different lenses and compare your findings. While content analysis offers a rigorous and well-established process to analyze qualitative data, additional insights may result from using more free-form, visual exercises, such as affinity diagramming or mind mapping. Visual tools allow you to connect concepts and see the relationships between different sets of information. They may be used for a variety of purposes, such as demonstrating a sequence of events or comparing and contrasting concepts (Visocky O’Grady and Visocky O’Grady 2006, p. 82). Explore the commonalities, differences, and relationships between the information you have collected to look for themes.

Content analysis and coding

Content analysis enables you to identify and code keywords, phrases, and concepts within text and speech to highlight general themes. Researchers often use content analysis to analyze open-ended questions in surveys, interviews, and focus groups.

Coding is a process of sorting and defining scraps of collected data—observation notes, interview transcripts, memos, notes from relevant literature, photographs—that are relevant to your research question. By putting like-minded pieces together into data clumps, you start to create a framework (Glesne and Peshkin 1992, p. 152).

To begin, read through your data several times (you may also check transcriptions with recordings at this time) and identify the pieces of information or ideas that you are looking to pull out and compare: these will be your “codes.” This process is a form of analysis, so be aware of what you choose to focus on, what you are not focusing on (deeming less important), and why. Go back to your research questions and make sure you are pulling out information that will allow you to gain insights into the answers to these questions. After reading through your data, you can make your initial list of codes, but recognize that these will likely change and evolve as you do your analysis. Make use of nested codes for easier post-coding synthesis.

For example, in addition to knowing the type of water collection container used by participants, you may also wish to know the quantity, so your coding list could look like the following:

1. Type of water collection container
 - a. Jerrycan
 - i. 10 L
 - ii. 20 L
 - iii. 30 L
 - b. Bucket
 - c. Drum
 - i. 180 L
 - ii. 200 L

¹⁵ D-Lab has recently used Rev (<https://www.rev.com>) with good results.

This way, after applying codes to your data, you can quickly see not only how many people used each type of container but also how many people used a particular size of container. You may not necessarily know all of the containers or sizes before beginning to code, so this list will be adapted as you go along. This level of detail may not be necessary for each coding theme, so keep in mind what you hope to learn and share from the analysis.

Content analysis and coding can be done manually or with the aid of specific software (or with a combination of both). An overview of the process is also presented in *The Road to Results* (Morra and Rist 2009, 377–388). To code by hand, after identifying your list of codes, use the following steps:

1. Go through each note and transcript again and highlight parts that deal with each interview question or code (such as “frequency of trips to water source” or “mode of transport for collecting water”).
2. Read all of the highlighted data for this question or code.
3. Pull out major themes or topics that appear.
4. Record the frequency of each response.

As you proceed with the analysis, record illustrative quotations and summarize findings for the list of themes that you have pulled out. In addition to counting the frequency of the idea occurrence, also examine relationships among the concepts identified.

Data should remain linked to relevant demographic information as you code and process. This way, not only will you see the over-all results, but you can compare responses for a given segment,

such as rural female farmers versus peri-urban male farmers. You may have demographic codes as well as content-related codes, so that you can easily search or filter within a demographic group.

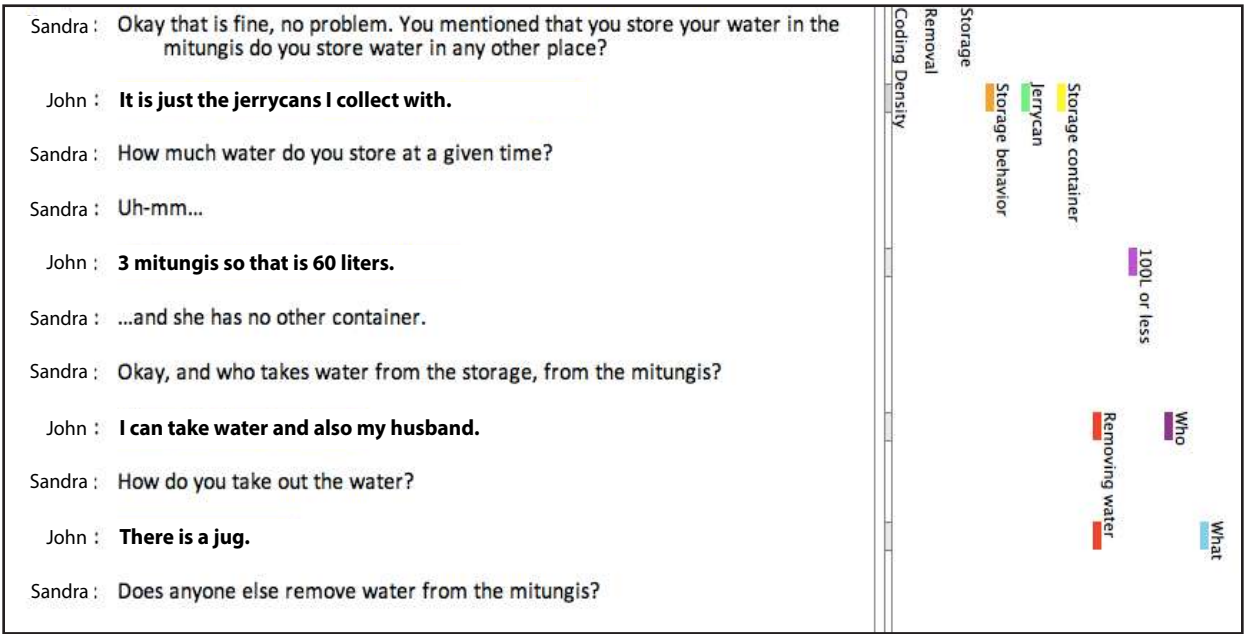
There are a number of computer-assisted qualitative data analysis software packages that can transcribe, organize and annotate textual and visual data such as RQDA (free) (Huang 2012), Qualpro, Hyerqual, NVivo, and HyperRESEARCH. You can also use Excel to organize your data. We have tried NVivo and found it to make the coding process easier and faster (particularly in comparing responses for a specific code), although it still has its challenges and limitations¹⁶ and costs approximately \$500–\$700 (education sector pricing).

An example of the content analysis and coding process is shown at the bottom of the page. The transcript was coded through the NVivo interface. Highlighted sections are coded in the categories shown on the right. You will notice that certain quotes have multiple codes, with varying levels of specificity.

The second image (next page) shows a summary of the codes for the “water storage and removal” category. This offers a quick look at the prevalence of responses for given codes: the number of sources, each corresponding to a different respondent, are shown, and the total number of references (with some transcripts having multiple quotes tagged for a given code: if, for example, they have a variety of storage containers).

16 At our time of use, the Mac beta version of the software lacked some processing features, and it was particularly time consuming to select nested codes from the master list for each selection of text to code.

Content analysis and coding example.



Example code summary.

Name	Sources	Refere...
▼ Water storage and remo...	0	0
▶ Changes	48	135
Children	9	9
Cleaning container	6	8
Current water in stor...	15	16
Drinking water storage	20	32
Other impressions	3	7
▶ Preferred storage	20	37
▶ Removing water	52	118
Storage behavior	35	52
▶ Storage container	53	113
▶ Storage location	1	1
Time to fill storage	3	3
Time water in storage...	8	10
▼ Total storage capacity	0	0
100L or less	4	4
101-200L	13	14
201-350L	8	8
351-500L	2	2
501-1000L	3	3
over 1000L	2	2

Affinity diagramming

Affinity diagramming is a visual processing technique used to discover relationships between ideas. The output can help to visualize idea patterns and connections, and turn data points into themes. Affinity diagramming has the following process (Kolko 2011, 76–78):

1. Write each piece of data (this could be a word, phrase, sentence, picture, or other discrete element) on a card or Post-It note,

coded with a reference to its source. (The small size adds portability and impermanence, making it easier to manipulate ideas.)

2. Once you have generated your cards, spread them out randomly on a surface.

3. Physically move the cards around, looking for patterns, connections, and groupings. This can be done as a group or individually. Options include the following:

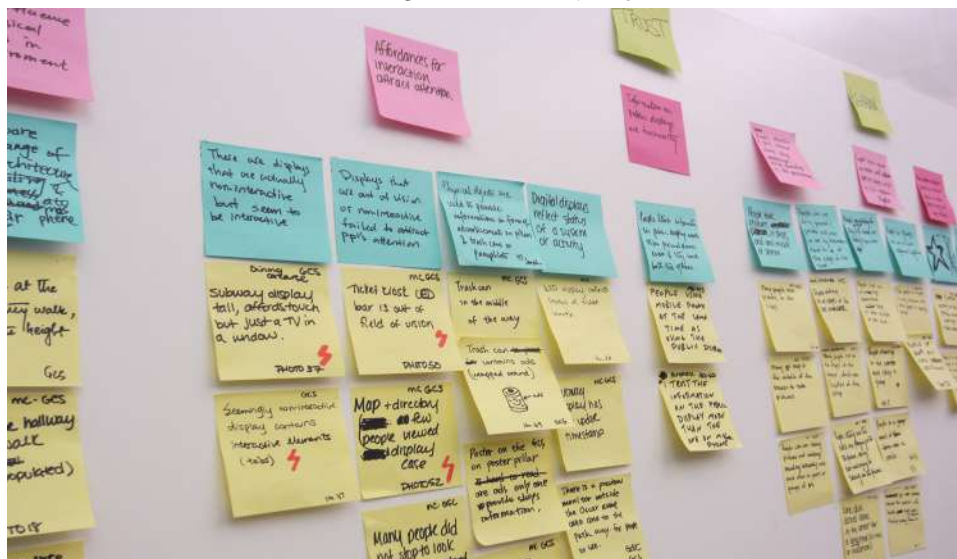
- a. Have several people do the exercise alone, and then combine results.
- b. Work as a group, and have each person verbally describe their intention or motivation for each move.
- c. As a group, silently move the cards.

Try not to attach labels to an idea grouping until all cards have been sorted. Delaying labeling makes it easier to disrupt groupings for alternate combinations. Try different sets of groupings, being sure to discuss and write down the results, and then create new sets of groups (d.school 2010, p. 14). If a grouping becomes too large (eight or more notes), consider breaking it up into a smaller and more defined group. See example at page bottom.

4. Once all of the data are sorted into groups, label each grouping with a word or phrase. Create a brief (2–3 sentence) description of the category, capturing the theme.

5. Input the results of the exercise into a document in outline format: include the group label, description, and pieces of data. The outline should help you to more easily communicate what you have done and learned. Themes may be ranked based on prominence and size. Consider why each theme matters: What are the implications? Have you reframed the problem in an interesting and thought-provoking way? (Kolko 2011, p. 73). Look for patterns and tensions between themes: Are they on the same level or talking about different kinds of things? (IDEO 2011, p. 98).

Post-It sorting. (Source: <http://jipinghe.com>)



Mind mapping

Mind maps¹⁷ (popularized by Tony Buzan; example below), sometimes called brainstorming maps, concept maps, or spider diagrams, are visual thinking tools that connect a variety of experiences and concepts and help to understand relationships between them. They are useful organizational and communication tools, consolidating information from different research sources. The process of mind mapping can expand psychological thinking capacity and ability to think laterally, stimulating imagination while creating strong associations. As you arrange a mind map, you start to group information, with linkages between the ideas conveying meaning.

Mind maps may be drawn by hand or made using a software program. The steps to create a mind map are as follows:

1. Choose a central idea. This is the starting point of your mind map and represents the topic you will explore.
2. Add branches to your map. These are key themes that will be explored in greater depth. You can continue to add more branches as they arise. Single words or simple phrases are most effective.

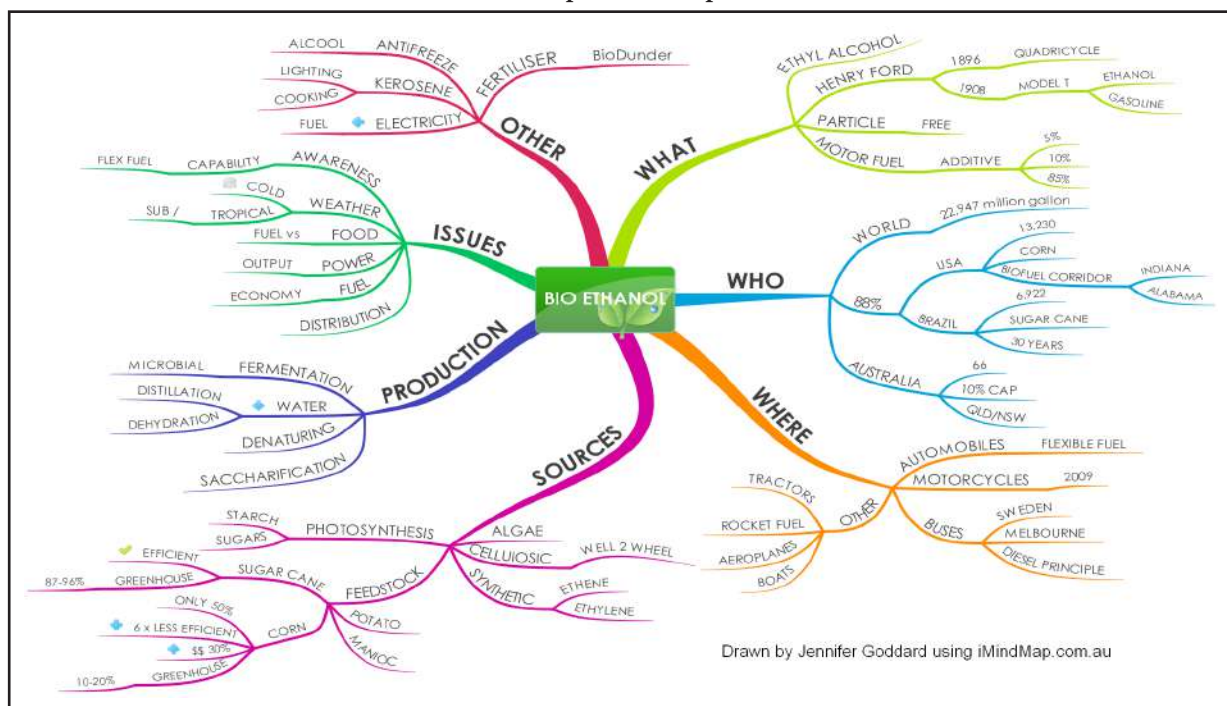
3. Create sub-branches that stem from the main branches to further expand on ideas and concepts. These sub-branches will also contain words that elaborate on the topic of the branch it stems from.

Color-coding branches and including images encourages whole-brain thinking. You can also draw lines to mark cross-linkages between information in different branches. As you connect pieces of information and use representative colors and shapes, you build an understanding of the patterns within the information and see how it all fits together.

To use a mind map as part of your data processing, consider making a map for each of several interviews or a map for data from each stakeholder group, and see if any patterns start to emerge. For data processing, mind maps are best used in combination with other methods, as they may result in new insights and ideas, but likely do not provide the rigor that may be required for your work.

¹⁷ http://www.mindtools.com/pages/article/newISS_01.htm;
<http://thinkbuzan.com/how-to-mind-map/>;
<http://www.novamind.com/mind-mapping/knowledge-management/>

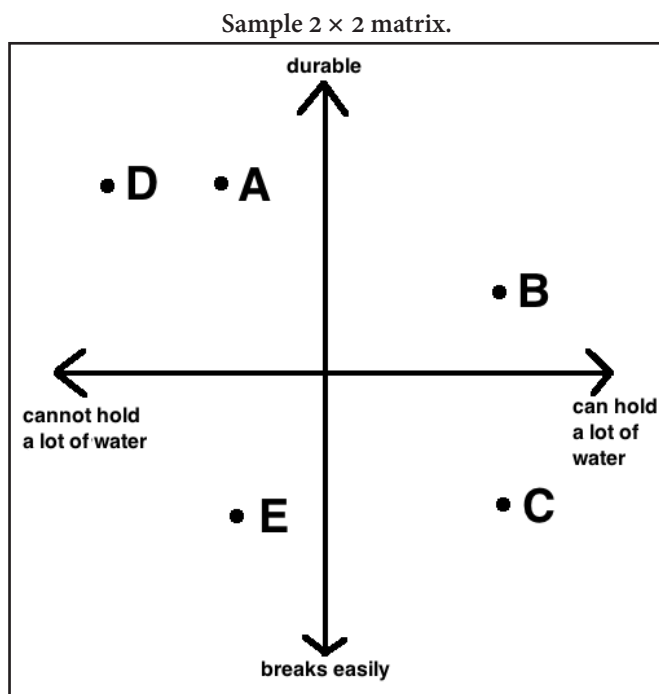
Sample mind map.



2 × 2 matrix creation

A 2 × 2 matrix is a tool that can be used to visually communicate relationships, telling a story that may be otherwise hard to express. It may reveal insights or areas that should be further explored. A common use of this tool is in representing a competitive landscape: a gap may signal a market opportunity or an area that others have realized is not worth pursuing. For example, a water pump company, having identified weight as an important product criterion, graphed competitors' total operational costs versus product weight on a 2 × 2 matrix to determine where they fit in (M. Gala, personal interview, October 7, 2014).

To use this method, pick two axes, draw a 2 × 2 matrix, and plot items within the map, with opposites on either end of each axis. Items could be products, objects, people, quotes, or any other category you would like to explore. You may need to try a combination of axes to get a meaningful and informative matrix; see which quadrants are more full or empty. When mapping a competitive landscape, for example, an empty quadrant could signal a market opportunity, or a bad idea. The discussion while trying to place items can also provide great value (d.school 2010, p. 19).



This 2 × 2 matrix was used to plot water collection technologies, based on feedback received on options shown in a focus group (with A-E corresponding to different products).

Journey mapping

Journey maps, inspired by customer journey maps or customer experience maps, are tools for understanding and improving user or stakeholder experiences. A *customer* journey map documents the customer experience from the customer's eyes, visually representing how a customer uses a product or service or how potential customers currently go through a shopping experience.

For our purposes, we can use the same idea to represent a relevant process or interaction for a stakeholder (who is not necessarily a customer). A journey map can be a very detailed or a higher-level representation depending on what is useful for the team. It can help to identify key points where the experience can be improved, be used as a tool to get feedback from various stakeholders on their understanding of the process (ultimately creating a shared understanding), and express a process in a highly visual way that can engage and motivate stakeholders. Through creating journey frameworks, new knowledge may be generated, gaps in understanding of a problem space and/or solvable design problems can be identified, and problems can be looked at in different ways. Models may be used to illustrate relationships, actions that occur during an activity, objects used to complete tasks, and movement of information (Kolko 2011, 86–87).

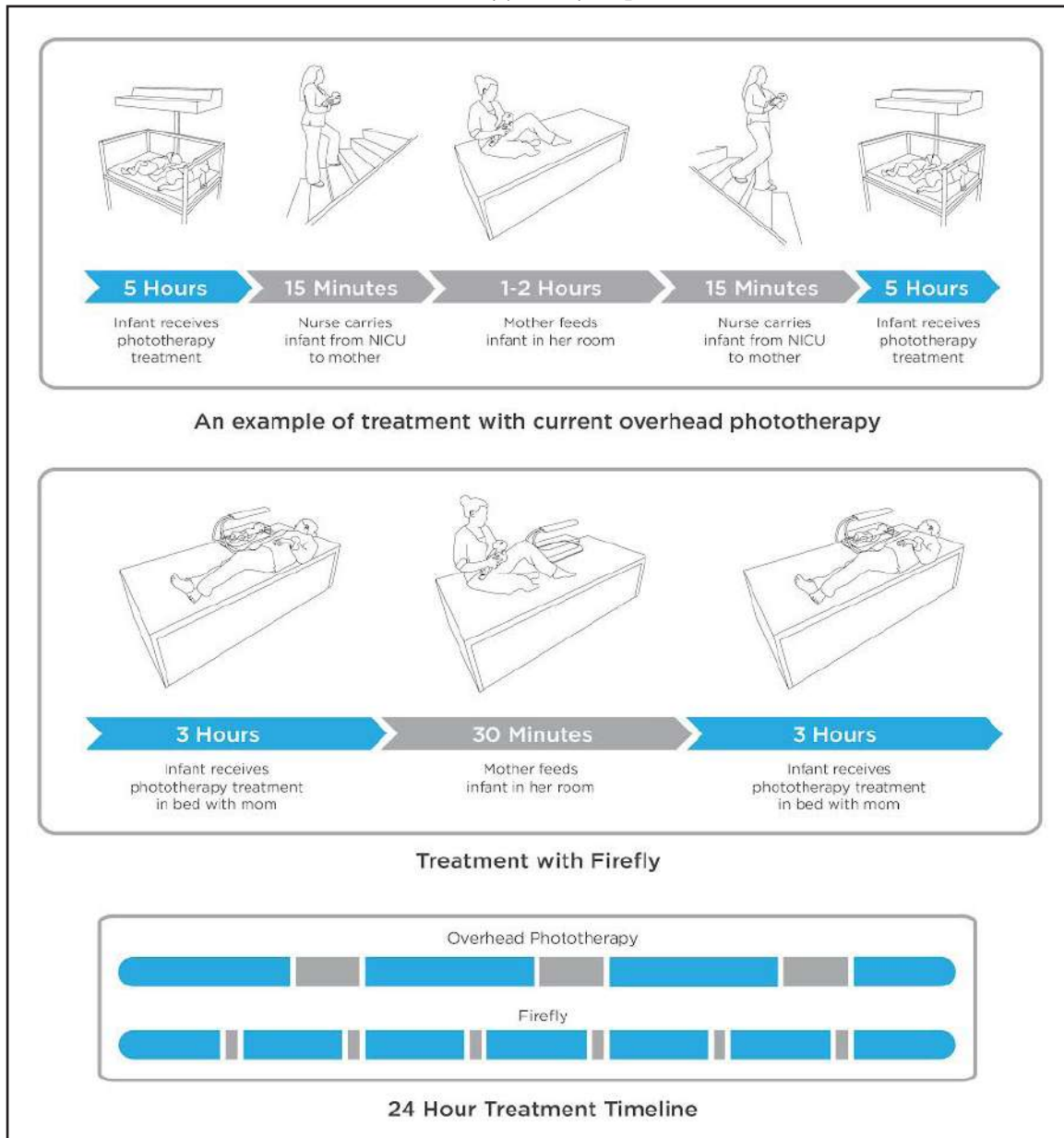
An example on the next page shows two journey maps created for the Firefly jaundice treatment technology by the Design that Matters team, comparing the typical process for jaundice treatment in developing countries (moving the baby between the treatment device, which is often difficult to move and is kept in one place, to the mother's room for breastfeeding) with the process using Firefly (keeping the new jaundice treatment device in the room with the mother, not requiring movement between different spaces).

At Design that Matters, journey maps are used to communicate and express key insights. They are important for communicating with different team members and stakeholders: the engineering and design teams can use a journey map to examine tradeoffs for given features; the tool can be used to inspire ideas for each step of the journey during brainstorming; it can be a logical check, shown to other experts or stakeholders for feedback; and it can be a powerful communication tool when building relationships with new partners (E. Johansen, personal correspondence, November 3, 2014).

While your journey map may have more or less detail as needed, some general guidelines to follow include (HM Government 2010):

- Clearly define the stakeholder group and the journey you are looking at.
- Write down all of the journey steps that a stakeholder goes through; use Post-It notes or another movable form. Arrange the steps in chronological order. (Ideally, you want to map 6–10 steps.)
- For each step, write down [what you know about] what your stakeholder is doing, thinking and feeling.
- For each step, note key touchpoints or interactions.
- Identify any steps where crucial decisions are made.
- Determine a visual representation of the process that will capture and clearly express the most important information.

Firefly journey map.



(Image provided by Design that Matters: <http://www.designthatmatters.org>)

Persona creation

Detailed customer profiles, or personas, are models used to describe users and their goals, attitudes, and behaviors. Profiles describe representative users (not a specific, recognizable individual but a compilation based on data about real people) from a segment of the target population and should be rich in detail and recognizable as “real people.” Each persona should have a photograph or drawing associated with it (“Persona Creation,” n.d.). An example is shown on the next page.

The purpose of creating personas is to keep the user(s) central to the team, with these profiles providing guidance through the design process and building empathy across the design team.

Personas can also help to communicate results and to explain a project to those who are unfamiliar with the work or the problem: describing the situation for a specific person can help make challenges more vivid and understandable.

Depending on the size and scope of your research, you may create a participant board for each individual you engage in your research. For a larger study, you may choose to highlight a few specific individuals (such as those that are representative or unusual in some way). Dedicate a physical space (board, sheet, window, etc.) to each participant and fill the space with photos and Post-It notes (with quotes or other pieces of data) from the interviews.

You can then look at the boards to find commonalities in the data or information that stands out as particularly interesting or important. Group the notes into affinity clusters, collaborating with a team if possible. Scan for patterns; encourage different points of view; and again, capture conversations (Kolko 2011, 71–72).

Case Study: Persona

The following example profile represents a typical water collector in rural Kenya and was developed to share with project funders who were less familiar with the context and collection behavior:



Damaris is a farmer (growing maize and beans for family consumption) and lives with her husband, her mother, and three children. She collects three 20 L jerrycans of water each day from a stream about 15 minutes away. She collects drinking water once a week from a spring that is 30 minutes away. To reach the stream and spring she travels on narrow, hilly, and rocky paths. She carries all of the containers to the source at a time, often collecting water at irregular times to attempt to find a shorter waiting time to fill her container. Once her containers are filled, she carries one back at a time. When she has the money she will pay for delivery of water, and she collects rainwater whenever possible, although her storage capacity is limited.

Identifying and prioritizing needs and opportunities

At this stage, opportunities are not product concepts or solutions; they identify potential problem areas and needs to focus on. The team should generate a list of significant opportunities—customer or market needs that can be pursued—and prioritize them based on what they have heard from users and customers. These opportunities can be presented as need statements; they are sometimes referred to as the Voice of the Customer. Remember that there are many types of needs.

After the research data has been translated into need statements, the statements should be grouped by level of generality and placed into a hierarchy of needs based on user and customer prioritization. Later in the design process, when designers will need to make tradeoffs, this hierarchy can help to guide decision making, identifying the options that serve the more important needs (Patnaik and Becker 1999, p. 39).

Case Study: Need Statements

Needs resulting from our water transport example include the following:

- Users need to be able to transport as much water at a time as possible.
- Users need to be able to transport water safely.
- Users need to be able to transport water over a variety of terrains.
- Users need affordable water transport options.

Defining design requirements

The information you have collected can also help to inform the design or system requirements for the solution(s) that you will pursue, and their corresponding engineering characteristics. Design requirements will include both quantitative and qualitative characteristics. Can the need statements from above be broken into more specific design requirements and customer attributes, and are there metrics for the criteria? For example, the statement “Users need to be able to transport water over a variety of terrains” can be expanded based on relevant information from stakeholders:

- The transport device cannot be punctured by branches.
- The transport device can be moved up and down hills.
- The transport device can be moved over rocky terrain.
- The transport device can rest stably on uneven terrain.

Additionally, we know that the statement “Users need to be able to transport as much water at a time as possible” has a minimum requirement of a 20 L capacity.

As possible, identify the ideal and minimum requirements for each characteristic, drawing from what you have heard from potential users and other stakeholders. Information on existing processes or practices, desired differences, availability of resources, and other relevant information can help to inform the design requirements for the solution. Prioritize the desired characteristics and features, assigning relative weights to show which preferences are most important. This will be critical information for the design team, as tradeoffs may need to be made during the design process.

As another example: When redesigning a chlorine dispenser in Kenya, “easy to refill” was determined to be an important customer need. To make this requirement more concrete, it was broken down into additional qualitative and quantitative specifications. One component of being easy to refill was that chlorine would not spill when refilling, and the critical design specification or engineering characteristic was determined to be the size of the cap on the container. Based on testing and experimentation, an ideal measurement of more than three inches in diameter was set.

Design requirements may change as more information is gained, but creating a document listing all of the needs and desired attributes, ways of measuring if the need is being met, critical design specifications, and ideal and acceptable measurements for the specification will be an extremely valuable tool. You may not have all of the information, but you can identify which areas to

further explore with users in order to collect this information. You may also have to be creative in how you measure if you are meeting a given need.

When thinking about design requirements, consider the whole ecosystem for the solution and not just the technical requirements. Supply, distribution, method of payment, and marketing may also be part of the set of needs and requirements.

.....

Having collected extensive information relating to your design challenge through multiple research methods, analyzed the data to develop communication tools, and identified insights, needs and design requirements, we hope that you are now ready for the next phase of the design process!

Conclusions

Congratulations! You have made it through this document, and we hope that the information provided has been helpful. If you have practiced the set of tools and approaches presented in the framework (or a variation that makes sense for your project and context), you have likely learned a lot, and still have a lot of work ahead of you. However, know that you have made an important step toward long-term positive impact. Investing time in early-stage design research with users and customers not only shows respect for your stakeholders, it puts you in a much stronger position to create something that can add significant value to people’s lives. Particularly in developing markets, a deep understanding of users and customers is critical for the success of new products and services. As you have likely observed, it is not as easy as designing a product that works well or looks good; consumers need products that fit their lives and create value.

This document offers a variety of methods for collecting information from users and stakeholders that will inform technology and venture design. You can utilize these methods again when doing user testing and piloting the product or service. We encourage you to explore other methods and approaches as well: try *something*, and you will learn.

This resource will continue to evolve. Please document what you have tried and learned, and share this information back so that others may build on our collective work. Thank you to those of you who have already given feedback and contributed content.

Good luck!

Thank you,
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Kendra Leith (kleith@mit.edu)

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Appendix A: Working With Interpreters

The importance of working with skilled and experienced interpreters cannot be understated, as the quality of information that is collected can be negatively impacted by bias, lack of accuracy in interpretation, lack of understanding of the research goals, and more. This document outlines D-Lab's process for selecting, hiring and working with interpreters in the field. Not all practices will be relevant for each project, so feel free to take what is most relevant and adapt to your specific project.

Steps for working with interpreters

- 1. Define research activities and project goals:** This is a critical step in the project management process and will later help you to identify your staffing needs.
- 2. Identify staffing requirements to achieve goals:** Do you require interpreters (people who can interpret the research team's questions from one language to another) or project assistants (people who can conduct the research independently of a research team member)? Which types of people do you need? This document focuses primarily on working with interpreters rather than project assistants, who require more preparation and training. Typically, interpreters accompany someone who does not speak the local language, whereas project assistants will directly conduct an interview. It is effective to use interpreters when the information needed is easily knowable, such as when asking questions of facts or non-sensitive personal experiences. It may be more difficult to employ interpreters in an interview when the subject is sensitive, or when the goal is to get below the surface and discuss values, motivation, and emotion. In these cases, breaking up the conversation for interpretation may make the flow less natural and the interviewee less comfortable. Instead, you may consider training the interpreter as a project assistant if they possess an appropriate background so that they may collect the information directly.
- 3. Put out a call for applicants:** Initiate the process by connecting with your community partner and inquiring about local interpreters. Ideally, community partners can connect you with vetted interpreters who are external to the organization. In some cases, a community partner may offer to translate for you, and while this may be convenient, in general it is better to find an external interpreter. There is less chance of bias with outside interpreters, and this will require fewer demands on your partners' time. If partners are unable to suggest or recommend interpreters, the D-Lab network and IDIN are also great places to start. It is worthwhile to pay an extra cost to work with an experienced, recommended interpreter if available. Even with recommendations, be sure to carry out your own vetting process to ensure there is a good fit.
 - Update interpreter job description for your project (*see suggested requirements below*). Send the job description to your partners and networks.
 - Requirements for interpreters
 - Fluent in English and main in-country language such as Kiswahili, Hindi, etc. and local language (a plus).
 - Previous interpreting experience
 - Capable of traveling in rural areas away from main roads, by car and on foot
 - Comfortable leading interactions with lower income people with humility and respect
 - Able to deal with basic accommodation such as limited electricity and possibility of non-running water
 - Resourceful and capable of adapting to unforeseen situations
 - Knowledgeable of and with established connection in communities is a plus
 - Interested in rural life and international development is a plus
 - *Capacity to drive is a plus*
 - Project assistants should also have:
 - Experience conducting interviews and facilitating focus groups (and other research activities, as relevant)
- 4. Narrow the list of applicants:** Partner or D-Lab staff members vet the interpreters and narrow down the pool to invite for interviews.
- 5. Interview applicants:** Introduce yourself briefly, including role, and have the applicant introduce him/herself. Introduce the project and the objectives. Types of questions you might ask during an interview for interpreters include:
 - Motivation:
 - How did you find out about this position?

- What was your motivation for applying?
 - Prior experience:
 - Do you have prior experience as a translator (written) or interpreter (oral), even if it is informal? *Probe a little and have them describe any lessons learned, challenges, etc.* If no experience, what do they foresee as challenges?
 - Do you have prior experience interviewing, volunteering, and working in rural areas? Could you describe your last field experience (or ask them to describe a specific field experience you see in their CV)? *Share what we expect our field experience will be like this time (including transport, hours, no cell phones during interviews, etc.), to give them a point of comparison and let them know what to expect.*
 - Languages spoken:
 - *You may want to test the language skills during the call if possible (and if you have the ability to test them). We have found this to be very helpful.*
 - Logistics and availability:
 - Explain project logistics (including lodging) and objectives
 - *Make explicit any weekends or trainings that are mandatory and check their availability/willingness to participate; give general overview of the calendar and work hours (e.g., they are free to go home on weekends, we will be working and dining together each day during the week; give specific times as examples)*
- 6. **Discuss interview results with team** and select interpreters
- 7. **Develop and send out contract for selected interpreters** (including pay, requirements, calendar, deliverables) and make sure that they agree to all requirements. Following this, D-Lab will commit to the contract.
- 8. **Send research materials** (research plan document, consent forms, interview guides, etc.) and any background information on the project to the interpreters
- 9. **Train the interpreters:** If working with an interpreter, make sure that you are both on the same page in terms of the role of the interpreter and the researcher(s) ahead of time. Adapt the D-Lab interpreter training (outlined below) to your project as needed. Recommended amounts of time to budget for each training module are included, but depending on the time available, you may need to condense the schedule. Consider which elements are critical for a 30-minute training, in the event of needing to train a new interpreter quickly.
 - Program and project orientation (½ day)
 - An interpreter should have a good understanding of the research goals and process, so that his/her work may support this work rather than create challenges. Take the time to go through the research design and questions before a formal interview situation.
 - D-Lab's approach to fieldwork (½ day). Highlight the following key points:
 - Stress that you do not want the interpreter to paraphrase or summarize responses or questions, but rather to interpret responses in language as close to the exact words as possible.
 - There may be times when the interpreter must change the wording of a question to make it more clear to the interviewee and use a more common phrasing – this is fine.
 - Reiterate that the goal is to ask non-leading, open-ended questions, and to not make assumptions about the interviewees or their answers. Include all information in a question or response, even if it does not seem explicitly relevant. Do not omit information.
 - During the research, the same questions may be repeated a number of times and similar answers may be repeated; it can be tempting for an interpreter to skip or speed through some questions. Interpreters will likely have much more familiarity with the research topic in the given context and may not see a need to ask a question they feel they can answer accurately. However, it is still critical to ask questions as if the answer is not known; you never know when a new and unexpected piece of information will appear. Also, being able to compare answers across a larger sample can allow you to draw more meaningful conclusions.
 - Be aware of non-verbal cues and translate the cues as necessary. (For example: “She said she has no problems with the current system but she looked uncomfortable.”)
 - Talk about expectations for the work and clarify any questions.
 - State the hours explicitly and confirm that they are comfortable with these requirements.

- Think about where interpreters live geographically and consider their commute and safety issues: either they stay with you **OR** you must arrange for safe transportation options. Aim to work with interpreters who live nearby whenever possible, as transport may add significant time and/or cost to your plan.
 - What do you hope to gain? What are your fears for this experience?
 - Have your interpreters complete the COUHES online training (Social and Behavioral Research course - ½ day), regardless of whether they will be conducting research on their own. It is good for the interpreters to be familiar with the principles of ethical human research. If internet access is an issue, D-Lab has an abbreviated presentation version of the training that may be given in the field by the research team.
 - Practice interviews (1-2 days)
 - Have the interpreters translate the questions (this could happen before the training). If you have more than one interpreter, have both translate some of the interview questions during the preparation period and compare the translations. They can discuss the best way to ask questions so that they are each asking in similar ways. You can also have someone else verify or attest that this is the correct translation.
 - Work with your interpreter to do a mock interview during your pilot testing – be sure that they have practiced delivering the questions before the formal research begins. This is very important, especially if your interpreter is going to conduct interviews as a project assistant.
 - Practice the facilitation of focus groups (1 day) and co-design sessions (1-2 days; typically done by a project assistant rather than an interpreter), if included in your research plan. Budget more time for these activities.
 - You may want to build the project context with the interpreters/project assistants through observation and meetings with key stakeholders (1-2 days).
 - You may also consider team-building activities (½-1 day) and technical training (up to 1-2 days) for a relevant technology device such as a solar lantern.
10. Continue to check in with your interpreters
- After the first day of research, debrief with your interpreters and determine which things you need to change. How are things going? What would they change? What additional training do the interpreters need? Are there any issues to address?
 - Keep lines of communication open! Check in with the interpreters regularly to see if they have questions or suggested changes, and to make sure that they are still doing well personally – energized, motivated and engaged.

Potential issues to be aware of:

- Be wary if a long statement by the respondent leads to a few words from the interpreter. If you are recording the interviews, have someone review the recordings and the accuracy of the translations.
- Do your best to know ahead of time which languages are spoken in your fieldwork areas – there may be tribal languages that are more widely spoken than English and the main local language, particularly in more rural areas. If this is the case, you may need to seek out interpreters with more specific language abilities – and prepare to be adaptable if the situation arises during the research.
- Consider what you will do if your interpreters get sick, or in the case of another emergency, which may prevent them from working. Try to have at least once backup interpreter who you can call on, and at a minimum, know where you may be able to find an interpreter on short notice. Sources of interpreters could include IDIN, local universities and local partners.

Appendix B: Sample Interview Questions

Objectives of the fieldwork:

- Needs assessment and user research:
 - Understand current practices around water transport, storage and treatment in Kenya (with approximately equal numbers of people who have and have not received/used the new technology)
 - Investigate potential needs around water transport, storage and treatment in Kenya
 - Understand quality of water that is being collected
- Gain inspiration for (re)design phase
- Understand design requirements for improved design

Overview of the interview questions:

- What are the general water needs of individuals for use at home, in their business, or their organization?
 - What are users' water usages and needs?
 - What are users' current water transport practices and needs?
 - What are users' current water storage practices and needs?
 - What are users' current water treatment practices and needs?
- What are the mechanisms for selecting and acquiring new technologies for the home, for a business, or in an organization?
- What and who typically drives the decisions for technology selection and acquisition?
- Who typically uses and maintains the new technologies?

Interview questions:

General

We'd like to learn more about your daily routine. Can you describe what you did yesterday? (*prompt to get details*)

Can you describe how you use water on a daily basis in your household?

(*Try to understand the full set of activities/tasks*)

Water collection/transport

Where does your household get water? Does your household get water from any other sources of water? If yes, what are those sources?

Which members of your household collect water? Who is the primary collector?

Can you tell us about your last trip to the water source?

How far is the source from your home? (*minutes*) Can you describe the route you use to reach the source? (*terrain*) How often do you go? (*Per day, week*) When do you collect water? How long does a complete trip to collect water take (*going and coming back*)?

What container(s) do you use? What are the sizes of the containers? How many containers do you take with you per trip? How are they transported? Can you show us your container(s)? (*Note: is it clear how much water is used per day or per week?*)

[If applicable] What is your preferred transport method? Why? What do you like best about it?

Does your water collection process change throughout the year?

(*e.g. source, mode of transport, container, etc.*)

Is there anything that you would change about how you collect and transport water?

Water storage

Where do you put your water after you return from collecting it? Are there any other locations where you store water? [If in someone's home:] Can you show me? (*Note: if not already stated, ask for the capacity of the tanks.*)

How much water do you store? (*Try to understand the trigger point for collecting more water*)

Who takes water from the storage container and how? (*Listen for: Is it transported again? Are children getting water? Is there recontamination?*)

If multiple storage methods, which method do you prefer? What do you like most about this storage option?

Is there anything you would change about how you store water?

Is there anything you would change about how you take your water from storage?

Water treatment

Do you treat your water?

If no...

Why?

If yes...

How/with what? When?

For which activities do you use the treated water? How much do you use per day? (*Note: If inputs are needed, how are they acquired? Is there a cost?*)

Why did you select this method over others? What do you like most about this method?

Is there anything you would change about how you treat your water?

General tech adoption

What is one of your favorite items in your house? Why?

Wrap-up

Do you have any questions for me?

Can we follow up with you if we have any other questions? (*If yes*) Can we get your contact information?

Appendix C: Sample Interview Debrief Guide

To be filled in as soon after the interview as possible, with interpreter and any other member of the research team present, if applicable.

Participant _____ Researchers/Interpreters _____

Describe the person you spoke to. *What do they do? What is their home environment like?*

When were they most animated?

Were there any surprises or 'aha' moments?

Did you hear connections to other interviews?

Do you have any insights about the interviewing process? What would you ask, or ask differently, in the next interview?

What features would you include in a design for this user?

In your notes:

Highlight any existing challenges or unmet needs that you heard.