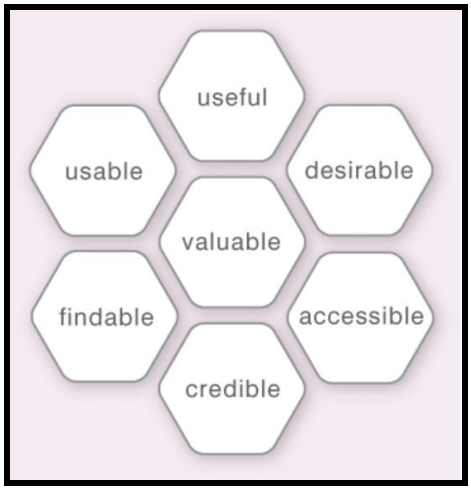
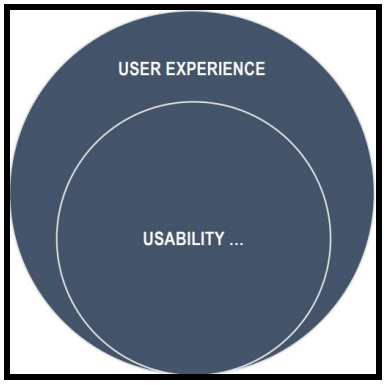
Lecture Notes:

- **Usability and User Experience:**
- **Usability** is the effectiveness, efficiency, and satisfaction with which users can achieve tasks in a particular environment of a product.
- **High usability means a system is:**
  - Easy to learn and remember.
  - Efficient
  - Visually pleasing and fun to use.
  - Quick to recover from errors.
- **Usability Goals:**
  - Functional
  - Effective
  - Efficient
  - Safe
  - Discoverable/Visible
  - Learnable/Expert
  - Memorable
- **User Experience Honeycomb:**

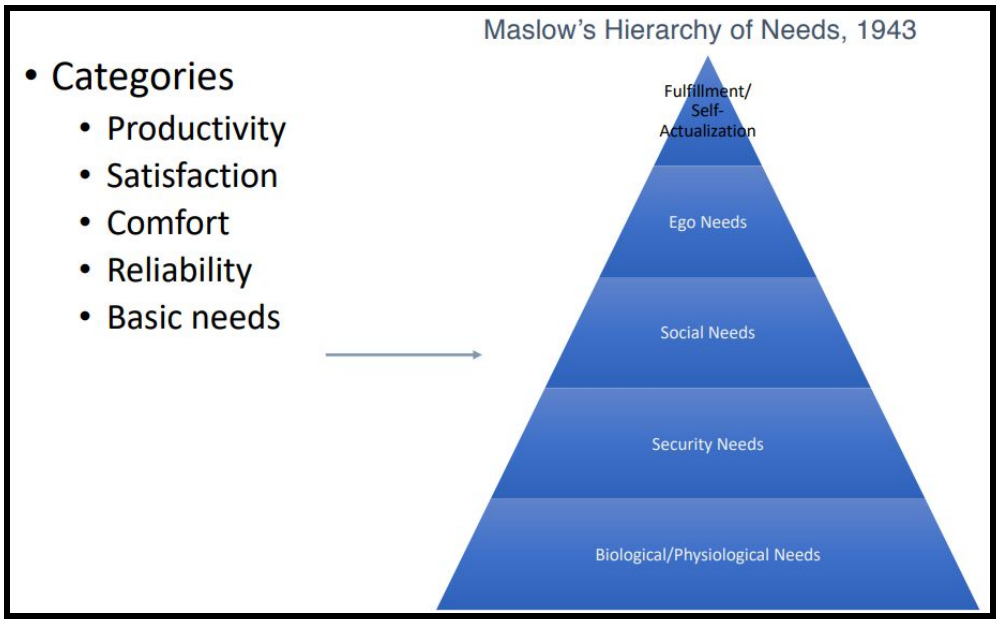


- **User Experience:**



- **Research:**
- **We need to research to:**
  - Understand context of use.
  - Uncover user needs & requirements.

  - Evaluate & compare designs.
  - Account for our own biases & assumptions.
- **Research Questions:**
  - Who
  - What
  - When
  - Where
  - Why
  - How
- **User Needs:**



- **Special Needs of User Group:**
  - Budgetary constraints
  - Time constraints
  - Information needs
  - Communication needs
  - Physical, emotional, psychological constraints
  - Facility with technology
  - Availability of technology
- **User Needs Questions:**
  - Who is the primary user?
  - What tasks do they now perform?
  - What tasks are desired?
  - How are the tasks learned?
  - Where are the tasks performed?
  - What is the relationship between user and data?
  - What other tools does the user have?
  - How do users communicate with each other?
  - How often are the tasks performed?
  - What are the (time) constraints on the task?
  - What happens when things go wrong?

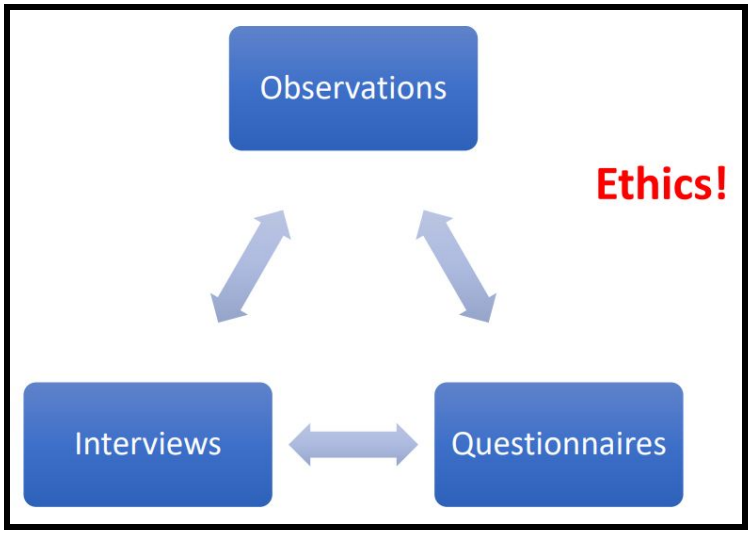
- **Users' Profiles:**
    - Demographics include:
        - Age
        - Gender
        - Family
        - Education
        - Job
        - HHI
        - Technology
        - Geography
        - Language
        - Culture
        - Preferences
    - Habit patterns include:
        - Where
        - When
        - How
        - Why
- **Research:**
- **Research Types:**
    1. Background vs Empirical:
        - **Background research** is literature review.
        - **Empirical research** is generating new knowledge from user observations & insights.
    2. Primary vs Secondary:
        - **Primary research** needs to have user contact.
        - **Secondary research** doesn't need to have new users involved as prior work suffices.
    3. Formative vs Summative:
        - **Formative research** leads to product design and development.
        - **Summative research** evaluates existing products & designs.
    4. Empirical vs Theoretical:
        - **Empirical research** is generating new knowledge from user observations & insights.
        - **Theoretical research** predicts outcomes based on theory, keystroke counts, design comparisons.
- **360 Degree View of Customer/User:**
- The **360-degree customer view** is the idea that companies can get a complete view of customers by aggregating data from the various touch points that a customer may use to contact a company to purchase products and receive service and support.
- It involves:
    - Field Studies
    - Interviews
    - Surveys
    - Diary studies
    - Focus groups
    - Card sorting
    - Usability testing

- Call centre
- Customer support emails
- User forums
- Analytics
- Web logs
- 3rd party review sites
- Sales reps

- **User Research & Evaluation Methods:**

Method	**Description**	**When**
User Observations, Field studies	What users really do in real life	Very early
Focus Groups	What users say they do to try and impress others	Very early
Surveys, Interviews	What users say they do	Anytime
Usability Experiments - Quantitative	What users do in the lab	Anytime
User Testing	What users do in controlled situations	Anytime
A/B Testing	What users really do with your product	To compare two design options
Expert Reviews	What experts predict users will do	Anytime

- **User Research:**



- **<u>Interviews:</u>**
- **Interviewer Challenges:**
  - Building trust
  - Following script, yet allowing digression
  - Avoiding repetition
  - Timekeeping
  - Capturing interview details (multiple methods)

- Multitasking: talking, listening, filtering, note taking
- Avoiding bias
- Listen! “Shut up” Dead air chicken

- **Getting Inside Your Users’ Heads – 9 Interview Tips:**
  1. Pinpoint issues and topics to explore.
  2. Choose the right participants.
  3. Get close to users, or internal staff close to users.
  4. Choose a medium – in person, phone, online.
  5. Invite teammates to listen and help capture data.
  6. Structured but conversational.
  7. Let participants lead the conversation.
  8. Record your interview.
  9. Share insights with teammates.
- **Interview Questions:**
  - Question types:
    - **Closed questions** have a predetermined answer format. E.g. Yes or no.
    - **Open questions** do not have a predetermined format.
  - Avoid these types of interview question:
    i. Long questions.
    ii. Compound sentences (split them into two).
    iii. Jargon and language that the interviewee may not understand.
    iv. Leading questions that make assumptions.
    v. Unconscious biases.
- **Components of an Interview:**
  - Introduction:
    - Introduce yourself.
    - Explain the goals of the interview- context, motivation, importance.
    - Reassure about the ethical issues.
    - Ask to record.
    - Present an informed consent form.
  - Warm-up:
    - Make interviewee feel important.
    - Make first questions easy & non-threatening.
  - Main body:
    - Present questions in a logical order.
    - Follow ideas of interviewee BUT keep interviewee on track.
  - Cool-off period:
    - Include a few easy questions to defuse tension at the end.
  - Wrap-up or Closure:
    - Thank the interviewee.
    - Signal the end.
    - Debrief (This is optional.)
- **Recording the Interview:**
  - Note taking on paper:
    - Easy tech, fast to analyze, not too intrusive.
    - Difficult to talk and write, so have a two person team.
  - Audio recording:

        - Good detail capture.
        - Problems with poor audio quality.
        - The interviewee may be uncomfortable.
    - Video recording:
        - Great detail capture.
        - Higher technical complexity so there might be more analysis time.
        - Intrusive, possible impact on interview, confidentiality.
- **Summary of "Semi Structured Interviewing for UCD" in interactions magazine:**
    - Goal:
        - Elicit expert knowledge as foundation for design, using natural settings & real work activities.
    - Challenges:
        - Requires guided tour around the domain without translation of terminology and over simplification.
        - Build an understanding of work objects, categories, sub-categories, and functional relationships.
        - Some expert knowledge may be subconscious to the expert.
    - Methods:
        - Questions are object identification and relationships.
        - Guided Tours, Think-Aloud during problem solving, Guided Recall of recorded problem solving activity.
        - Iterative Collaborative Development of Work Model represented in Outlines, Work Scenarios, Flow Charts & Object Glossaries.
- **Ethics:**
    - Basic principles:
        - Respect for participants.
        - Do not harm.
        - Informed consent.
        - Voluntary participation.
        - Right to privacy.
    - Consent forms:
        - Adults (> 18 years old) can give consent.
        - Explanation of study and purpose.
        - Ability to withdraw at any time.
        - Anonymity, confidentiality, privacy.
- **<u>Questionnaires/Surveys:</u>**
- **7 Tips for Good Survey Questions:**
    1. Questions interpreted in a consistent manner.
    2. Questions people are willing to answer.
    3. Questions answered truthfully.
    4. Questions with a known answer.
    5. Avoid double questions.
    6. Avoid biased terms or wording.
    7. Pretest your questions.

- **Common Mistakes of Questionnaires:**

1. How many mobile phones do you own?
   0-1 1-2 2-4 4-8

2. The iphone is a revolutionary device with an amazing set of features. Indicate how much you like it on a scale of 1 to 5: 1 2 3 4 5

3. Which do you prefer: being able to call people while riding the subway, or having to wait?

4. When did you last visit a doctor?
   Always Sometimes Never

- **Questions Formats:**

Check boxes and ranges

- Please choose: Yes / No / Not sure
- Age: 0-20 21-30 31-40 41-50 51-60 71+

Likert scales

Strongly agree Agree Disagree Strongly disagree

Strongly agree Agree Undecided Disagree Strongly disagree

Semantic differential scales

Never Very Often

- Questions people cannot answer are bad and useless.
  E.g. “How many hours did you spend preparing meals yesterday?” is a bad question. A better way of phrasing the question is:

We would like you to think about the events of yesterday and write an approximate schedule of how you spent your time. Begin with your waking time and put down the activity that took up the most time in each half-hour period.

7:00 AM – 7:30 AM _____

7:30 AM – 8:00 AM _____

8:00 AM – 8:30 AM _____

...

- **Questionnaires can measure:**

- Data about users:
    - Demographic information
    - Personality traits
    - Cognitive abilities
- Prior knowledge:
    - Task domain
    - Technical expertise
- Attitudes and experiences:
    - User satisfaction or frustration
    - Other perceptions of user experience
- **Questionnaires cannot measure:**
    - How fast the user can accomplish tasks.
    - Where the user will make errors.
    - What command names to use.
    - How to organize items in the menu.
    - Which colors enhance visibility.
    - How a user learns commands.
    - **Note:** Questionnaires and interviews cannot assess information that the user is unaware of.
- **Summary of "Designing Useful and Usable Questionnaires.":**
    - Clear purpose & objective for each question.
    - Persuasion & trustworthy to participants.
      I.e. What for, how used, confidentiality, benefits.
    - Efficiency for participants & researchers.
    - Questions – clarity, wording, order, narrow focus.
    - Bias – questions, responses, scales, results.
    - Plan for analysis and for reporting results.
    - Iterate & test both questions & media.
- **Comparing Questionnaires & Interviews:**

	Questionnaires/Surveys	**Interviews**
Positive	- Easier to have a large sample. - More normalized data. - More quantitative.	- Allows for clarification, confirmation, and guidance. - Same-time ethnographic observation study (if interviewed in environment). - Can have multiple paths in an interview.
Negative	- May get junk data due to ambiguities and apathy (why questions need to be written so carefully). - More detailed planning. - Distribution and return can be a headache. - Hard to get qualitative data.	- Difficult to have large samples. - Requires more time to conduct interviews. - Can be more difficult to scribe answers. - More difficult analysis of open ended data

- **Bias:**
- **Confirmation bias:** Signals the desired response.
- **Unanswerable bias:** Asks about unknown or unreliable information.
- **Social acceptance bias:** Socially desirable or undesirable topics.

- **Moderator bias:** Participants try to please the moderator rather than be honest.
- **Observations:**
    - Direct:
        - Observe users at the moment of accomplishing tasks.
        - Varies with Context & Control.
        - Potential sources include:
            - Naturalistic observations
            - Contextual inquiry
            - Participatory
            - Scripted task observation
            - Laboratory experiments
    - Indirect:
        - Analyze documents or records of past activity.
        - Potential sources include:
            - Diaries
            - Usage logs
            - Artifacts
- **Summary of "Participant Observation" in Qualitative Research Methods: A Data Collector's Field Guide:**
    - Goal:
        - Discover unanticipated truths & confirm expectations.
    - Challenges:
        - Choosing appropriate people, place, time.
        - Not interfering with normal activity during observation.
        - Taking notes briefly, concisely, quickly, later expanding notes.
        - Taking unbiased objective notes.
    - Example: Observing a street corner scene:
        - Subjective: "Dirty and overcrowded."
        - Objective: "Garbage everywhere and so many people around that it was difficult to move.

Reading Notes:

1. **Getting Inside Your Users' Heads: 9 Interviewing Tips:**
    - **Planning and Preparing for Interviews:**
    - **Pinpoint the issues and topics that you need to explore:**
    - Ask your team, your management, and other project stakeholders for their input on the types of people to whom you should be talking and the questions you should ask.
    - Crafting a single statement that encapsulates your interview objectives will help you and your teammates to stay focused and make good decisions about which questions to cover. You should limit the number of topic areas that you'll be covering, so you can explore each topic in depth without worrying about going over schedule. This is especially true if you are new to a subject area or your goal is to give research participants the opportunity to provide rich, unique insights.
    - **Choose the right participants:**
    - Create a separate set of recruiting criteria for each distinct type of user that " you want to include in your study.

- Define the characteristics of your most important types of users. For example, if you need usability feedback on an app for caregivers, your key users might be adult children, home health workers, and general nursing practitioners.
- You should talk with people who either potentially would or actually do use your product.
- Use the recruiting process as an opportunity to build trust and rapport with participants. Do not hide any logistical details from anyone who is taking part in the study.
- **Talk with internal staff who deal directly with users:**
- By talking with internal staff while planning your interviews, you can learn how to group different types of users and what issues you should discuss with participants. This leads to your asking participants better questions and having more productive interviews.
- These conversations will give you a more realistic understanding of the product and how users react to it. They will also provide a framework that will help you to absorb and organize the knowledge that you'll gain as you carry out your interviews and analyze your findings.
- **Consider whether your interviews should be in person, by phone, or online:**
- While it is always best to talk with users in their natural surroundings, this approach can be costly. Consider alternative ways of interviewing people.
- **Invite your teammates to listen in and help you to capture data:**
- Observers provide unique and valuable perspectives on the issues that users bring up, especially when they are from different parts of your organization.
- Furthermore, your teammates can take notes on what participants are saying, allowing you to concentrate on interviewing the participants.
- **<u>Conducting Interviews:</u>**
- **Keep your interviews structured, but conversational:**
- The best interviews are guided conversations, never rigid Q&A sessions.
- Try to learn as much as you can about participants before you meet them. This knowledge will help you build a rapport with them, as well as to think of unique questions that you can ask them.
- To help you stay on track, create a discussion guide that is based on your objectives, with a list of topics that you want to cover during each interview.
- Each interview should follow an hourglass format. At the beginning of the interview, focus on building trust and rapport with the participant. Start the interview by explaining its purpose, the types of questions you'll be asking, and what you'll do with the results. Find out whether the participant has any questions about the overall interview. Ask general questions at the beginning, then more detailed questions once the conversation gets rolling, and finally, taper off to general questions at the end.
- Phrase your questions as open-ended questions, focusing on the here and now, not on what a person would like or might do in the future. Set up your interview session to ensure that you collect both quantitative and qualitative information. Above all, don't worry about perfection, just connect with participants by being genuine, making eye contact, using body language, and by listening well.
- **Let the participant lead the conversation:**

- If you've recruited the right types of users, have established good rapport, and are asking great questions, your participants will likely take the conversation into unanticipated areas.
- As long as the conversation serves your research objectives, let them talk. Your results will be much richer. A sign of a good interview is when the participant answers your questions without your having to ask them.
- People are usually flattered that you have sought them out for their special knowledge and, if they trust you, they will share what they can with you. Your goal should be to learn something unique and valuable from each person who you interview, even when you've reached the point where the information is becoming repetitive. When things do become repetitive, that is your cue that you've accomplished your mission and can end your study.
- **Record your interviews:**
- Whenever possible, record your interview sessions so you can share the best snippets with your entire team and the rest of your organization. These recordings provide physical proof of why talking with users is a worthwhile investment.
- **Share insights with teammates:**
- Once your interviews are complete, invite all of the people who observed them to a meeting, during which you can discuss your new insights and their implications.
- After each interview, spend about half an hour debriefing your team about what they've just observed.

2. **Field Visits: Learning from Observation:**
   - **What Are Field Visits:**
   - **Field visits** are going out of the office to meet people where they're most comfortable. Field visits move research into offices, homes, shops, cars, public transportation, hospitals, factories, gyms, and any place important to your target audience. The goal of field visits is to understand both how and why people do what they do.
   - Field visits give you information about the environment people live in and work in that you couldn't otherwise get. It helps you interpret their lives within the context of that environment and not as they recall their lives while sitting in a lab or conference room. It uncovers what people really do, how they define what is actually valuable to them, and what will compete with your product for their time and attention. In experiencing the world alongside them, you can better understand the problems people face and how your product can fit into their lives.
   - This basic research method involves visiting people once or multiple times, asking them questions, and often following them as they go about their normal activities.
   - **How Are Field Visits Used:**
   - Most projects begin with an idea about an initial problem or situation and some rough ideas about how to respond to it. Field visits clarify and focus these ideas by giving concrete insights into the situation, what the situation entails, and how people cope with it.
   - However, field visits are also useful in between development cycles or as part of a redesign. In those situations, they can tell you how people are using the product, when they're using it, and what they're using it for. This serves as a check of your initial assumptions, a way to evaluate the suitability of the product

to its actual use, and a method of discovering areas into which the product can naturally expand.

- Field visits typically have one or more of these outcomes:
    1. Specifying concrete details about actual use. Researchers often observe how people work and play in order to help write concrete requirements that engineers can implement. This kind of project is often called **requirements gathering**. It's important to note that requirements are produced through skilled analysis and interpretation of research data.
    2. Surfacing hidden understandings. In everyday life, people have experiences that they can't recall or explain abstractly when asked. Engaging with people in context helps us not just identify those moments of hard-to-explain emotions and activities, but also elicit discussion and description of how tools and technologies play a role in social relationships and internal states.
    3. Challenging assumptions. One of the roles of the user researcher is to challenge incorrect, and sometimes insulting, assumptions about the intelligence, competence, and dignity of users, who are, after all, just ordinary people trying to use your product to accomplish their goals. We challenge these assumptions not just because it's the right thing to do, but also because our job is to help make more useful, more desirable, and more usable products. Informed empathy lies at the heart of better design.
- **Selecting Participants:**
- Pick people like the ones you think will want to use your product. Maybe they use the product already. Maybe they use a competitor's product. Maybe the people who use the product are different from the people who buy the product, so there are actually multiple important groups to consider. Regardless, your participants should resemble the people who will eventually use and/or purchase your product.
- You should specify this target audience in as much detail as you can, concentrating on their behavior:
    1. What is their demographic makeup?
    2. What activities are most significant to their relationship with the product?
    3. What tools (digital and otherwise) do they regularly use in those activities?
    4. Are there tools they must occasionally use to solve specific problems?
    5. How do they use them?
- There are two main strategies for selecting sites and people for observation. Your choice of strategy will reflect the priority of your project. If your goal is to develop a wide range of new opportunities for design, you may want to follow the **extreme or lead user strategy**. If your goal is to solve a specific problem, you may want to follow the **typical user strategy**.
- **Typical User Strategy:**
- After specifying your target audience, identify the most important activities and groups of customers. Your product may appeal to a varied group of people, but there are only going to be a couple of key target markets defined by the factors you earlier identified. In fact, there may be only one. Focus your research on participants who share the most common key factors until you feel that you know

what there is to know about their behavior, and then move on to secondary markets

- **Extreme/Lead User Strategy:**
- After identifying a domain of interest and specifying the possible audiences, ensure as much diversity in key factors as possible. Instead of looking for typical users, look for people who are extreme in some way, such as extremely enthusiastic users, extremely negative or resistant nonusers, or **lead users**, people who are ahead of most in adopting a new technology.
- You may find that extreme users make visible behaviors or desires that are present in users that are more typical but are harder to see. You may also find that widely divergent participants may suggest a broader set of opportunities than a narrow, though deep, study of one particular group.
- **Recruiting:**
- Once you have your profile, you need to find people who match it.
- Decide how many people you want to visit. The number will depend on how much time you have allocated to the research and the resources available. If you find that you have not met the goals of the research or you don't feel comfortable with the results of the first round, schedule a second round.
- **Scheduling:**
- After finding some candidates, you need to schedule time to visit them. Observational research sessions can last from a couple of hours to multiple full workdays, depending on the length of the tasks and how much ancillary information you'll be collecting. The most important criterion in scheduling is that the people need to be doing the kinds of activity you're going to study while you're observing them.
- If you are interested in complex activities achieved by multiple people working together, it is a good idea to schedule multiple days of visits, with a team of more than two people. That way, you get a more complete perspective on how people's jobs fit together. During the day, you should also make time at least once to meet with other people on your team to share what you're seeing and discuss any emerging insights into patterns of behavior.
- Since the research is going to be on-site, give the participants some idea of what to expect when you arrive. Before you show up, tell them the general goals of the research, how long it will take, the equipment you will use, and what kinds of activities you want to observe. You don't have to be specific (in fact, leaving some specifics out can produce a more spontaneous response), but they should have a good idea of what you are asking of them. That way, you minimize the chance of unwelcome surprises for both you and the participants. You will need to get consent from all participants before taking photographs or video of them, so it's an especially good idea to clarify your documentation plans ahead of time. Finally, ask them not to prepare for your arrival at all. People tend to tidy up their living and working space when a stranger arrives, so make it clear that it's important for you to see their daily environment.
- When studying people in office environments, it's often necessary to get releases and to sign nondisclosure agreements. Sometimes it's possible to do stealth research under the promise of anonymity, but this approach brings real ethical and pragmatic problems. When you do not tell people you are a researcher, you are essentially spying on them. You are violating their privacy.

- Pragmatically, field visits are hard to overlook. People are unlikely to ignore a stranger taking photos, waving around a video camera, or obsessively taking notes. If there's any doubt that your visit might come as a surprise, ask the people you've scheduled to tell everyone who needs to know about your arrival and to get you all the forms you need to have as early as possible.
- Remember, research participants are doing you a favor by welcoming you into their homes and workplaces.
- **Learn the Domain:**
- In order to be able to understand what people are doing and to properly analyze your data, you need to be familiar with what they do. This means getting to know the terminology, the tools, and the techniques that they are likely to be using in their work. You don't have to know all the details of their job, but you should be somewhat familiar with the domain.
- If you know nothing about an activity or domain, before you visit you'll probably want to start with some preliminary research.
- If possible, try a typical task yourself. This is the most basic form of participant observation.
- In general, it's a good idea to start with a **beginner's mind**, to act as if you are just coming to a topic or audience, even if you think it's very familiar to you. That way, you can make yourself more sensitive to details you might otherwise take for granted.
- **Make Your Expectations Explicit:**
- As part of your preparation, get clear about your expectations. Write down how and when you expect people to do things that are important to your product, and what attitudes you expect they will have toward certain elements. You can do this with other members of the development team, asking them to profile the specific actions you expect people to take.
- When you're in the field, keep these scenarios in mind. Use the situations where what you see doesn't match your expectations to trigger more investigation.
- **Preparing for the Visit:**
- In addition to all the research-related preparation, do these things just because you're leaving the comfort of your office:
    1. Make a list of everything you're going to bring.
    2. Make sure you have twice as many media releases and/or consent forms as you expect to need.
    3. Put everything you need to make and track incentive payments in one container that you can carry with you inconspicuously, like a large envelope or small bag.
    4. Know how to operate your equipment.
    5. Have more than enough supplies.
    6. Plan for meal breaks and debrief time.
- **Establishing a Relationship:**
- If you are going to be talking with participants, one of the most important activities in observation is establishing a rapport with them. **Rapport** here means a comfortable working relationship. It doesn't require friendship, but it does mean that people should not be afraid of you or hostile to your presence. If you sense fear or hostility, try to figure out the cause. You may need to clear up some misunderstandings about your role.

- Since you want to observe people acting naturally, it helps to structure your visit with them in a way that helps people understand what you're doing there.
- **Observational research/contextual inquiry** tends to follow two main patterns:
    1. The **master/apprentice model** introduces you as the apprentice and the person you're observing as the master. You learn his or her craft by watching. Occasionally, the apprentice can ask a question or the master can explain a key point, but the master's primary role is to do his or her job, narrating what he or she is doing while doing it, without having to think about it or explain why. This keeps the "master craftsman" focused on details, avoiding the generalizations. Generalizations may gloss over key details that are crucial to understanding how people actually live and work.
    2. **Partnership** extends the master/apprentice model. The interviewer partners with the participant in discovering the details of work. The partner asks questions in order to surface problems and ways of working. The participant is occasionally invited to step back and consider the reasons for his or her behavior. This discussion can make the participant aware of the elements of his or her work that are normally invisible to him or her. Although this can potentially alter the participant's behavior, it can also provide critical information.
- There are also several relationships to avoid:
    1. The **interviewer/interviewee**. Normally, an interviewer's questions prompt an interviewee to reveal information. Interviewees won't reveal details unless specifically asked. That's not desirable for site visits. You want the participant's work and thoughts to drive the interview. When you find yourself acting as a journalist, prompting the participant before he or she says something, take a deep breath and give the person you're watching time to act or talk.
    2. The **expert/novice**. Although you may be the expert in design, the participants are experts in their own domain. It should be clear that the goal is not to solve the problems then and there, but to know what the problems are and how they solve them on their own. If the participant asks for your expert advice, use nondirected interviewing techniques to reverse the question: for example, "How would you expect it to act?"
    3. Similarly, you are not the complaint department. While of course you are interested in hearing about frustrations and difficulties with different products, giving too much time to them can turn your observation session into tech support. Depending on your relationship to the client and participant, you could also be getting yourself into trouble.
    4. Don't be a guest. Your comfort should not be the focus of attention. You are there to understand how they do their work, not to enjoy their hospitality. But do be flexible. If good manners dictate acting as a guest for the first few minutes of your visit, then do so to make the participants comfortable. After that, quickly encourage them to get on with their work.
    5. Another role to avoid is big brother. You are not there to evaluate or criticize the performance of the people who you are observing. Try to make that as clear as possible. If they feel that way, then they're not likely to behave as usual. Moreover, if participation in your research is at the

request of company management, it can seem that your presence is just a sneaky way to check on them. Emphasize clearly that you are not there to evaluate their performance. If possible, get permission from management to contact and schedule people yourself rather than having the request come as a demand from above.

- **<u>Structuring Your Time:</u>**
- There are three basic components to a field visit:
    1. **Introduction:**
        - Schedule time for an introduction and warm-up conversation. These are moments for the participant and the observer to get comfortable with each other and to set up expectations for the observation. This is the time to get all the nondisclosure and consent forms signed, describe the project in broad detail, and set up the equipment.
        - Make sure that the image and sound recording is good, and then don't fuss with the equipment again until the interview is over, since it'll just distract everyone.
        - If you're taking notes, show the participant your notebook and explain what kinds of things you'll be writing down. You'll probably make people a little nervous if you just whip out a notebook and start scribbling at top speed without any warning.
        - Describe roughly what you are interested in learning more about, emphasizing your role as an observer and learner. Remind the participant to narrate what he or she is doing and not go for deep explanations.
        - During the introductory conversation, you may want to ask some general questions to gain an understanding of who the person is, what his or her job is, and what tasks he or she is going to be doing. Ask the participant to describe the last time he or she performed the activity at hand.
        - **Note:** If you are there to shadow people as they work, you may not need or want to bring your own schedule to your visit.
    2. **Main observation period:**
        - The main observation period is where you are following people as they do some work. This phase should comprise at least two-thirds of the visit.
        - Most of the time should be spent observing what the participants are doing, what tools they are using, and how they are using them.
        - Begin by asking them to give a running description of what they're doing, as to an apprentice. That means just enough to tell the apprentice what's going on, but not enough to interrupt the flow of the work, and then tell them to start working. As an apprentice, you may occasionally ask for explanations, clarifications, or walkthroughs of actions, but try to stay unobtrusive. Write down your questions and save them for a quiet moment.
    3. **Wrap-up:**

    - When either the task has ended or time is up, the main interview period is over. An immediate follow-up interview with in-depth questions can clarify a lot.
    - Certain situations may not have been appropriate to interrupt, whereas others may have brought up questions that would have interrupted the task flow. As much as possible, ask these while the participant's memory is still fresh.
    - You can start by going over what you learned that day.
    - If there are too many questions for the time allotted, or if they're too involved, schedule another meeting to clarify them and schedule it quickly, generally within one or two days of the initial interview, since people's memories fade quickly.
    - Wrap up the interview by asking the participant about the observation experience from his or her perspective.

- **What to Look For:**
- It's rare to enter any research project without some clear questions to answer. However, you don't want to get so focused on answering your questions that you miss what people are trying to tell you.
- It can be easy to feel that because you're not seeing what you expect, there's nothing useful to see. Other times, you just feel overwhelmed by all the new activities happening around you. You end up feeling like no matter what you look at, you're missing some crucial incident. Most of the time, since you can't pay attention to everything equally, the kinds of data you collect will reflect your initial questions, adapted to what you experience during your observation.
- If your expectations are completely off, there's no point in sticking to the plan. However, there are a few organizing systems to help you get the most out of your visit.
- **AEIOU Framework:**
- The **AEIOU framework** can be especially helpful when you are just starting your observation and need to catalogue and categorize what's happening around you.
- Activities (A) are goal-directed sets of actions, things that people want to accomplish.
- Environments (E) include the entire arena where activities take place.
- Interactions (I) are between a person and someone or something else and are the building blocks of activities.
- Objects (O) are building blocks of the environment, key elements sometimes put to complex or unintended uses, changing their function, meaning, and context.
- Users (U) are the consumers, the people providing the behaviors, preferences, and needs.
- **Contextual Inquiry Framework:**
- The **contextual inquiry framework** can help guide a more directed, task-focused observation.
- Pay attention to below four kinds of information when observing people at work. Each of these elements can be improvised or formal, shared or used alone, specific or flexible.
    1. The tools they use. This can be formal tools, such as a specialized piece of software, or it can be informal tools, such as a scribbled note. Note

whether the tools are being used as intended or if they've been repurposed.
2. The sequences in which actions occur. The order of actions indicates the participant's thoughts about the task.
3. Their methods of organization. People group some information together for convenience, and some out of necessity. The groups may be shared or unique to individuals.
4. What kinds of interactions they have.

- These frameworks are entirely compatible. You can use one or more or make up your own. However, your time and attention are always limited. Here are some tips and tricks for getting the most out of observation:
    1. Pay attention to the environment. The spaces in which people work and play are vital to understanding how people live. Learning to closely observe those spaces, however, takes work because we take so much around us for granted. Part of observation is learning to defamiliarize ordinary places and see them as if you're a stranger to them. As well, the understandable emphasis on learning how to ask questions and interpret answers can sometimes excessively focus our attention on what people say and distract us from a systematic analysis of the spaces around them. One of the first things to do when you enter a new place is to examine the environment around you, especially those aspects that seem particularly relevant to the tools used in the activity you're following. Next, examine the physical arrangement of the environment. The places people inhabit signal their relationships with each other and with the objects around them. They can suggest what people value, what they celebrate, and what they dislike. Places also influence how people form relationships and these relationships can be harder to observe than heat and dust, so use what you see as prompts for follow-up questions. Additionally, you'll want to understand how people keep necessary tools up and running. You should have established some initial expectations ahead of your visit, but try to verify them.
    2. Seek out workarounds. **Workarounds** are situations in which informal, ad hoc responses to a problem have become the status quo. Workarounds are often harder to discover than overt failures and frustrations because they represent solved problems. Those solutions, however, may be causing other problems. Moreover, there may be a more satisfactory solution available that the workaround creators did not imagine or could not implement. Alternatively, perhaps the workaround is a fantastic solution that should be implemented everywhere. Nevertheless, workarounds mean that there once was a problem. But with the immediate need met, your participants may have forgotten that the problem ever existed. Workarounds are one of the main reasons why field visits are so useful. It's hard to get people in a focus group to identify a problem they've forgotten they ever had. When you see something that looks like a workaround, ask how it got there. That may give you some insight into the original problem.

3. Collect artifacts. **Artifacts** are the non digital tools people use to help them accomplish their tasks. Documenting and collecting people's artifacts can be extremely enlightening.

- **Note Taking:**
- Some people find that taking occasional notes while concentrating on participants' words and actions works well, but it requires watching the videotape to get juicy quotations and capture the subtlety of the interaction. Others recommend taking lots of notes on-site and using the videotape as backup.
- Note taking isn't just about you. It also affects your relationship with participants. There are very real negative consequences to paying too much attention to what you're writing. While the etiquette of listening differs from place to place, interviews depend on how we appropriately signal attentiveness and respect. Looking people in the eye, smiling, turning your body toward them are all meaningful signals.
- If you are constantly looking down at a notebook, participants may feel like you don't care about what they're saying. You will also miss lots of meaningful body language and hence lots of opportunities to probe more deeply when what participants are saying doesn't quite match how they're saying it.
- You will want a clear method to highlight your follow-up questions. One way is to write them in a separate place from the rest of his notes. Another way is to keep follow-ups scattered throughout the notes, but mark them so you can find them again.
- You will also need to clearly differentiate what you see and hear from your interpretations about what it all means. Confusing observation with your personal interpretation leads to inaccurate analysis later, because you can so easily end up replicating your own biases and assumptions. The easiest way to avoid this problem is to visibly separate different kinds of notes as you go.
- **Why Can't You Just Ask People:**
- Field visits take more time and effort than other techniques.
- Observational research generates enormous amounts of data that you then have to analyze. Moreover, despite a long and quite successful history of use in ergonomics, product design, and information systems design, it can seem exotic to people more accustomed to surveys and usability labs.
- The reasons why field visits are so important are:
    1. There's a lot to learn from field visits, even if you just have an afternoon. You can use what you learn from a brief period of observation to argue for dedicating more resources to visiting your audience on their home turf.
    2. Doing some field visits early can help avoid sinking huge amounts of time and money into products that turn out to be undesirable or unusable.
    3. Traditional market research and user research are complementary. Market research attempts to map the size of the potential consumer base in order to drive business decisions. In order to make those decisions, market research requires a well-defined product. Field visits are one of the tools we use to design that product. Focus groups and surveys are useful, but they are prone to multiple biases. First, people aren't always good at remembering and reporting all the details of what they do. Second, it turns out that people aren't very good at predicting what they will do in the future.

- Furthermore, the observation, analysis, and communication of results of field visits require rigorous thought and skill.
- Field visits are labor intensive, but they can help you generate insights that no other technique can reproduce.

3. **Qualitative Research Methods: A Data Collector's Field Guide - Participant Observation:**
   - **Introduction:**
   - What people say they believe and say that they do are often contradicted by their behavior. A large body of scientific literature documenting this disparity exists, and we can all likely summon examples from our own lives. Given the frequency of this very human inconsistency, observation can be a powerful check against what people report about themselves during interviews and focus groups.
   - **Overview of Participant Observation:**
   - **What is participant observation:**
   - **Participant observation** is a qualitative method with roots in traditional ethnographic research, whose objective is to help researchers learn the perspectives held by study populations.
   - As qualitative researchers, we presume that there will be multiple perspectives within any given community. We are interested both in knowing what those diverse perspectives are and in understanding the interplay among them. Qualitative researchers accomplish this through observation alone or by both observing and participating in the study community's daily activities. Participant observation always takes place in community settings, in locations believed to have some relevance to the research questions. Generally speaking, the researcher engaged in participant observation tries to learn what life is like for an "insider" while remaining an "outsider." While in these community settings, researchers make careful, objective notes about what they see, recording all accounts and observations as field notes in a field notebook. Informal conversation and interaction with members of the study population are also important and should be recorded in the field notes.
   - **What can we learn from participant observation:**
   - Data obtained through participant observation serve as a check against participants' subjective reporting of what they believe and do.
   - Participant observation is also useful for gaining an understanding of the physical, social, cultural, and economic contexts in which study participants live.
   - In addition, the method enables researchers to develop a familiarity with the cultural milieu that will prove invaluable throughout the project. It gives them a nuanced understanding of context that can come only from personal experience. There is no substitute for witnessing or participating in phenomena of human interaction. Observing and participating are integral to understanding the breadth and complexities of the human experience.
   - Through participant observation, researchers can also uncover factors important for a thorough understanding of the research problem but that were unknown when the study was designed. This is the great advantage of the method because, although we may get truthful answers to the research questions we ask, we may not always ask the right questions. Thus, what we learn from participant observation can help us not only to understand data collected through other methods, such as interviews, focus groups, and quantitative research

methods, but also to design questions for those methods that will give us the best understanding of the phenomenon being studied.

- **What are the disadvantages of participant observation:**
- The main disadvantage of participant observation is that it is time-consuming.
- A second disadvantage of participant observation is the difficulty of documenting the data. It is hard to write down everything that is important while you are in the act of participating and observing. As the researcher, you must therefore rely on your memory and on your own personal discipline to write down and expand your observations as soon and as completely as possible. The quality of the data depends on the diligence of the researcher, rather than on technology such as tape recorders.
- A third disadvantage of participant observation is that it is an inherently subjective exercise, whereas research requires objectivity. It is therefore important to understand the difference between reporting or describing what you observe (more objective) versus interpreting what you see (less objective).
- **Table of strengths and weaknesses of participant observation:**

Strengths	**Weaknesses**
Allows for insight into contexts, relationships, behavior.	Time-consuming
Can provide information previously unknown to researchers that is crucial for project design, data collection, and interpretation of other data	Documentation relies on memory, personal discipline, and diligence of researcher
	Requires conscious effort at objectivity because method is inherently subjective

- **What form do participant observation data take:**
- In large part, participant observation data consist of the detailed field notes that the researcher records in a field notebook. Although typically textual, such data may also include maps and other diagrams. Occasionally, participant observation may involve quantification of something and produce numerical data.
- **How are participant observation data used:**
- In applied research, participant observation is almost always used with other qualitative methods, such as interviews and focus groups. It is an integral part of the iterative research process in several ways:
    1. At the beginning stages of a research project, participant observation is used to facilitate and develop positive relationships among researchers and key informants, stakeholders, and gatekeepers, whose assistance and approval are needed for the study to become a reality. These relationships are essential to the logistics of setting up the study, including gaining permission from appropriate officials, and identifying and gaining access to potential study participants.
    2. Researchers also use data collected through participant observation to improve the design of other methods, such as interviews and focus

groups. For instance, they help to ensure the cultural relevance and appropriateness of interview and focus group questions.

3. Participant observation data are invaluable in determining whom to recruit for the study and how best to recruit them.
4. When acting as interviewers or focus group facilitators, researchers are guided by the cultural understanding gained through participant observation, allowing them to discern subtleties within participant responses. Knowing what these culturally specific cues mean allows the researcher to ask more appropriate follow-up questions and probes.
5. Participant observation data also provide a context for understanding data collected through other methods. In other words, they help researchers make sense of those other data. Participant observation may be done prior to other data collection, as well as simultaneously with other methods and during data analysis. Frequent consultation of participant observation data throughout a study can inform instrument design, save time, and prevent mistakes.

- **<u>Ethical Guidelines:</u>**
- **How much should I disclose about who I am and what I am doing:**
- When conducting participant observation, you should be discreet enough about who you are and what you are doing that you do not disrupt normal activity, yet open enough that the people you observe and interact with do not feel that your presence compromises their privacy.
- You should never be secretive or deliberately misleading about the research project or your role in it. If someone asks directly what you are doing, always provide a truthful response, using your judgment to gauge how exactly to handle a given situation. Be open, polite, and cognizant of your position as a guest or outsider.
- There are no formal rules about disclosing your involvement in a research project while in casual conversation with community members, but it is usually advisable to do so.
- Do not neglect to inform the person or persons of their right to refuse further discussion and of your commitment to confidentiality.
- **How do I maintain confidentiality during participant observation:**
- Maintaining confidentiality means ensuring that particular individuals can never be linked to the data they provide. This means that you must not record identifying information such as names and addresses of people you meet during participant observation. If it becomes necessary to get such information, it should not be included in the field notes that are entered into the computer. Similarly, it may be reasonable in some instances to record the names and locations of establishments, if, for example, follow-up observation will be required. These names and locations may be documented in field notes and shared with other research staff, but they should be coded and eliminated upon entry of the field notes into the computer, with the code list kept in a separate, secure computer file with limited access.
- Sometimes, you may develop informal personal relationships with key informants. If that happens, be sure that no personal information they give you is ever included in the actual participant observation data. If you are unsure

whether information they provide is appropriate for your official field notes, ask their permission.

- Protecting participants' confidentiality also requires that researchers do not disclose personal characteristics that could allow others to guess the identities of people who played a role in the research. This dictates that you take great care not only in entering participant observation data into field notes but also when talking with other people in the community, whether for research purposes or otherwise. Participant confidentiality must also be respected during eventual presentation of the data in public dissemination events, as well as in printed publications.
- **How should informed consent be handled for participant observation:**
- It is not necessary to obtain formal informed consent for participant observation. However, when talking to people informally about the research and your role in it, it is important to emphasize that they are not required to talk to you and that there will be no repercussions if they do not.
- If your involvement with an individual appears to be progressing beyond participant observation to a formal interview, it is necessary to obtain informed consent before beginning an in-depth interview.
- **<u>Logistics of Participant Observation:</u>**
- **What are my responsibilities as a participant observer:**
- Researchers conducting participant observation need to be prepared and willing to adapt to a variety of uncontrolled situations and settings. How much you actively participate in activities versus observe them depends on the objectives and design of the specific project, on the circumstances in which you find yourself, and on your ability to blend in with the study population.
- Your specific responsibilities include:
    1. Observing people as they engage in activities that would probably occur in much the same way if you were not present.
    2. Engaging to some extent in the activities taking place, either in order to better understand the local perspective or so as not to call attention to yourself.
    3. Interacting with people socially outside of a controlled research environment, such as at a bar, public meeting place, bus depot, religious gathering, or market. If casual conversation gives way to more substantive discussion of the research topic, you would need to disclose your identity, affiliation, and purpose.
    4. Identifying and developing relationships with key informants, stakeholders, and gatekeepers.
- **Is participant observation done individually or as a team:**
- Participant observation may be done individually, in pairs, and in teams, whichever arrangement is most appropriate for covering the locations and topics at issue.
- Factors often considered in determining the appropriate arrangement include the age, gender, physical appearance, ethnicity, personality, and linguistic abilities of different data collectors.
- The objective should be to gather data in the least obtrusive and most efficient manner possible, in light of the specific population and context.

- One way to do participant observation is for members of a team to disperse to different locations individually, or in pairs or groups, to spend time doing focused observation to address particular questions. They can then reconvene to compare notes. From these notes, they can construct a more complete picture of the issues being studied.
- **Where should I do participant observation:**
- Where you should go to do participant observation depends on the research goals. Generally, you should try to go where people in the study population often go in their daily lives, and if appropriate, engage in the activity of interest. A key informant could tell you where those places are.
- In team-based research, data collectors could decide to distribute themselves among observation sites that best match their ages and genders.
- **When should I do participant observation:**
- Participant observation is often done at the beginning of the data collection phase, but the method is also sometimes revisited later to address questions suggested by data collected using other methods.
- The best time to schedule participant observation sessions depends on what, whom, and where you need to observe.
- Less structured, unscheduled participant observation may occur any time you are moving about the community and interacting with people.
- **How long does participant observation take:**
- The specific duration of participant observation depends on the setting, activity, and population of interest.
- **What is the difference between observing and participating:**
- When you're observing, you remain an "outsider" and simply observe and document the event or behavior being studied. When you're participating, you take part in the activity while also documenting your observations.
- It is best to have some questions in mind before beginning participant observation. These topics and questions are typically provided for you or may be generated from team discussion about the research objectives. Generally, it is best to focus directly on observing behaviors and other factors that are most relevant to the research problem.
- **Table of what to observe during participant observation:**

Category	**Includes**	**Researchers should note**
Appearance	Clothing, age, gender, physical appearance.	Anything that might indicate membership in groups or in sub-populations of interest to the study, such as profession, social status, socioeconomic class, religion, or ethnicity.
Verbal behavior and interactions	Who speaks to whom and for how long. Who initiates interaction. Languages or dialects	Gender, age, ethnicity, and profession of speakers. Dynamics of interaction.

	spoken. Tone of voice.	
Physical behavior and gestures	What people do, who does what, who interacts with whom, who is not interacting	How people use their bodies and voices to communicate different emotions. What individuals' behaviors indicate about their feelings toward one another, their social rank, or their profession.
Personal space	How close people stand to one another.	What individuals' preferences concerning personal space suggest about their relationships.
Human traffic	People who enter, leave, and spend time at the observation site.	Where people enter and exit. How long they stay. Who they are (ethnicity, age, gender). Whether they are alone or accompanied. Number of people.
People who stand out	Identification of people who receive a lot of attention from others.	The characteristics of these individuals. What differentiates them from others. Whether people consult them or they approach other people. Whether they seem to be strangers or well known by others present.

- Effectively participating typically requires blending in, interacting with people, and identifying individuals who may be good sources of information.
- **How do key informants figure into participant observation:**
- Another important aspect of participant observation is identifying **key informants**, local individuals who can directly provide important information about the community and thus help the researcher more quickly understand the study population and cultural environment. Key informants can facilitate your access to particular resources, populations, organizations, gatekeepers, etc, and can help you make connections between phenomena that might not be obvious to an outsider.

- Key informants with personal connections to the study population can be invaluable. They may not be appropriate study participants themselves but may be willing to serve as liaisons to the community.
- **How do I document what I learn during participant observation:**
- **Documentation of participant observation** data consists of field notes recorded in field notebooks. These data are records of what you experienced, what you learned through interaction with other people, and what you observed.
- **Field notes** should include an account of events, how people behaved and reacted, what was said in conversation, where people were positioned in relationship to one another, their comings and goings, physical gestures, your subjective responses to what you observed, and all other details and observations necessary to make the story of the participant observation experience complete. Field notes may be written either discreetly during participant observation or following the activity, depending on where you go and how much you participate. Whatever the case, notes should be expanded as soon as possible before your memory of the details fades.
- **What should I do with my field notes:**
- As soon as possible after collecting participant observation data, you should expand whatever notes you were able to make into a descriptive narrative.
- Include as many details as possible.
- **When should I share my data with the research team:**
- Frequent sharing of data from participant observation among researchers helps the study team to become familiar with the context and study population, to identify unanticipated but potential problems and issues related to carrying out the project successfully, and to adjust procedures as necessary.
- Team meetings typically take place throughout data collection but are more frequent at the beginning of a project. At such meetings, be prepared to discuss what you have seen, raise questions about the meaning or implications of your observations, and suggest how your observations might be followed up in interviews, focus groups, or in further observation. Also, discuss any logistical or security concerns that emerge. The local principal investigator will also review participant observation data to get a sense of how things are going in the field, identify areas that may be over- or under-observed, and identify any other issues that need to be addressed. Be sure to share with the principal investigator any nuances of your participant observation experience that seem important.
- **How to Be an Effective Participant Observer:**
- Participant observation data are only as good as researchers' observations, descriptions, and notes. Getting these data requires that participant observers be prepared, know how to gauge their behavior, be objective, take good notes, and use the data throughout data collection activities, including those associated with other methods.
- **How do I prepare for participant observation:**
- First, know what the research is about. A thorough understanding of the study will help you stay focused during participant observation. Once you have a clear idea of what the research is about, you can determine specific objectives for the participant observation activity.
- In preparing for the participant observation activity, it is useful to find out as much as you can about the site where you will be participating or observing and about

any activities in which you might participate. If necessary, visit the scene and make initial observations before you set up your official data collection time

- Also, take some time to rehearse how you will describe or explain yourself and your purpose, if necessary.
- **How should I behave during participant observation:**
- The most important behavioral principle in participant observation is to be discreet. Try not to stand out or to affect the natural flow of activity. One way to do this is to behave in a way similar to the people around you.
- **What should I document:**
- Simply put, document what you observe, taking care to distinguish it from both your expectations and your interpretation of what you observe.
- It is important to document what is actually taking place rather than what you were expecting to see and to not let your expectations affect your observations. The purpose of participant observation is partly to confirm what you already know, but is mostly to discover unanticipated truths. It is an exercise of discovery.
- Also, avoid reporting your interpretation rather than an objective account of what you observe. To interpret is to impose your own judgment on what you see. The danger of not separating interpretation from observation is that your interpretations can turn out to be wrong. This can lead to invalid study results, which can ultimately be damaging for the study population.
- **How do I expand my notes:**
- Following each participant observation event, data collectors need to expand their notes into rich descriptions of what they have observed. This involves transforming your raw notes into a narrative and elaborating on your initial observations.
- Expanding your notes involves the following:
    1. **Scheduling time to expand your notes**, preferably within 24 hours from the time field notes are made. If you cannot expand your notes the same day as data collection, try to do so first thing the next morning. This makes it less likely that you will forget what an abbreviation stands for or that you will have trouble remembering what you meant. Also, the sooner you review your notes, the greater the chance that you will remember other things that you had not written down. Good note-taking often triggers the memory, but with the passage of time, this opportunity is lost.
    2. **Expanding your shorthand into sentences** so that anyone can read and understand your notes.
    3. **Composing a descriptive narrative from your shorthand and key words.** A good technique for expanding your notes is to write a narrative describing what happened and what you learned about the study population and setting. This narrative may be the actual document you produce as your expanded notes. Be sure that you create separate, clearly labeled sections to report your objective observations versus your interpretations and personal comments.
    4. **Identifying questions for follow-up.** Write down questions about participant responses that need further consideration or follow-up, issues to pursue, new information, etc. This continual adjustment of the research questions and techniques is part of the iterative nature of qualitative research.

5. **Reviewing your expanded notes and adding any final comments.**

4. **Semi-Structured Interviewing for User-Centered Design:**
   - **Guiding Principles and Working Assumptions:**
   - Interviews alone are not sufficient to meet all the needs of work/task analysis. It is vitally important to observe users doing work in their natural settings, and to gather and document examples of that work.
   - One of the principles underlying the interviewing techniques concerns the nature of expert knowledge. Potential users of an application are usually experts in the work domain which the application is intended to support, whether or not they are considered experts in the use of computer software. One reason that work/task analysis can be a difficult problem is that analysts underestimate the complexity of expertise in a given domain of knowledge.
   - **Organization of Expert Knowledge:**
   - Because concepts in human memory are associated with one another, the experience of remembering or being cued with one concept results in the recall of additional relevant concepts.
   - Expert knowledge is generally organized hierarchically, at a macro level, although many other types of relationships are also present, depending on the particular domain of expertise.
   - At the micro level, expert knowledge is stored as organized “chunks” of frequently occurring patterns, with attached procedures for appropriate responses when those patterns are recognized in problem-solving situations.
   - You should distinguish between **object knowledge** and **process knowledge**. **Object knowledge** includes the conceptual entities and objects (both concrete and abstract) in a particular domain and their various categories and relationships. **Process knowledge** is the knowledge required to accomplish the intended work using relevant concepts and objects.
   - Obviously the goal of interviewing is to understand how work objects are used in performing the relevant work. However, simply from a pragmatic point of view, it has proven more effective for some people to focus first on the objects themselves, rather than attempting to understand the objects and the procedures used on/with them concurrently.
   - **Tacit Knowledge:**
   - A potential difficulty in gaining an understanding of a user’s work relates to the fact that much of an expert’s problem-solving knowledge has become automatic or tacit through extensive use.
   - In early stages of skill learning, an individual consciously considers various items of knowledge during problem solving. In well-learned tasks, much of the relevant knowledge is no longer consciously available during problem solving. Although it has not been forgotten, it may be difficult for an expert to articulate, especially when asked to do so directly. An awareness of this potential problem can help an analyst use information about an expert’s view of the domain to constrain inferences about tacit knowledge. The analyst must observe examples of a user engaged in actual work, where tacit knowledge is often manifest.
   - **Translation Competence:**
   - **Translation competence** may occur when cultural experts translate their view of their culture when explaining it to an outsider. The more an expert translates for the convenience of an investigator, the more the researcher’s view becomes

oversimplified and distorted compared to that of the expert. Analysts are often relative novices in the work domain being analyzed.

- In an effort to avoid the errors that might result from translation competence, the researcher should make minimal assumptions about experts' knowledge, and which uses information they provide as the basis for further questioning.
- The researcher first uses very general probing techniques to persuade experts to talk freely about their domains in a global sense. An expert's language is recorded and then examined for category labels and other domain-specific linguistic cues. Domain-specific terms are then used by the researcher to probe experts for additional, related information.
- Throughout the process, it is necessary to verify that the researcher's emerging understanding of the domain accurately reflects the informant's expertise.
- **Object Identification:**
- Because information about relevant objects and their related categories and concepts is reflected in a user's use of domain-specific terminology, it is important for the analyst to elicit and document work-related language from the user. A word or phrase does not need to be obviously unfamiliar to an analyst in order to be important.
- Analysts should give particular attention to all terms and phrases which are frequently mentioned by the user to make certain that such assumptions are tested.
- The goal in the early stages of interviewing is to direct the user's attention toward the task of describing the structure of the work domain. The analyst must enable the user to describe the work practice in a natural way, using domain-specific terms for important objects. The analyst should also guide the general direction and flow of the interview, while letting the user freely and naturally express her/his conceptualization of it.
- One way to elicit a large sample of work-related terminology is to ask **Grand Tour questions**, which encourage the user to verbally "show the analyst around" the physical, temporal, and conceptual space of the work domain.
- Grand Tour questioning is particularly useful in early analysis, but may be used whenever the user reveals a new subproblem. Because the analyst's ultimate goal is to understand the tasks and their interrelationships that are required to perform a user's work, task-related and guided questions help keep the user focused on relevant aspects of the work domain without narrowing the focus too early.
- **Case-Focused questions** are also useful in eliciting work-related terminology, and are used to characterize work-related objects by evoking the user's description of the characteristics and details of particular problem-solving situations. They also keep the interview focused on relevant topics, especially if a user tends to get sidetracked. Case-Focused questions also require reference to specific examples of work and provide the basis for further questioning about process knowledge. Their main function in the early stages of analysis is to provide cues for retrieval of information about work related objects.
- **Example questions and personal experience questions** help the analyst obtain more detail about terms already identified.
- **Hypothetical-Interaction questions** provide the analyst with indirect access to a larger community of users and experts.

- Although most of the object identification questions are designed to elicit natural domain descriptions in an indirect way, there will undoubtedly be times when this strategy will fail. Cultural experts tend to translate their knowledge into terms they believe the interviewer will find easier to understand. **Direct language questions** can help alleviate this problem.
- One technique often to elicit informants' natural descriptions of terms and concepts is to ask how terms, tools and concepts are used rather than what they are or mean. Direct questions about meaning tend to encourage an expert to translate. Use questions prompt the informant to describe the context in which a particular term or object plays a role. This description provides information which can be used to structure more in-depth questioning, as needed.
- Perhaps the most important aspect of the techniques described here is for the analyst to phrase questions to a user in work-related terminology that has been elicited by a more general question. Otherwise, an analyst's consistent use of terminology different from that of the user will encourage the user to translate. Using specific work-related language provides a context of familiarity and encourages a user to focus on the work domain itself rather than the analyst's methods and unfamiliarity with the domain.
- Whenever possible, it is preferable to interview users in their natural work setting. The familiar surroundings serve as further cues to the knowledge users rely on to perform their work.
- **Object Relationships:**
- Once important work objects have been identified, an analyst can use questioning techniques that explore the rich, integrated organizational structure of a user's knowledge.
- It is important to phrase questions to the user using work-related terminology that has already been obtained in responses to previous questions. For object relationships, an analyst needs to look for category labels. A particular category term may be associated with a number of subcategories, each of which are related to the category label by a particular functional relationship.
- Generally, the most fruitful way of eliciting knowledge about relationships among work objects is to first identify the category label and functional relationship from a sample of a user's language elicited through object identification questions. Then a list of category members may be elicited by asking **Category Member questions**.
- Any objects for which the analyst is uncertain regarding category membership can be clarified by asking additional Category Membership questions. Once the user indicates that there are no more members in a particular category, the analyst should elicit the relevant features and dimensions of contrast which distinguish the members of a category from one another in meaningful ways. This is accomplished by asking a number of **Contrast questions**.
- **Process Knowledge:**
- Once a large portion of the object knowledge has been documented, the analyst can proceed to an examination of how users employ work objects in accomplishing their work. Perhaps the most widely-used technique developed in cognitive science to investigate problem-solving strategies is **think-aloud protocol generation and analysis**. This involves participants thinking aloud as they are performing a set of specified tasks.

- **Aided Recall questions**, a type of retrospective (rather than concurrent) protocol generation, can be used to follow up results obtained in concurrent think-aloud protocols. This technique involves video or audiotaping the performance of an expert engaged in problem-solving and then reviewing this record with the problem solver at a later time regarding her/his thoughts at a particular stage of problem solving. This procedure creates a situation in which recall of processing is cued by an unbiased record of the problem solver's own performance.
- A variation on aided-recall, called **cross-examination**, has been used successfully to probe the limits of knowledge directly. After completing a concurrent think-aloud protocol on a particular problem, the expert is asked specific questions about it, particularly aspects that seem vague or uncertain to an analyst.
- In developing work/task models of users' work, the problems users attempt to solve are those that define the relevant work. Therefore, any use of protocol generation should be done in the context of that work. It should be obvious in the context of any user-centered design approach that observations relate to naturally occurring work situations from which more general descriptions can be derived.
- Process knowledge, like object knowledge, must be represented in some manner in a work model description for future reference by the analyst and other members of the development team, including potential users.
- **Work Model Validation:**
- A continuing concern during work/task analysis is to develop a valid model of the work performed by users, including the ways they think about it, which a potential application will support. There are limitations to what can be obtained using the interviewing techniques discussed here, including any static description, with its combination of verbal and graphic representations.
- It is imperative that the work model be based on naturally occurring work examples and products. Not only does this help ensure accuracy of the work model in early stages of development, but the examples and products can be used to verify a final version of the work model and to develop more general scenarios.
- If the model can run with representative examples of naturally occurring work, then the analyst can be reasonably confident about its validity at that stage of development.

5. **Designing Useful and Usable Questionnaires - You Can't Just "Throw a Questionnaire Together:**
    - Asking good questions and designing useful and usable questionnaires are core skills for usability practitioners.
    - The design of solid questionnaires must consider various issues, including:
        1. **Clear objectives:** A questionnaire designer must be clear on the purpose of the questionnaire as a whole and of each question in the questionnaire.
        2. **Persuasion:** What will get people to answer the questionnaires carefully and completely?
        3. **Efficiency:** What can the questionnaire designer do to improve the efficiency of the questions and questionnaire?
        4. **Clear wording of questions and responses:** How will the language of the question and any response categories influence the results?

5. **Question order:** What is the impact of the order of the questions and the responses? What should one consider about the first question? Where should sensitive questions go?
6. **Bias:** What are the common biases in the design of questions, responses, and scales that can affect how you interpret the data?

- **Relate Each Question to a Business and UserExperience Goal:**
- As part of the question-definition process, try to connect each question to a business and user-experience goal.
- As part of your questionnaire design, you could create a matrix of questions, question types, and the associated business and user-experience goals.
- **Make Your Questionnaire Persuasive and Trustworthy:**
- Personalize the questionnaire. Too many questionnaires have a brief introduction that identifies the owner of the questionnaire as “Customer Satisfaction Committee.” If you list a real person’s name, rather than a vague, impersonal “committee” or “team” designation, people are likely to view your questionnaire as a bit more trustworthy.
- Indicate how the data will be used, and also indicate that the group can do something with the results, like use them to prioritize what will be considered in future revisions.
- Consider all the costs and benefits to respondents, and design the survey to minimize the costs and maximize the benefits for respondents. Costs and benefits can be a mix of tangible and intangible factors.
- **Always Prepare a Data-Analysis Plan:**
- Something that is often skipped in the design and implementation of a questionnaire is a detailed data-analysis plan that spells out how answers will be coded, what analyses you will do on single questions and sets of questions, any hypotheses that you may have, and what questions you will use to test those hypotheses. Your plan should spell out how you will analyze open-ended data. The plan should list the descriptive, and inferential statistics that you will use.
- **Revise and Pilot Test the Questionnaire with an Audience As Close to Your Real Audience As Possible:**
- Pretesting questionnaires is essential for discovering flaws and usability issues with cover letters, the questionnaire itself, and the method of administration.
- The best way to pretest a questionnaire is to have potential respondents test the questionnaire individually by reading aloud each question and set of response categories and choosing their answer to the question.
- Encourage respondents to think aloud and comment on any aspect of the questionnaire, including unclear or ambiguous questions, the completeness and clarity of the response categories, biased questions, terminology, legibility, sentence structure, and potentially threatening questions.
- If you are using an online questionnaire, focus the process on the navigation and error-correction features of the survey tool you are using.
- If necessary, conduct remote telephone interviews with your pilot participants to get feedback on how well they can understand and navigate the questionnaire.
- **Choose the First Question Wisely:**
- Make the first question:
    1. Easy to understand. Do not require complex instructions.

2. Easy to answer. Consider a factual question with limited response categories that everyone can answer.
3. Interesting and relevant. The respondent should feel that the first question is worth answering. An interesting first question can increase the reward value of your survey.
4. Clearly connected to the purpose of the questionnaire.
5. Nonthreatening. Don't start out by asking a question that might threaten the respondent.

- **Be Careful About Two Questions Disguised As One:**
- A common flaw in question design is to have two questions posing as a single question. Double questions are difficult to answer and can yield ambiguous data.
- **Avoid Vague Response Quantifiers When More Precise Quantifiers Can Be Used.**

6. **Survey Research in HCI:**
   - A **survey** is a method of gathering information by asking questions to a subset of people, the results of which can be generalized to the wider target population.
   - There are many types of surveys, many ways to sample a population, and many ways to collect data from that population.
   - Traditionally, surveys have been administered via mail, telephone or in person, but the internet has become a popular mode for surveys due to the low cost of gathering data, ease and speed of survey administration and its broadening reach across a variety of populations world-wide.
   - Surveys in HCI can be helpful for:
     1. Gather information about people's habits, interaction with technology, or behaviour.
     2. Get demographic or psychographic information to characterize a population.
     3. Get feedback on people's experiences with a product, service, or application.
     4. Collect people's attitudes and perceptions toward an application in the context of usage.
     5. Understand people's intents and motivations for using an application.
     6. Quantitatively measure task success with specific parts of an application.
     7. Capture people's awareness of certain systems, services, theories, or features.
     8. Compare people's attitudes, experiences, etc. over time and across dimensions.
   - While powerful for specific needs, surveys do not allow for observation of the respondents' context or follow-up questions. When conducting research into precise behaviors, underlying motivations, and the usability of systems, then other research methods may be more appropriate or needed as a complement.
   - When used appropriately, surveys can help inform application and user research strategies and provide insights into users' attitudes, experiences, intents, demographics, and psychographic characteristics. However, surveys are not the most appropriate method for many other HCI research goals. Ethnographic interviews, log data analysis, card sorts, usability studies, and other methods may be more appropriate. In some cases, surveys can be used with other research methods to holistically inform HCI development.

- Overall, surveys are appropriate when needing to represent an entire population, to measure differences between groups of people, and to identify changes over time in people's attitudes and experiences. Some examples of when surveys are useful in HCI research include:
    1. **Attitudes.** Surveys can accurately measure and reliably represent attitudes and perceptions of a population. While qualitative studies are able to gather attitudinal data, surveys provide statistically reliable metrics, allowing researchers to benchmark attitudes toward an application or an experience, to track changes in attitudes over time, and to tie self-reported attitudes to actual behavior. For example, surveys can be used to measure customer satisfaction with online banking immediately following their experiences.
    2. **Intent.** Surveys can collect peoples' reasons for using an application at a specific time, allowing researchers to gauge the frequency across different objectives. Unlike other methods, surveys can be deployed while a person is actually using an application, minimizing the risk of imperfect recall on the respondent's part. Note that specific details and the context of one's intent may not be fully captured in a survey alone. For example, "Why did you visit this website?" could be answered in a survey, but qualitative research may be more appropriate in determining how well one understood specific application elements and what users' underlying motivations are in the context of their daily lives.
    3. **Task success.** Similar to measuring intent, while HCI researchers can qualitatively observe task success through a lab or a field study, a survey can be used to reliably quantify levels of success. For example, respondents can be instructed to perform a certain task, enter results of the task, and report on their experiences while performing the task.
    4. **User experience feedback.** Collecting open-ended feedback about a user's experience can be used to understand the user's interaction with technology or to inform system requirements and improvements. For example, by understanding the relative frequency of key product frustrations and benefits, project stakeholders can make informed decisions and trade-offs when allocating resources.
    5. **User characteristics.** Surveys can be used to understand a system's users and to better serve their needs. Researchers can collect users' demographic information, technographic details such as system savviness or overall tech savviness, and psychographic variables such as openness to change and privacy orientation. Such data enables researchers to discover natural segments of users who may have different needs, motivations, attitudes, perceptions, and overall user experiences.
    6. **Interactions with technology.** Surveys can be used to understand more broadly how people interact with technology and how technology influences social interactions with others by asking people to self-report on social, psychological, and demographic variables while capturing their behaviors. Through the use of surveys, HCI researchers can glean insights into the effects technology has on the general population.

7. **Awareness.** Surveys can also help in understanding people's awareness of existing technologies or specific application features. Such data can help researchers determine whether low usage with an application is a result of poor awareness or other factors, such as usability issues. By quantifying how aware or unaware people are, researchers can decide whether efforts are needed to increase overall awareness and thus use.
8. **Comparisons.** Surveys can be used to compare users' attitudes, perceptions, and experiences across user segments, time, geographies, and competing applications and between experimental and control versions. Such data enable researchers to explore whether user needs and experiences vary across geographies, assess an application's strengths and weaknesses among competing technologies and how each compares with their competitors' applications, and evaluate potential application improvements while aiding decision making between a variety of proposed designs.

- Because surveys are inexpensive and easy to deploy compared to other methods, many people choose survey research even when it is inappropriate for their needs. Such surveys can produce invalid or unreliable data, leading to an inaccurate understanding of a population and poor user experiences. Below are some HCI research needs that are better addressed with other methods:
    1. **Precise behaviors.** While respondents can be asked to self-report their behaviors, gathering this information from log data, if available, will always be more accurate. This is particularly true when trying to understand precise user behaviors and flows, as users will struggle to recall their exact sequence of clicks on specific pages visited. For behaviors not captured in log data, a diary study, observational study, or experience sampling may gather more accurate results than a survey.
    2. **Underlying motivations.** People often do not understand or are unable to explain why they take certain actions or prefer one thing over another. Someone may be able to report their intent in a survey but may not be aware of their subconscious motivations for specific actions. Exploratory research methods such as ethnography or contextual inquiry may be more appropriate than directly asking about underlying motivations in a survey.
    3. **Usability evaluations.** Surveys are inappropriate for testing specific usability tasks and understanding of tools and application elements. As mentioned above, surveys can measure task success but may not explain why people cannot use a particular application, why they do not understand some aspect of a product, or why they do not identify missteps that caused the task failure. Furthermore, a user may still be able to complete a given task even though he or she encountered several confusions, which could not be uncovered through a survey. Task-based observational research and interview methods, such as usability studies, are better suited for such research goals.

- **How to Do It: What Constitutes Good Work:**
- This section breaks down survey research into the following six stages:
    1. **Research goals and constructs:**

- Before writing survey questions, researchers should first think about what they intend to measure, what kind of data needs to be collected, and how the data will be used to meet the research goals.
- When the survey-appropriate research goals have been identified, they should be matched to **constructs**, unidimensional attributes that cannot be directly observed. A construct is an indicator variable that measures a characteristic or trait. The identified constructs should then be converted into one or multiple survey questions. Constructs can be identified from prior primary research or literature reviews. Asking multiple questions about the same construct and analyzing the responses may help the researcher ensure the construct's validity.
- Furthermore, a technique called **cognitive pretesting** can be used to determine whether respondents are interpreting the constructs as intended by the researcher.
- Once research goals and constructs are defined, there are several other considerations to help determine whether a survey is the most appropriate method and how to proceed:
    - Do the survey constructs focus on results which will directly address research goals and inform stakeholders' decision making rather than providing merely informative data?
    - Will the results be used for longitudinal comparisons or for one-time decisions? For longitudinal comparisons, researchers must plan on multiple survey deployments without exhausting available respondents.
    - What is the number of responses needed to provide the appropriate level of precision for the insights needed? By calculating the number of responses needed, the researcher will ensure that key metrics and comparisons are statistically reliable. Once the target number is determined, researchers can then determine how many people to invite.

2. Population and sampling:

- The key to effective survey research is determining who and how many people to survey. In order to do this, the survey's **population**, or set of individuals that meet certain criteria, and to whom researchers wish to generalize their results must first be defined.
- Reaching everyone in the population is typically impossible and unnecessary. Instead, researchers approximate the true population by creating a **sampling frame**, the set of people who the researcher is able to contact for the survey. The perfect sampling frame is identical to the population, but often a survey's sampling frame is only a portion of the population. The people from the sampling frame who are invited to take the survey are the **sample**, but only those who answer are **respondents**.
- Sampling a population can be accomplished through probability and nonprobability based methods. **Probability** or **random sampling** is considered the gold standard because every person in the sampling frame has an equal, non-zero chance of being chosen for the sample. Essentially, the sample is selected completely randomly. This minimizes **sampling bias**, also known as **selection bias**, by randomly drawing the

sample from individuals in the sampling frame and by inviting everyone in the sample in the same way.

- While probability sampling is ideal, it is often impossible to reach and randomly select from the entire target population, especially when targeting small populations or investigating sensitive or rare behavior. In these situations, researchers may use non-probability sampling methods such as volunteer opt-in panels, unrestricted self-selected surveys (E.g. links on blogs and social networks), snowball recruiting (I.e. asking for friends of friends), and convenience samples (I.e. targeting people readily available, such as mall shoppers). However, non-probability methods are prone to high sampling bias and hence reduce representativeness compared to random sampling. One way representativeness can be assessed is by comparing key characteristics of the target population with those from the actual sample.
- No matter which sampling method is used, it is important to carefully determine the target **sample size** for the survey, the number of survey responses needed. If the sample size is too small, findings from the survey cannot be accurately generalized to the population and may fail to detect generalizable differences between groups. If the sample is larger than necessary, too many individuals are burdened with taking the survey, analysis time for the researcher may increase, or the sampling frame is used up too quickly. Hence, calculating the optimal sample size becomes crucial for every survey.
- First, the researcher needs to determine approximately how many people make up the population being studied. Second, as the survey does not measure the entire population, the required level of precision must be chosen, which consists of the **margin of error** and the **confidence level**. The **margin of error** expresses the amount of sampling error in the survey. I.e. The range of uncertainty around an estimate of a population measure, assuming normally distributed data. For example, if 60% of the sample claims to use a tablet computer, a 5% margin of error would mean that actually 55–65% of the population use tablet computers. Commonly used margin of errors are 5 and 3%, but depending on the goals of the survey anywhere between 1 and 10% may be appropriate. Using a margin of error higher than 10% is not recommended, unless a low level of precision can meet the survey's goals. The **confidence level** indicates how likely the reported metric falls within the margin of error if the study were repeated. A 95% confidence level, for example, would mean that 95% of the time, observations from repeated sampling will fall within the interval defined by the margin of error. Commonly used confidence levels are 99, 95, and 90%. Using less than 90% is not recommended.
- After having determined the target sample size for the survey, the researcher now needs to work backwards to estimate the number of people to actually invite to the survey, taking into account the estimated size for each subgroup and the expected response rate. If a subgroup's incidence is very small, the total number of invitations must be increased to ensure the desired sample size for this subgroup. The **response rate**

of a survey describes the percentage of those who completed the survey out of all those that were invited.

- To reach respondents, there are four basic survey modes: mail or written surveys, phone surveys, face-to-face or in-person surveys, and Internet surveys. Survey modes may also be used in combination. The survey mode needs to be chosen carefully as each mode has its own advantages and disadvantages, such as differences in typical response rates, introduced biases, required resources and costs, audience that can be reached, and respondents' level of anonymity.
- Today, many HCI-related surveys are Internet based, as benefits often outweigh their disadvantages. Internet surveys have the following major advantages:
    - Easy access to large geographic regions.
    - Simplicity of creating a survey by leveraging easily accessible commercial tools.
    - Cost savings during survey invitation and analysis.
    - Short fielding periods, as the data is collected immediately.
    - Lower bias due to respondent anonymity, as surveys are self-administered with no interviewer present.
    - Ability to customize the questionnaire to specific respondent groups.
- Internet surveys also have several disadvantages. The most discussed downside is the introduction of **coverage error**, which is a potential mismatch between the target population and the sampling frame. For example, online surveys fail to reach people without Internet or e-mail access. Furthermore, those invited to Internet surveys may be less motivated to respond or to provide accurate data because such surveys are less personal and can be ignored more easily.

3. Questionnaire design and biases:

- Upon establishing the constructs to be measured and the appropriate sampling method, the first iteration of the survey questionnaire can be designed. It is important to carefully think through the design of each survey question, as it is fairly easy to introduce biases that can have a substantial impact on the reliability and validity of the data collected. Poor questionnaire design may introduce **measurement error**, defined as the deviation of the respondents' answers from their true values on the measure.
- There are two categories of survey questions: open and closed-ended questions. **Open-ended questions** ask survey respondents to write in their own answers, whereas **closed-ended questions** provide a set of predefined answers to choose from.
- Open-ended questions are appropriate when:
    - The universe of possible answers is unknown. However, once the universe of possible answers is identified, it may be appropriate to create a closed-ended version of the same question.
    - There are so many options in the full list of possible answers that they cannot be easily displayed.

    - Measuring quantities with natural metrics when being unable to access information from log data. E.g. How many times have you used your tablet within this week?
    - Measuring qualitative aspects of a user's experience.
- Closed-ended questions are appropriate when:
    - The universe of possible answers is known and small enough to be easily provided.
    - Rating a single object on a dimension. E.g. Overall, how satisfied or dissatisfied are you with your smartphone? (on a 7-point scale from "Extremely dissatisfied" to "Extremely satisfied").
    - Measuring quantities without natural metrics, such as importance, certainty, or degree. E.g. How important is it to have your smartphone within reach 24 h a day? (on a 5-point scale from "Not at all important" to "Extremely important").
- There are four basic types of closed-ended questions: single-choice, multiple-choice, rating, and ranking questions.
- Single-choice questions work best when only one answer is possible for each respondent in the real world.
- Multiple-choice questions are appropriate when more than one answer may apply to the respondent. Frequently, multiple-choice questions are accompanied by "select all that apply" help text. The maximum number of selections may also be specified to force users to prioritize or express preferences among the answer options.
- Ranking questions are best when respondents must prioritize their choices given a real-world situation.
- Rating questions are appropriate when the respondent must judge an object on a continuum. To optimize reliability and minimize bias, scale points need to be fully labeled instead of using numbers and each scale point should be of equal width to avoid bias toward visually bigger response options. Furthermore, rating questions should use either a unipolar or a bipolar scale, depending on the construct being measured.
  Unipolar scales range from zero to an extreme amount and do not have a natural midpoint. They are best measured with a 5-point rating scale, which optimizes reliability while minimizing respondent burden. Unipolar scales use the following scale labels: "Not at all, Slightly, Moderately, Very, Extremely."
  Bipolar scales range from an extreme negative to an extreme positive with a natural midpoint. Unlike unipolar scales, they are best measured with a 7-point rating scale to maximize reliability and data differentiation. Bipolar scales use the following scale labels: "Extremely, Moderately, Slightly, Neither nor, Slightly, Moderately, Extremely."
- After writing the first survey draft, it is crucial to check the phrasing of each question for potential biases that may bias the responses. Five common questionnaire biases are satisficing, acquiescence bias, social desirability, response order bias, and question order bias.
- **Satisficing** occurs when respondents use a suboptimal amount of cognitive effort to answer questions. Satisficers will typically pick what they consider to be the first acceptable response alternative.

- When presented with agree/disagree, yes/no, or true/false statements, some respondents are more likely to concur with the statement independent of its substance. This tendency is known as **acquiescence bias**.
- **Social desirability** occurs when respondents answer questions in a manner they feel will be positively perceived by others.
- **Response order bias** is the tendency to select the items toward the beginning (**primacy effect**) or the end (**recency effect**) of an answer list or scale.
- **Question order bias** or **order effects bias**, is a type of response bias where a respondent may react differently to questions based on the order in which questions appear in a survey or interview. Order effects also apply to the order of the questions in surveys. Each question in a survey has the potential to bias each subsequent question by priming respondents.
- Other types of questions to avoid include **broad questions** that lack focus and include items that are not clearly defined or those that can be interpreted in multiple ways, **leading questions** that manipulate respondents into giving a certain answer by providing biasing content or suggesting information the researcher is looking to have confirmed, **double-barreled questions** that ask about multiple items while only allowing for a single response, resulting in less reliable and valid data, **recall questions** that require the respondent to remember past attitudes and behaviors, leading to recall bias, and **prediction questions** that ask survey respondents to anticipate future behavior or attitudes, resulting in biased and inaccurate responses.

4. Review and survey pretesting:

- At this point in the survey life cycle, it is appropriate to have potential respondents take and evaluate the survey in order to identify any remaining points of confusion.
- Two established evaluation methods used to improve survey quality are **cognitive pretesting** and **field testing** the survey by launching it to a subset of the actual sample.
- By evaluating surveys early on, the researcher can identify disconnects between their own assumptions and how respondents will read, interpret, and answer questions.
- To conduct a **cognitive pretest**, a small set of potential respondents is invited to participate in an in-person interview where they are asked to take the survey while using the think-aloud protocol. A cognitive pretest assesses question interpretation, construct validity, and comprehension of survey terminology and calls attention to missing answer options or entire questions. During the interview, the researcher should observe participant reactions; identify misinterpretations of terms, questions, answer choices, or scale items; and gain insight into how respondents process questions and come up with their answers. The researcher then needs to analyze the collected information to improve problematic areas before fielding the

final questionnaire. A questionnaire could go through several rounds of iteration before reaching the desired quality.

- Piloting the survey with a small subset of the sample will help provide insights that cognitive pretests alone cannot. Through **field testing**, the researcher can assess the success of the sampling approach, look for common break-off points and long completion times, and examine answers to open-ended questions. High break-off rates and completion times may point to flaws in the survey design, while unusual answers may suggest a disconnect between a question's intention and respondents' interpretation. To yield additional insights from the field test, a question can be added at the end of each page or at the end of the entire survey where respondents can provide explicit feedback on any points of confusion. Similar to cognitive pretests, field testing may lead to several rounds of questionnaire improvement as well as changes to the sampling method. Finally, once all concerns are addressed, the survey is ready to be fielded to the entire sample.

5. Implementation and launch:

- When deciding on the appropriate platform, functionality, cost, and ease of use should be taken into consideration.
- With the survey's launch, researchers should monitor the initial responses as well as **survey paradata** to identify potential mistakes in the survey design. **Survey paradata** is data collected about the survey response process, such as the devices from which the survey was accessed, time to survey completion, and various response-related rates. By monitoring such metrics, the survey researcher can quickly apply improvements before the entire sample has responded to the survey.
- Some survey paradata to note are:
    - **Click-through rate:** Of those invited, how many opened the survey.
    - **Completion rate:** Of those who opened the survey, how many finished the survey.
    - **Response rate:** Of those invited, how many finished the survey.
    - **Break-off rate:** Of those who started, how many dropped off on each page.
    - **Completion time:** The time it took respondents to finish the entire survey.
- In order to gather enough responses to represent the target population with the desired level of precision, response rates should be maximized. Several factors affect response rates, including the respondents' interest in the subject matter, the perceived impact of responding to the survey, questionnaire length and difficulty, the presence and nature of incentives, and researchers' efforts to encourage response.

6. Data analysis and reporting:

- Once all the necessary survey responses have been collected, it is time to start making sense of the data by:
    1. **Preparing and exploring the data:**

- Cleaning and preparing survey data before conducting a thorough analysis are essential to identifying low-quality responses that may otherwise skew the results.
- When taking a pass through the data, survey researchers should look for signs of poor-quality responses. Such survey data can either be left as is, removed, or presented separately from trusted data. If the researcher decides to remove poor data, they must cautiously decide whether to remove data on the respondent level, an individual question level, or only beyond a certain point in the survey where respondents' data quality is declined.
- The following are signals that survey researchers should look out for at the survey response level:
    1. **Duplicate responses**
    2. **Speeders**
    3. **Straight-liners and other questionable patterns.** Respondents that always, or almost always, pick the same answer option across survey questions are referred to as straight-liners.
    4. **Missing data and break-offs.** Some respondents may finish a survey but skip several questions. Others may start the survey but break off at some point. Both result in missing data.
- Furthermore, the following signals may need to be assessed at a question-by-question level:
    1. **Low inter-item reliability.** When multiple questions are used to measure a single construct, respondents' answers to these questions should be associated with each other. Respondents that give inconsistent or unreliable responses may not have carefully read the set of questions and should be considered for removal.
    2. **Outliers**
    3. **Inadequate open-ended responses.** Due to the amount of effort required, open-ended questions may lead to low-quality responses. Obvious garbage and irrelevant answers should be removed, and other answers from the same respondent should be examined to determine whether all their survey responses warrant removal.

2. Thoroughly analyzing the data:

- For an analysis of closed-ended responses, getting an overview of the **descriptive statistics,** what the survey data shows, is fundamental. By looking at measures such as the **frequency distribution**, **central tendency** (mean or median), and **data dispersion** (standard deviation), emerging patterns can be uncovered. The **frequency distribution** shows the proportion of responses for each answer option. The **central tendency** measures the central position of a frequency distribution and is calculated using the mean, median, and mode. Dispersion examines the data spread around the central position through

calculations such as standard deviation, variance, range, and interquartile range. While descriptive statistics only describe the existing data set, **inferential statistics** can be used to draw inferences from the sample to the overall population in question. Inferential statistics consists of two areas: **estimation statistics** and **hypothesis testing**. **Estimation statistics** involves using the survey's sample in order to approximate the population's value. **Hypothesis testing** determines the probability of a hypothesis being true when comparing groups through the use of other methods.

- In addition to analyzing closed-ended responses, the review of open-ended comments contributes a more holistic understanding of the phenomena being studied.
- An interpretive method, referred to as **coding**, is used to organize and transform qualitative data from open-ended questions to enable further quantitative analysis. The core of such qualitative analysis is to assign one or several codes to each comment; each code consists of a word or a short phrase summarizing the essence of the response with regard to the objective of that survey question. Available codes are chosen from a coding scheme, which may already be established by the community or from previous research or may need to be created by the researchers themselves. In most cases, as questions are customized to each individual survey, the researcher needs to establish the coding system using a deductive or an inductive approach.
- When employing a **deductive approach**, the researcher defines the full list of possible codes in a **top-down fashion**. I.e. All codes are defined before reviewing the qualitative data and assigning those codes to comments. On the other hand, when using an **inductive approach** to coding, the codes are generated and constantly revised in a **bottom-up approach**. I.e. The data is coded according to categories identified by reading and re-reading responses to the open-ended question. Bottom-up, inductive coding is recommended, as it has the benefit of capturing categories the researcher may not have thought of before reading the actual comments.
- To measure the reliability of both the developed coding system and the coding of the comments, either the same coder should partially repeat the coding or a second coder should be involved. **Intra-rater reliability** describes the degree of agreement when the data set is reanalyzed by the same researcher. **Inter-rater reliability** determines the agreement level of the coding results from at least two independent researchers. If there is low agreement, the coding needs to be reviewed to identify the pattern behind the disagreement, coder training needs to be adjusted, or changes to codes need to be agreed upon to achieve consistent categorization. If the data set to be coded is too large and coding needs to be split up between researchers, inter-rater consistency

can be measured by comparing results from coding an overlapping set of comments, by comparing the coding to a pre-established standard, or by including another researcher to review overlapping codes from the main coders.

3. **Synthesizing insights for the target audience of this research:**

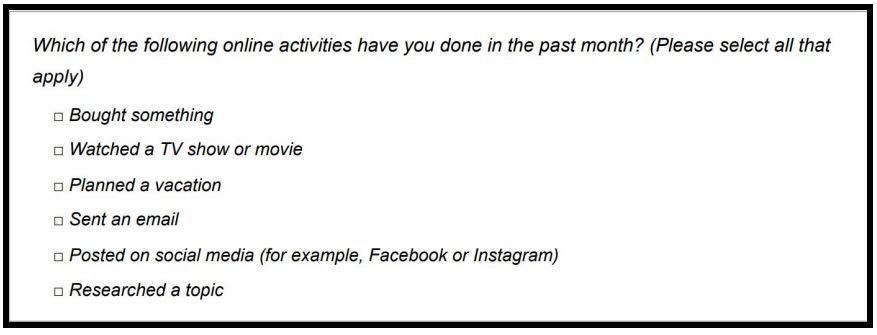
- A key criterion in any survey's quality is the degree to which the results accurately represent the target population. If a survey's sampling frame fully covers the population and the sample is randomly drawn from the sampling frame, a response rate of 100% would ensure that the results are representative at a level of precision based on the sample size.
- However, if a survey has less than a 100% response rate, those not responding might have provided a different answer distribution than those who did respond.
- Once the question-by-question analysis is completed, the researcher needs to synthesize findings across all questions to address the goals of the survey. Larger themes may be identified, and the initially defined research questions are answered, which are in turn translated into recommendations and broader HCI implications as appropriate. All calculations used for the data analysis should be reported with the necessary statistical rigor. Furthermore, it is important to list the survey's paradata and include response and break-off rates. Similar to other empirical research, it is important to not only report the results of the survey but also describe the original research goals and the used survey methodology. A detailed description of the survey methodology will explain the population being studied, sampling method, survey mode, survey invitation, fielding process, and response paradata. It should also include screenshots of the actual survey questions and explain techniques used to evaluate data quality. Furthermore, it is often necessary to include a discussion on how the respondents compare to the overall population. Lastly, any potential sources of survey bias, such as sampling biases or non-response bias, should be outlined.

7. **<u>Iterative Design of a Survey Question: A Case Study:</u>**

- Survey questions are delicate things. Even small details in wording can affect how your respondents interpret and answer them. A carelessly written question can ruin a study, so it's worth a little extra time to perfect your survey.
- Poor phrasing, ambiguity, or the wrong sequence of questions can easily result in skewed survey results.
- Surveys need to be tested.
- **Case Study: Survey on How People Use the Web:**
- Recently, we decided to replicate a study conducted 21 years ago by researchers at Xerox PARC. The original study investigated how the information found online affects people's decision making. The study consisted of a large-scale survey in which 3,292 respondents described in detail a situation where online content impacted their decisions or actions. Today, people rely even more heavily on information found on the web than 20 years ago. Thus, we replicated the study to

see if the important online information-seeking behaviors have changed over two decades. In the Xerox survey, the researchers asked the following single question: “Please try to recall a recent instance in which you found important information on the World Wide Web, information that led to a significant action or decision. Please describe that incident in enough detail so that we can visualize the situation.” While we wanted the responses to be comparable to the 1998 study, we realized that we would likely need to tweak the question’s wording to ensure we’d collect information that reflects today’s use of online services. Through 4 rounds of pilot testing the survey, we were able to refine the question.

- 1st Round of Testing:
  For the 1st round of testing, we rephrased the survey question as follows “Please try to recall a recent instance in which you found important information online, information that led to a significant action or decision. Please describe that incident in enough detail so that we can visualize the situation.” Then, we recruited 11 participants who filled out a written survey and we collected their verbal feedback at the end of the survey. Four of these pilot participants reported that this question was too general, and they were not sure what we wanted. To address this problem, we added an explanatory sentence in the second design.
- 2nd Round of Testing:
  We changed the survey question to “Please try to recall a recent instance in which you found important information online, information that led to a significant action or decision. Please describe that incident in enough detail so that we can visualize the situation. A significant action or decision can be any change in your plans, thoughts, or actions that you consider to be meaningful.” In this second pilot, people were constrained by the explanatory text and talked only about the changes they made because of the online information. Almost all the responses were related to some specific changes, but change should not be a necessary aspect of a significant decision or action. We realized that adding explanations to "significant" could bias the respondents’ answers. We decided to remove the clarifying sentence and try another approach.
- 3rd Round of Testing:
  For the third round of testing, we tried adding a multiselect question before the main question about the respondents’ significant activity.



We hoped that this question could help users reflect on their recent online activities, and that this process may help them answer the following question. We carefully balanced different kinds of activities, from entertaining to serious ones. We invited 4 users to fill out the revised version of the survey, and also conducted a cognitive walkthrough with 3 participants to gain insights on the

language of the survey. Unfortunately, all of the participants in this group ended up reporting activities that sounded too similar to our multiselect responses. We realized that the multiselect responses were **priming** our respondents. Namely, the last response option in the first question, “researched a topic", primed the participants to come up with research related answers in response to the second question. We decided to remove the priming question from the survey.

- 4th Round of Testing:
  At this point, we were quite confident that the biggest problem was that people had too many online activities to choose from. They needed reassurance that they could choose just one to report. That could help explain why pilot participants were confused when presented with the original question and why they were easily influenced by the changes we’d tested: people weren’t sure which decisions counted as “significant” and which ones didn’t, so they tried to find clues from other information researchers provided. This was probably not a problem during the original XEROX PARC study because, at that time, the Internet was not pervasive and didn’t impact people’s lives as much. Based on this insight, we revised the question again, to include a clarification that could help respondents if many instances came to mind. The survey question became “Please try to recall a recent instance in which you found important information online, information that led to a significant action or decision. Please describe that incident in enough detail so that we can visualize the situation. If you can recall several such instances, please describe the one that was the most important to you.” With this addition, we reassured users that they could reply to the question with the one example they believe is the most significant to them. We piloted the survey online and collected 50 responses. The 50-person pilot survey went well; we got a diverse set of responses.
- **Tips for Survey Design:**
  1. Make sure that your research questions can be investigated with your survey methodology. Surveys cannot answer all research questions. They are good at helping us capture attitudinal data, but not behavioral data. The details and the contextual information they can provide are also limited. In our case, we wanted to identify online information-seeking behaviors that could lead to significant decisions and actions. A survey can address this goal. But if we want to understand why people choose certain types of information-seeking behaviors instead of others or when and where they engage in these behaviors, surveys are not appropriate. Instead, user interviews or field studies can work better in these situations.
  2. Avoid priming or asking leading questions. Keep the language of the survey questions neutral. People are social animals who can interpret subtle clues and try to behave as (they assume) researchers want them to, even subconsciously. As we saw in this case study, minor changes in phrasing the same question or adding another question before it can result in dramatically different responses.
  3. Run pilot studies. You can test several versions at the same time. Sometimes, you may not be able to tell if your survey language is neutral enough until you run it with real people. For your very first pilot, your colleagues or people in a coffee shop could act as testers. However,

conduct at least one round of pilot testing with respondents from your demographic of interest — don't rely just on your coworkers. Ask your participants to think aloud as they are completing the survey, to help you identify any interpretation issues or potential leading questions. Testing 5–10 users for each version of your pilot should work fine.

4. Pay attention to the timing of collecting the responses. Sometimes the time when you send out an online survey can impact the number and quality of your answers. In our study, half of the participants were sent the survey on a weekend and half on weekdays. We did that to avoid biased results related to the timing of response collecting. If your users are likely to be busy during the daytime, sending out a survey at 9:00 A.M. may prevent you from collecting high-quality data.