Research Methods in Human-Computer Interaction

Chapter 7
Case Studies
One or Many?

- More often seen as better
  - Especially for controlled studies looking for statistically significant results, but..
- Large groups not necessarily available, and
- Going “in-deep” with small fewer can provide more insight
Case Study

• in-depth study of a specific instance (or a small number of instances) within a specific real-life context.

• Build understanding, generate hypotheses, document behavior that would otherwise be hard to document

• Time and labor intensive, but potentially informative
• Understand case studies by looking at a published study in the research literature

Observing Sara: Goals/Methods

• Goal: develop in-depth understanding of how a blind person uses assistive technologies

• Method: In-depth and in-context interviews and observations with one person
  – Digital and physical objects
  – Specific tasks

• Results: insights that might be used to improve designs.
What is a case study?

• Four key aspects:

1. In-depth examination of a small number of cases
2. Examination in context
3. Multiple Data Sources
4. Emphasis on Qualitative Data and analysis
Small number of cases

• Sara: 12 hours of interviews, transcriptions, etc.
  – Couldn't easily do this for 20-30 people
• Case study: small numbers  1,2,3
• Don't worry about statistical significance
In Context

- Lab studies don't reflect how people work and live
  - They aren't “ecologically valid”
- Real environments
- Real users
- Real tasks
- .. provide more realistic understanding of how technology is actually used.
Multiple Data Sources

• Combine observations from
  – Artifacts
  – Observations
  – Interviews
  – Documents, etc.

• Data Triangulation: Using supporting evidence from multiple sources to increase confidence in observations

• But, they might contradict…dig deeper!
Focus Qualitative Data

• Questions are usually broad and open-ended.
  – “How does Sara use technology?”, not
  – “How fast can she complete as specific task”

• Answers (data) often (but not always) descriptive, not quantitative.

• See Chapter 11 for Qualitative Data Analysis
Goals of Case Studies

• **Exploration** of novel problems or situations, possibly to inform new designs

• **Explanation**: develop models to understand technology use

• **Description**: document a context that led to a design

• **Demonstration**: show how a tool was successfully used.
Types of Case Study

- Intrinsic: Specific to a given context
- Instrumental: try to generate general insights

Caveat: be cautious when generalizing
- Case studies can provide insight that might apply more broadly...
- But, they might not...
Single or Multiple Cases?

- Single case,
- Multiple case \((n>1)\) possible

- Similarities between cases might support generalization

- But, can't generalize complete based on 2 or 3 cases
Literal vs. Theoretical Replication

- **Literal Replication:** Repetition of two or more similar cases designed to demonstrate consistency
  - Another blind college student alongside Sara

- **Theoretical Replication:**
  - Cases that differ in some crucial way
  - Differences between cases might explain differences in observations
  - Blind college student vs. blind executive
Multiple cases as confidence boosters

- What if your single case is idiosyncratic?
- Less likely that multiple cases will be unrepresentative all in the same way
- Less chance of cherry-picking
- But, generalization still might not be appropriate.
Embedded vs. Holistic

- **Unit of analysis**: granularity of discussion

- Embedded: multiple units of analysis
  - Sara - study of 12 separate tasks.

- Holistic: one unit
  - Sara as an individual

- Holistic study of a large organization vs. embedded study - multiple departments
Components of a Case Study Design

- **Questions**
  - What are you interested in understanding?
- **Hypotheses or propositions**
  - Statements of what you expect to find
- **Units of analysis**
  - Granularity of what you expect to focus on
- **Data analysis plan**
  - How will you interpret data?
Observing Sara: Goals

• Goals

  – understanding how a blind person might use a variety of assistive technologies to accomplish tasks and to recover from task failures using workarounds.
Propositions

• Expected to see...

• Common types of failure and workaround strategy.

• Influence of choice of implementing features in hardware or software on user interaction, including failures and response to those failures.
Choosing Cases

• Often no choice
  – Mandate of project
  – Convenience

• When making a choice
  – Identify participants who are committed
  – Maximize convenience for participants
  – Try to be representative of complete class of users, if possible
    • Greater External Validity
Alternative Strategies

• “Edge” cases
  – Situations that are innovative, highly capable, or otherwise not representative
  – But, in some way interesting

• Critical Cases
  – Particularly distinctive with respect to problem under consideration
Choosing between cases

- Multiple possibilities – which to pick?
- Conduct a screening survey
  - See Chapter 5 on surveys
- Questions designed to assess alignment with your goals and commitment to project
- Screening surveys can stand on their own to provide valuable data
Collecting Data

- Use multiple sources
  - Documentation
  - Archival Records
  - Interviews
  - Observations
  - Artifacts
  - Computational data (See Chapter 12)
Choosing Data Sources

• Documentation and archives good for studying past history
• Interviews – perceptions, concerns, needs, reactions
• Observation – what do people do?
• Artifacts – How do people bridge gap between physical and computational worlds
More on Data Collection

- Goals guide data sources and specific questions
- Be clear about what you want to learn, and how data sources will help you learn it
- If only one data source will address a specific question, add other data sources
Logistics of data collection

• Each data source is a mini-experiment
  – Develop questions, procedures, etc.

• Protocol
  – Guide to reproduction establishes reliability

• Draft of write up
  – Describe what you can, and fill in observation, analysis, and conclusion later.
Case Study Protocol

• Introduction – questions and hypotheses
• Details of data collection
• Case selection criteria
• Contact information for relevant individuals
• Plans for each data source
• Specific questions and methods
• Outline of report
Pilot Case Study

• As with other research methods, a dry run can help debug

• Not always possible, particularly if there are no other suitable cases

• Pilot selected materials if complete pilot is not possible
Analysis and Interpretation

- Plan analysis early
- Qualitative techniques – Chapter 11
- Triangulate
- Chains of analysis – link conclusions and inferences back to original observations
- Go from units of analyses to whole case, or to all cases
- Triangulate
Matrix Displays

- Units of analysis in rows, aspects of analysis in columns

<table>
<thead>
<tr>
<th>Object/Task</th>
<th>Description</th>
<th>Intentions/Goals</th>
<th>Limitation (what exactly is going on?)</th>
<th>Explanation (why does limitation happen?)</th>
<th>Workaround (how is limitation overcome?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigating with JAWS</td>
<td>Incorrect key strokes may cause her to lose her bearings.</td>
<td>Execute an action through specific hotkeys.</td>
<td>JAWS is doing something other than the intended action.</td>
<td>Other keys may have been hit by mistake.</td>
<td>Keeps trying different key combinations to execute intended action.</td>
</tr>
<tr>
<td>Searching for a CD to play.</td>
<td>Linearly searches all CDs.</td>
<td>To select a specific CD to listen to.</td>
<td>She cannot quickly read CD covers.</td>
<td>CD jewel cases not easily identifiable. Labels do not fit on case spines.</td>
<td>Labeled CDs, mentally organized by preference, read one at a time.</td>
</tr>
</tbody>
</table>
Pattern Matching

• Match observations to predictions
• Researchers believed that Sara would use a range of approaches and workarounds
• Description of tasks in terms of situations that led to difficulties & characteristics of workarounds lead to matches between observations and theory
Developing Models

- Combine observations to develop model or framework
- Higher-level patterns
- Common concerns
- Recurring ideas
- Sara: criteria for technologies
  - Efficiency, portability, distinguishability, suitability for socially appropriate use
- Quantitative data when available
Writing up the Study

- Descriptive – constructive a narrative
- Start early
- Present theories, data, methodologies, analytic steps, and models
- Summaries followed by analysis, or interspersed
- Thematically or chronologically organized
- Tell the story – quotes, specific incidents
More on the writeup

• Rival explanations: show why your observations support your model better than alternatives
• Be cautious in making overly general claims
• Share draft with participants
  – They will tell you if you have details wrong
• Protect participant concerns
  – Privacy/anonymity when possible
Informal Case Studies

• Need “quick-and-dirty” feedback for needs assessment or usability evaluation
• Document successful use of a tool
• Full-blown case study may be overly complicated
• Might forego theoretical background or analytic framework
• But, try to be as rigorous as possible.
• Intermediate steps in larger studies
End-of-chapter

• Summary
• Discussion questions
• Research design exercise