Qualitative Research

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Lecture notes in this series are based on
- Ahmed Sabbir Arif. 2021. Statistical Grounding. *Intelligent Computing for Interactive System Design: Statistics, Digital Signal Processing, and Machine Learning in Practice*, ACM
- Ann Blandford, Dominic Furniss, Stephann Makri. 2016. Qualitative HCI Research: Going Behind the Scenes. Morgan & Claypool
- Jonathan Lazar, Jinjuan Feng, Harry Hochheiser. 2017. Research Methods in Human-Computer Interaction. Morgan Kaufmann
- I. Scott MacKenzie. 2013. Human-Computer Interaction: An Empirical Research Perspective, Morgan Kaufmann
- Interaction Design Foundation. 2022. Design Thinking
- Lecture notes of Amy Bruckman, Mark Dunlop, Niels Henze, I. Scott MacKenzie, Laura Moody, Albrecht Schmidt, Kami Vaniea

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Qualitative Research

- Qualitative research is the process of collecting, analyzing, and interpreting non-numerical data
  - Used to understand how an individual subjectively perceives and gives meaning to their social reality
- Qualitative data is non-numerical data, e.g., text, photos, audio and video clips
  - Collected using a qualitative technique (next slides)
  - Analyzed using grounded theory or thematic analysis (next lecture)
- Methods: observational and correlational

Saul McLeod. 2019. Qualitative vs Quantitative Research. Simply Psychology.

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Scenario

You are developing a solution to let computational systems biologists collaboratively model biological systems. Modelling of biological systems requires the development and use of efficient algorithms, data structures, visualization, and communication tools. It uses computer simulations of cellular subsystems, i.e., the networks of metabolites and enzymes, to analyze and visualize the complex connections of these cellular processes.

Case Study 1: UX Design

Your task is to investigate how users interact with the existing applications, what types of tasks they perform, and what types of challenges they face in interaction and collaboration.

Case Study 2: Research

It is well-documented that the existing applications takes too long to master, don't have efficient tools for error correction, and don't allow for novice-expert collaboration. Your task is to identify what causes these problems then address those in novel input/interaction design.

Qualitative Techniques: Observation

Techniques	Features	Suited for	Considerations
Observation	Observing people working (or performing other activities) and interacting with technologies	Gaining an understanding of what people really do in practice	Without complementary interviews, it can be difficult to make sense of what is observed

- The dimensions on which observational studies may vary:
  - The extent to which participants are aware they are being observed
  - The extent to which obtaining informed consent is necessary
  - The extent to which the observer becomes a participant
  - How realistic the environment in which observation takes place is
  - Whether the observation is of existing systems or a novel technology
  - How structured the observation notes are

Qualitative Techniques: Think-Aloud

Techniques	Features	Suited for	Considerations
Think-Aloud	Users talking through thoughts while interacting with a system or solving a problem	Understanding how people perceive and experience a system, and how they use it to support their work	Requires access to system. Data focuses on the system rather than the broader work context

- Instruction: provide a "stream of consciousness" on what they are thinking:
  1. Focus on interface and interaction
  2. The broad work they are undertaking
- Tasks:
  1. Usual tasks performed with the system
  2. Specific tasks decided by the researcher
- Think aloud does not come naturally to all
  - Asking "what are you thinking" is acceptable when participants fall silent

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Qualitative Techniques: Semi-Struct. Interview

Techniques	Features	Suited for	Considerations
Semi-Structured Interviews	Interviewing people about their work, their experiences of technology, their hopes for future technology, etc.	Gathering people's perceptions and experiences	People have difficulty reporting accurately on what they do

- Usually have the following structure:
  1. Opening the conversation
  2. Introducing the research
  3. Beginning the interview
  4. During the interview:
     - Focus on relevant issues
  5. Closing the interview:
     - Give them a chance to add anything else they want to say

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Qualitative Techniques: Semi-Struct. Interview

Techniques	Features	Suited for	Considerations
Semi-Structured Interviews	Interviewing people about their work, their experiences of technology, their hopes for future technology, etc.	Gathering people's perceptions and experiences	People have difficulty reporting accurately on what they do

- Avoid using leading questions
- Use both broad and narrow questions
- Try to use open rather than closed questions
- Echo participants words
  Participants: *"I wish the feedback was clearer"*
  Researcher: *"You wish the feedback was clearer?"*

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Qualitative Techniques: Focus Groups

Techniques	Features	Suited for	Considerations
Focus Groups	Facilitating a group discussion, most commonly between people with similar backgrounds about the theme or technology of interest	Gathering perceptions and experiences, often with greater breadth but less depth than interviews	Focuses on perceptions rather than actions. Risk of "group think" unless carefully managed

- Researcher takes a role as facilitator
- Main interactions are between the participants
- Present topics that encourage open discussion
- Establish rules to assure quality data, like turn taking
- Assure, views are confidential
- Summarize key themes to check participants agree

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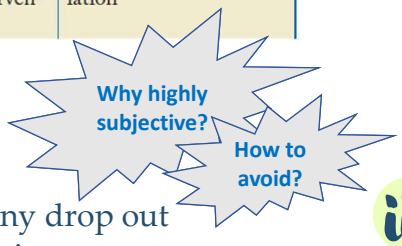
Qualitative Techniques: Diary, Autoethnography

Techniques	Features	Suited for	Considerations
Diary Studies	Participants maintain a diary of relevant actions, experiences or thoughts	Longitudinal data gathering that is situated in the context of use	May be fairly superficial unless participants have a high level of commitment
Autoethnography	Researcher participates in the intervention and maintains a diary of actions, experiences and reflections	Researcher gaining empathy with participants and with others who experience the intervention	Highly subjective, and probably not representative of the user population



- Provide clear instructions (pilot study?)
- Can use audio/video recorders
- Recruit more participants than needed since many drop out
- Autoethnography can be an excellent starting point

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Qualitative Techniques: Existing Sources

Techniques	Features	Suited for	Considerations
Working with Existing Sources	Using existing sources (video, social media, audio, text…) as data for addressing the research problem	Building understanding based on background material	Data was generated for a different purpose and audience, so may not be directly suited to the current research question

- Can't ask questions to users – limited to the available data
- Important to clearly define inclusion and exclusion criteria
  - Transparency is important

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Research Strategies: Theory-Shaped Study

Approach	Features	Suited for	Considerations
Theory-Shaped Study	The design of data gathering and/or analysis is informed and constrained by the selected theory	Testing or extending theory; gaining insights into design or evaluation of system from the selected theoretical perspective	May overlook important considerations that are not covered by the theory

- For example, whether collaborations between programmers can be explained by "distributed cognition"
- Data might not fit the theory
  - Adjust the focus of the investigation

Research Strategies: Ethnomethodology

Approach	Features	Suited for	Considerations
Ethnomethodology	Data gathering and analysis shaped by the ethnomethodological focus on how workers perform and "make sense" of their work	Gaining insights for design based on how people work and make sense of their work	May overlook important considerations that are not covered by the approach

- Focus on the people
- Represents perspective of the people, without theorizing
  - Pay attention, don't jump to conclusion
  - Keep comprehensive notes

Research Strategies: Contextual Inquiry

Approach	Features	Suited for	Considerations
Contextual Inquiry	Data gathering and preliminary analysis shaped by the constructs and questions of CI (information flow, artefact use, etc.)	Gaining insights for design based on information flow, how current artefacts are used, etc., within work	May overlook important considerations that are not covered by the CI models; not suited to mobile settings

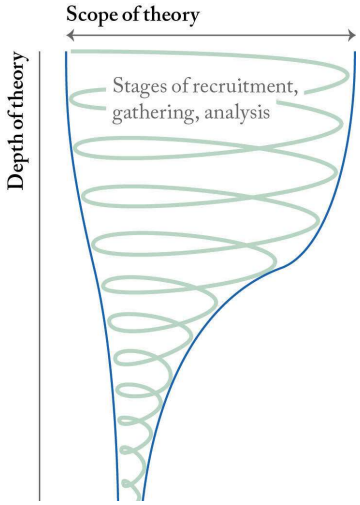
- Involves interleaving observations and interviews within the work setting

Research Strategies: Part. Obs., Action Research

Approach	Features	Suited for	Considerations
Participant Observation	The researcher participates (to a greater or lesser extent) in the setting being studied	Getting immersed in the activity and experiencing something similar to what others experience in that situation	It is not always possible to participate meaningfully in the activity; requires reflexivity to understand one's own role in the situation
Action Research	Involves an intervention—e.g., introducing a new technology or process—and studying the effect of that intervention on work and user experience	Introducing innovations into the situation and understanding their effect on practice	Can be difficult to discern the effects that are attributable to the intervention; requires reflexivity

- Both involve researchers getting involved in the study as gathering data

Grounded Theory



- Grounded theory involves constructing hypotheses and theories through the process of collecting and analysis data
- The scope of the theory generated starts off broad, narrowing as we learn more

Research Strategies: Grounded Theory

Approach	Features	Suited for	Considerations
Grounded Theory	Involves interleaving data gathering (usually interviews) with analysis; focuses on systematically developing theory in its strongest form	Developing new theory from data	Depth of analysis may be disproportionate for small studies

- Grounded theory is not a theory but an approach to theory development
- Must involves:
  - Interleaving between data gathering and analysis
  - Avoid bringing pre-conceived expectations
  - Use theoretical sampling
  - Conduct constant comparative analysis
    - Findings are constantly compared with each other

Questionnaire

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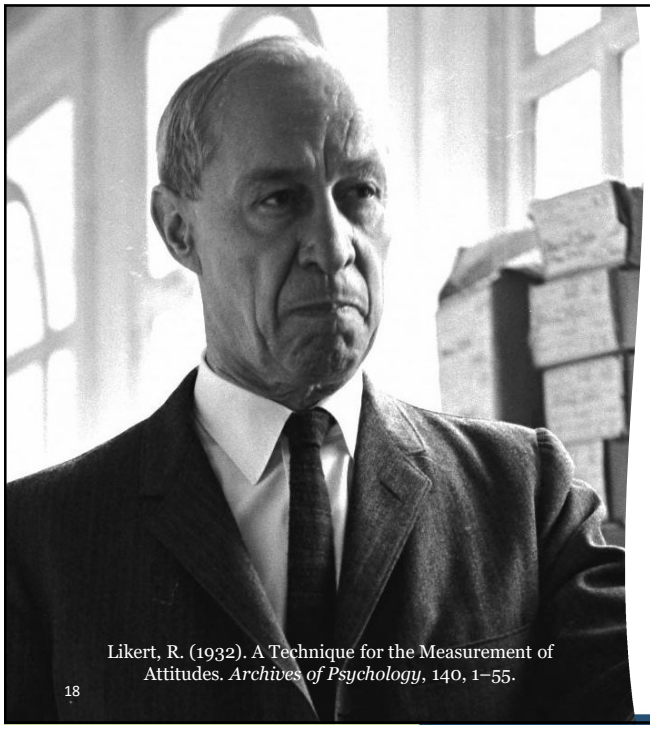

Likert, R. (1932). A Technique for the Measurement of Attitudes. *Archives of Psychology*, 140, 1–55.

Likert Scale

- American social psychologist Rensis Likert developed Likert scale in 1932
- Likert scale is used to allow participants to express how much they agree or disagree with a particular statement
- Researchers use Likert scale when they are seeking a greater degree of nuance than possible from a simple "yes or no" question

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Likert Scale: Structure

- Consists of a statement, followed by a range of options to allow respondents indicate their positive-to-negative strength of agreement
- Respondents choose the option that best corresponds with how they feel about the statement

1. The new numeric keyboard reduced number editing time.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree

Laxmi Pandey, Azar Alizadeh, Ahmed Sabbir Arif. 2020. Enabling Predictive Number Entry and Editing on Touchscreen-Based Mobile Devices. In *Proceedings of the 2020 Conference on Human Information Interaction and Retrieval* (CHIIR 2020). ACM, New York, NY, USA, 13–22.

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Likert Scale: Structure

- Likert scales are typically odd-point to allow neutral answer

1. The new numeric keyboard reduced number editing time.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree

Laxmi Pandey, Azar Alizadeh, Ahmed Sabbir Arif. 2020. Enabling Predictive Number Entry and Editing on Touchscreen-Based Mobile Devices. In *Proceedings of the 2020 Conference on Human Information Interaction and Retrieval* (CHIIR 2020). ACM, New York, NY, USA, 13–22.

- An even number of options on either end of the neutral option move toward the polar opposite responses
- Five- and seven-point scales are the most popular

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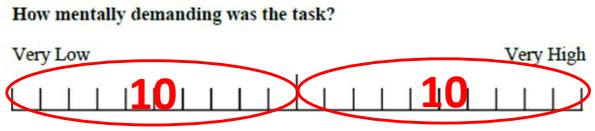
Likert Scale: Structure

- Even-point scale is rarely used
  - When the middle option is not available
  - To induce a "forced choice" by removing the neutral option



Hart, S. G., Staveland, L. E. 1988. Development of NASA-TLX (Task Load Index): Results of Empirical and Theoretical Research. In Hancock, Peter A.; Meshkati, Najmedin (eds.). Human Mental Workload. Advances in Psychology. Vol. 52. Amsterdam: North Holland. pp. 139–183.

- Likert scale can also ask a question
  - Follow the same guideline as interview questions

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Likert Scale: Structure

- In addition to measuring strength of agreement, Likert scales can measure:

Agreement	*Strongly Agree*	*Agree*	*Undecided*	*Disagree*	*Strongly Disagree*
Frequency	*Always*	*Often*	*Sometimes*	*Rarely*	*Never*
Importance	*Very Important*	*Important*	*Moderately Important*	*Slightly Important*	*Unimportant*
Quality	*Excellent*	*Good*	*Fair*	*Poor*	*Very Poor*
Likelihood	*Almost Always True*	*Usually True*	*Occasionally True*	*Usually Not True*	*Rarely True*
Likelihood	*Definitely*	*Probably*	*Possibly*	*Probably Not*	*Definitely Not*

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Likert Scale: Qualitative? Limitations?

- Collects numbers, but the data is ordinal (more on this later)
- Likert scales can be subject to distortion as respondents may:
  - Central tendency bias: avoid using extreme response categories
  - Acquiescence bias: agree with statements as presented
  - Novelty factor
  - Respondents may also agree/disagree:
    - To avoid making erroneous statements
    - Out of fear of retaliation
    - With the belief that it will be seen as strength or will be more favorable to the examiner or society "faking good"
    - With the belief that it will be seen as weakness or will be less favorable to the examiner or society "faking bad"

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Likert Scale: Validation

- Likert scale can be validated using a variety of methods:
  - Face validity: the extent to which a scale appears to measure what it is intended to measure
  - Content validity: the extent to which a scale covers all aspects of the construct being measured
  - Criterion validity: the extent to which a scale correlates with an external criterion
  - Construct validity: the extent to which a scale measures the construct it is intended to measure

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Common Usability Questionnaires

Instrument	Acronym	Reference
After Scenario Questionnaire	ASQ	Lewis, 1995
Computer System Usability Questionnaire	CSUQ	Lewis, 1995
Nielsen's Attributes of Usability	NAU	Nielsen, 1993
Nielsen's Heuristic Evaluation	NHE	Nielsen, 1993
Perceived Usefulness and Ease of Use	PUEU	Davis, 1989
Practical Heuristics for Usability Evaluation	PHUE	Perlman, 1997
Purdue Usability Testing Questionnaire	PUTQ	Lin et al, 1997
Questionnaire for User Interface Satisfaction	QUIS	Chin et al, 1988
System Usability Scale	SUS	Brooke, 1995
Technology Acceptance Model Satisfaction Questionnaire	TAM	Davis, 1989
USE Questionnaire	USE	Lund, 2001
User Experience Questionnaire	UEQ	Laugwitz et. al, 2008

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Other Common Questionnaires

Domain	Instrument	Acronym	Reference
Media/ VR	Immersive Tendencies Questionnaire	ITQ	Witmer & Singer, 1998
	Presence Questionnaire	PQ	Witmer & Singer, 1998
	Simulator Sickness Questionnaire	SSQ	Kennedy et al., 1993
Game	Game Experience Questionnaire	GE	Poels et al., 2007
Workload	NASA-Task Load index Questionnaire	NASA-TLX	Hart & Staveland, 1988
	Subjective Workload Assessment Technique	SWAT	Reid & Nygren, 1988

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