INFO3315 Human-Computer Interaction

Lecture 4 – Requirements. Data Gathering

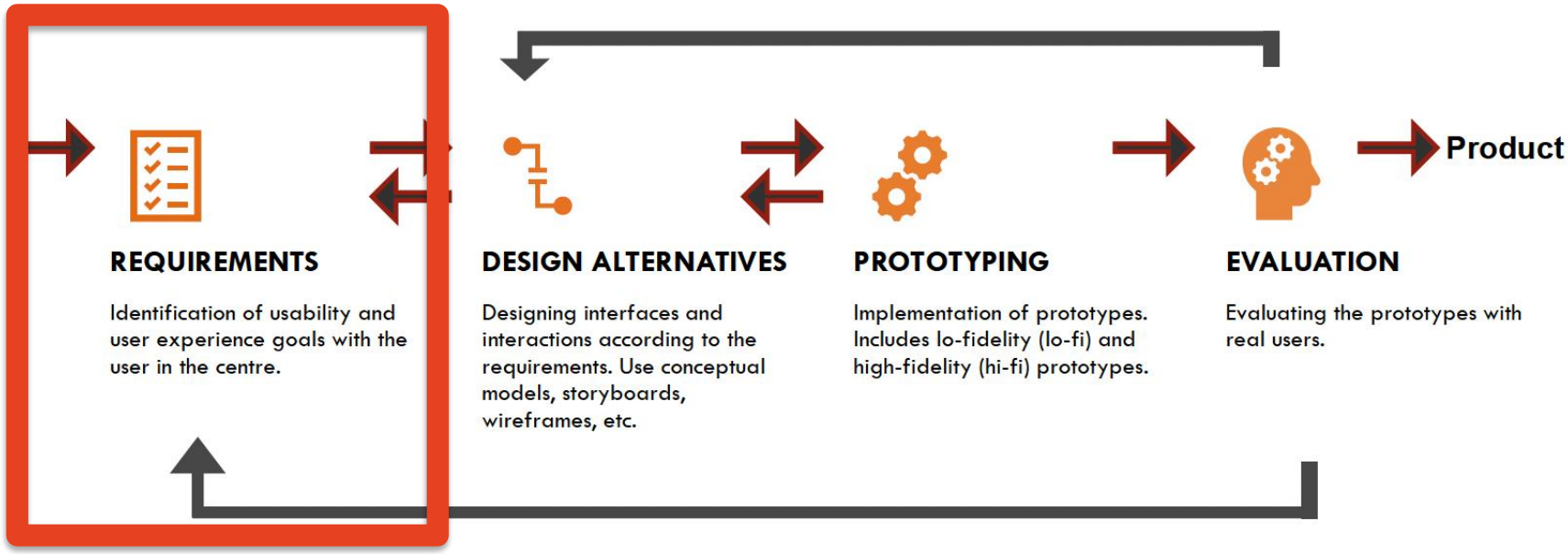


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Recap

- Interaction Design
- UX Design Process: Double Diamond Model
- Lifecycle Model
- AgileUX
- Key Principles of UCD
- PACT Framework

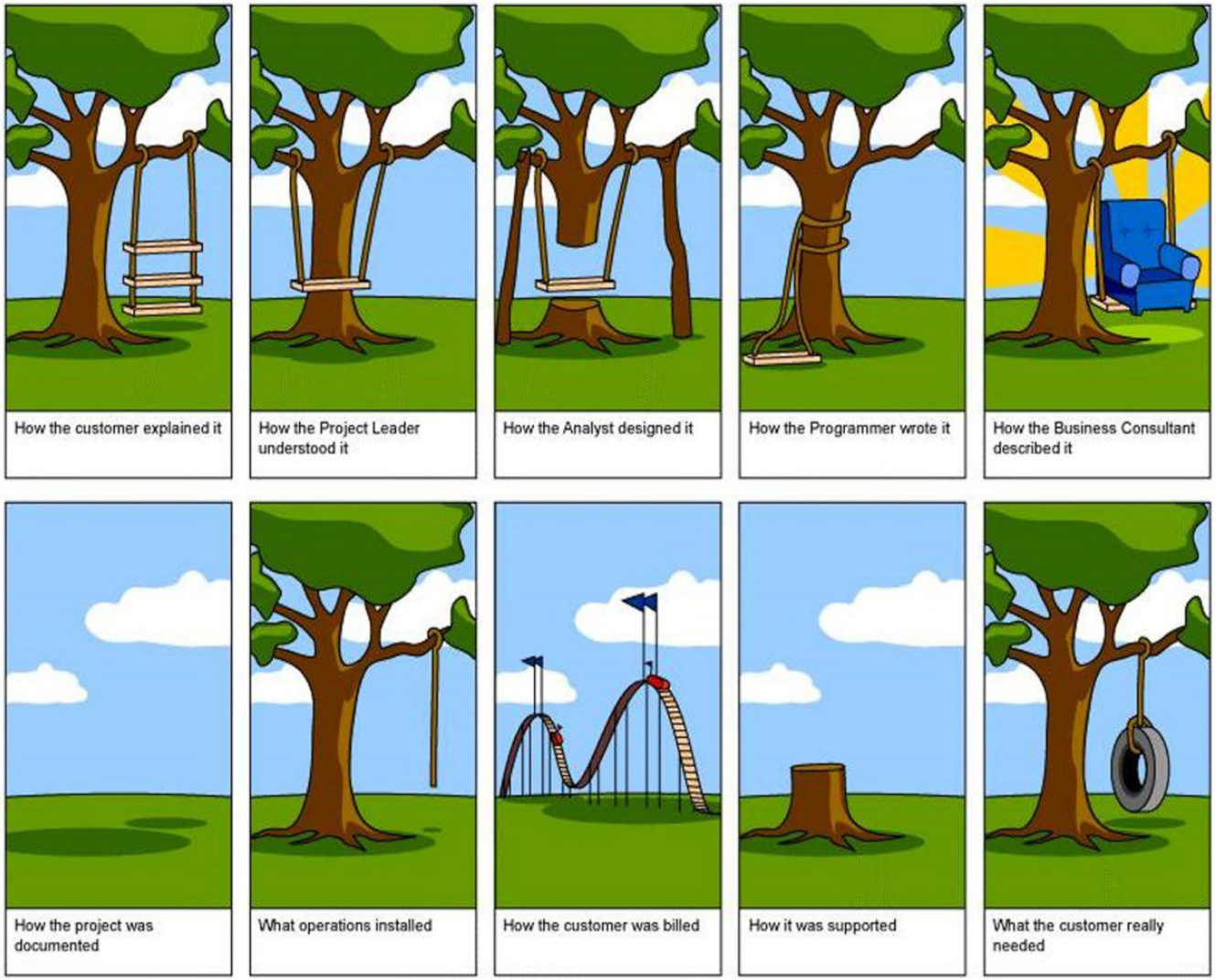
Interaction Design – Basic Activities



What are requirements?

- A statement about an intended product that specifies what it is expected to do or how it will perform
  - A requirement for a smartwatch GPS app:
    - "the time to load a map is less than half a second".
- Different forms and different levels of abstraction
  - E.g. User stories (most prevalent in agile development contexts)
  - As a <role>, I want <behaviour> so that <benefit>
    - As a <traveller>, I want <to save my favourite airline for all my flights> so that <I will be able to collect air miles>

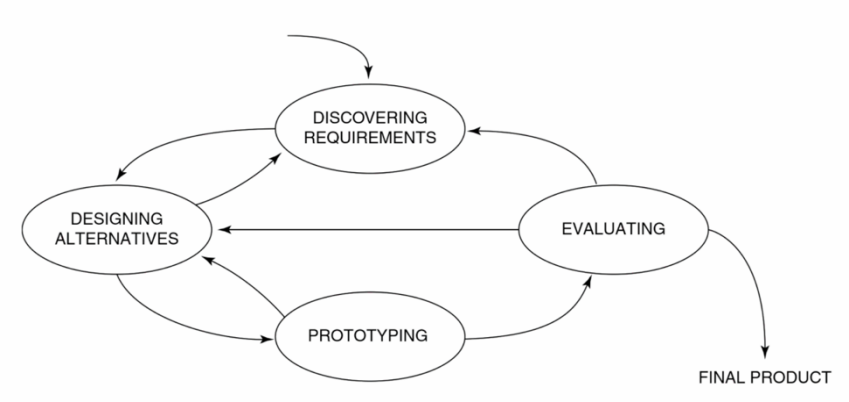
Why bother?



- This is where **miscommunication** occurs most commonly
- Fixing errors at a later phase is very **costly**
- Getting requirements right is **crucial**

Requirements in reality

- May come from several sources – users, business, application of technology
- May evolve and develop as the stakeholders interact with designs.
- May be represented in different formats.
  - Supplement requirements with supporting evidence to help understand the reasoning behind the requirement



Requirements types

- Design a product that allows an individual/family to plan a balance diet using weekly promotional items from their local groceries. The product must factor in the current lifestyle, food preferences and allergies (if any) to ensure that the product recommends adoptable diets.
  - Functional Requirements
  - Data Requirements
  - Environment Requirements
  - User Requirements
  - Usability Requirements
  - User Experience Requirements

Requirements types

- **Functional requirements**
  - What the system should do?
    - E.g., The system must generate a weekly meal plan based on grocery promotional items, user preferences, and allergy restrictions.
    - Irrelevant example: E.g., A robot in a car assembly plant should be able to weld together the correct pieces of metal accurately

Requirements types

- **Data requirements**
  - What kinds of data need to be stored and how?
  - The type, volatility, size/amount, persistence, accuracy, and value of the required data
  - In database or files
    - E.g., The system must securely store user data, including dietary preferences, allergy information, and family size.
    - Irrelevant example, E.g. In a personal banking application, data must be accurate and persist over many months and probably years

Requirements types

- **Environment requirements (or context of use)**
  - Physical
    - dusty? noisy? vibration? light? heat? humidity? …. (for example, in a hospital)
  - Social
    - collaboration and co-ordination, data sharing, distributed, synchronous or asynchronous, privacy
      - E.g., The product must integrate with local grocery store APIs to fetch promotional data weekly.
  - Organizational
    - user support, communications structure and infrastructure, availability of training
  - Technical
    - On what technologies will it run or need to be compatible?
      - E.g., The product must run on both desktop and mobile devices with internet access.

Requirements types

- **User requirements (Who are the users?)**
  - *Characteristics*
    - Background, language, educational background, preferences, personal circumstances, physical or mental disabilities
      - E.g., As a user, I need to easily filter out foods I am allergic to, so I can safely follow the meal plan.
  - *System use*
    - Novice: clear step-by-step guidance, constrained
    - Expert: flexibility, access to advance features
    - Frequent: shortcuts
    - Casual/infrequent: clear menu paths
- Collectively called a **user profile**

Requirements types

- **Usability / User Experience requirements**
  - Usability goals and user experience goals →Week 2
  - Evaluate performance of the system
- E.g., The product must provide clear error messages if a user enters invalid data (e.g., non-numeric age)
- E.g., The product should offer positive reinforcement (e.g., badges, encouraging messages) to improve adherence.

Prioritising requirements

- **M**ust have
  - Fundamental requirements
  - Minimum usable subset
- **S**hould have
  - Essential if have more time
  - System still usable without it
- **C**ould have
  - Can be left out of current development
- **W**ant to have but **W**on't have this time round
  - Can wait until a later development

MoSCoW

Other models

- Kano model
- Relative weighting method
- Opportunity Scoring
- Stack Ranking
- Priority Poker
- Cost of Delay
- 100 Dollar Test

Summary

- Requirement is a statement about an intended product that specifies what is expected to do or how it will perform
- Different kinds of requirements:
  - **Functional** >> what it does
  - **Data** >> what it needs
  - **Environment** >> where/how it runs
  - **User** >> what users need
  - **Usability** >> how easy it is to use
  - **UX** >> how it makes users feel
- Design projects usually have limited resources. E.g., MoSCoW rules can be used to prioritize requirements.

Now on to gathering requirements/data



https://www.linkedin.com/pulse/prepare-before-gathering-requirements-business-analysts-cetin

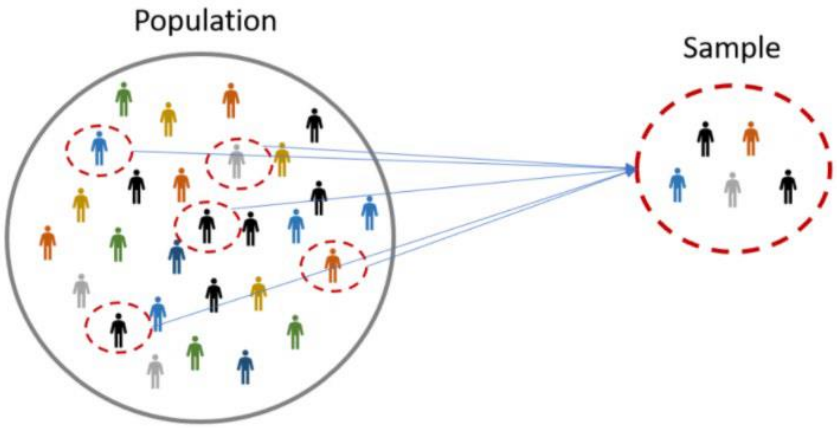
Five key issues

- 1. Setting goals
  - Purpose of requirements (data) gathering session
  - Influence choice of data gathering technique
  - Decide how to analyse data once collected



Five key issues

- 2. Decide from whom to gather data
  - How many participants are needed (more than one)?
  - Do you need to involve all the stakeholder groups?
  - Two major types of sampling:
    - Probabilistic sampling
    - Non-probabilistic sampling





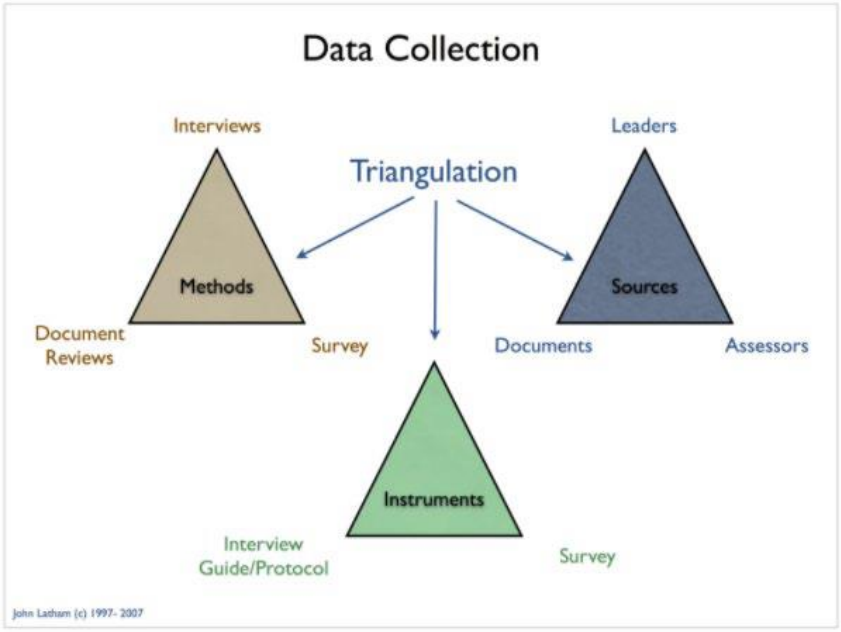
https://www.omniconvert.com/what-is/sample-size/
https://www.insightsintoimpact.com/3-reasons-why-your-staff-might-not-care-about-your-data

Five key issues

- 3. Relationship with participants
  - Clear and professional
  - Informed consent when appropriate
  - Participant Information Sheet (PIS) – purpose of study, type of data that is collected, how data is reported, stored and disposed, personnel with access to data.
  - Consent form:
    - Signed by participant/legal guardian
    - Permission to collect and conditions to use data.

Five key issues

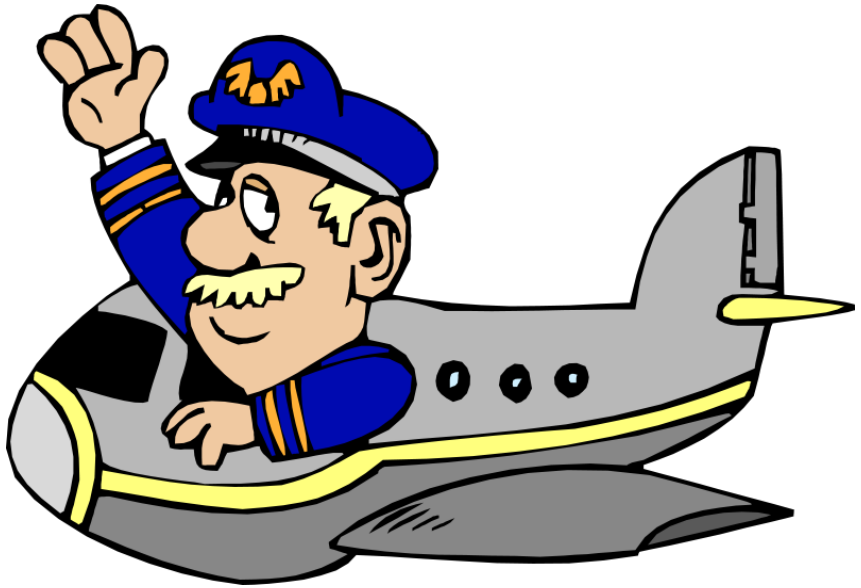
- 4. Triangulation
  - Look at data from more than one perspective
  - Collect more than one type of data/method
    - for instance, quantitative data from experiments and qualitative data from interviews
  - Data validation



https://www.drjohnlatham.com/frameworks/research-methods-framework/data-collection/

Five key issues

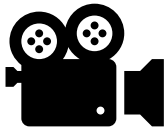
- 5. Pilot studies!
  - Small trial of the main study
  - Test run questions and analysis approach
  - Make adjustments if you are not getting the information that you are expecting



Data recording

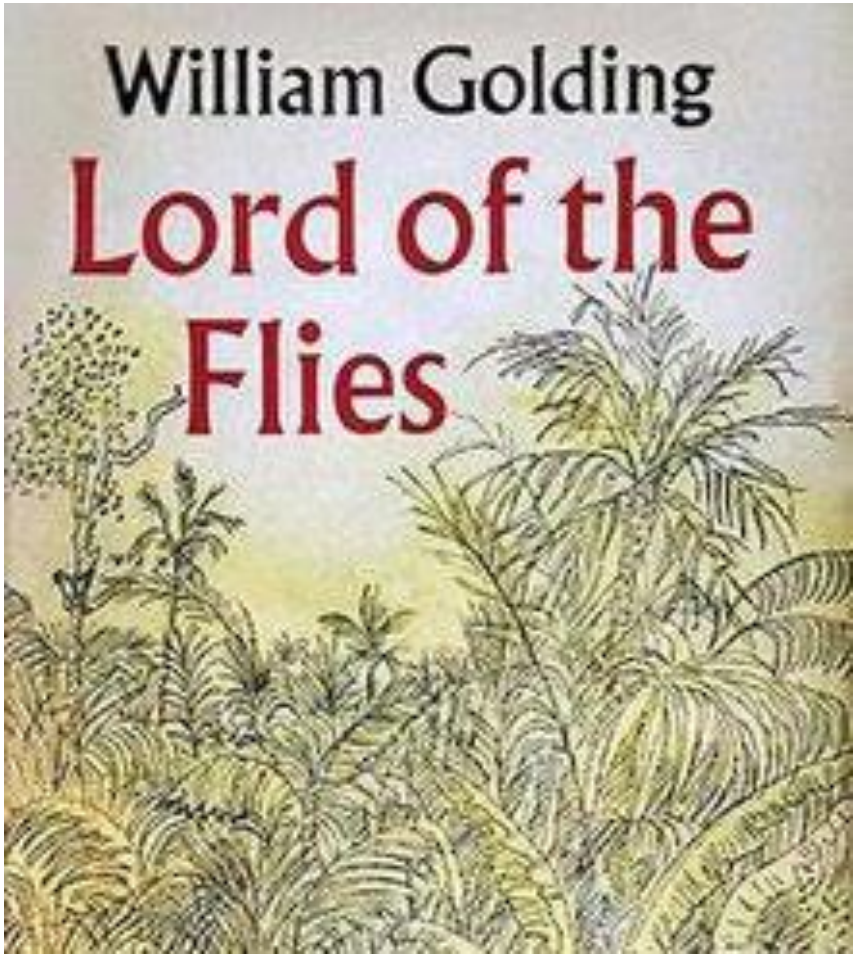
- Notes, audio, video, and photographs can be used individually or in combination






Example

- How long would you take to do these?
  - Read the book (224 pages)
  - Read own notes on the book
  - Look at still-shots of the movie
  - Listen to the audio recording of the movie
  - Watch the movie

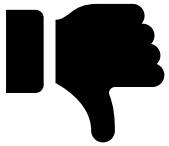


Notes

- Notes
  - Gives the analyst a good overview
  - Less intrusive and more flexible
    - Can write, draw, annotate
  - Helps to focus on what is important



  - Writing and decipher is difficult and slow
  - Easy to lose concentration
  - Biases creep in



- Working with a colleague can help

Audio / Video

- Audio plus photographs
  - A useful alternative to note-taking
  - Provide added context to the analysis
- Video
  - Short video clips of activity
- Both methods need:
  - Special permission and leads to privacy issues
  - Have to ensure quality (sound level, camera angle, etc.)

Data gathering techniques

- Survey
- Interviews
- Focus groups
- Observations
- Contextual inquiry
- Ethnography
- Studying documentation

Survey

- A set of well-defined and well-written questions to which an individual is asked to respond.
- Normally self-administered by an individual without the researcher present.
- They can be administered to large populations
  - Disseminated by paper, email and the web
- Questionnaire vs survey?
  - Survey – complete methodological approach
  - Questionnaire – actual list of questions
  - Both terms often used interchangeably

Survey

- Appropriate for measuring attitudes, awareness, intent, feedback about user experiences, characteristics of users and over-time comparisons.
- Provides overview or "snapshot" of a user population.
- Well-designed questionnaires can make statistically accurate estimates of a population
- Less appropriate for precise measurements or identifying usability problems in an interface

Practical considerations

- Target respondents of the questionnaire
  - Purpose of the research
  - Recruitment and sampling
- Questionnaire design
  - Type of questions
  - Structure of questionnaire
- Mode of administration
  - Paper, email and the web

Good reference book

Lazar, J., Feng, J., & Hochheiser, H. (2017). *Research Methods in Human-Computer Interaction* (pp. 105–131). Elsevier Inc. Chapter 5.

Recruitment

- Define the target population that you want to study.
  - Age, gender, education, computer experience
  - Users of certain websites, applications, OS?
- How many people are in the target population?
  - Determines sampling method
- How do you contact the members of the target population?
  - A directory
  - Membership list
  - Social networking group

Sampling

- Two major types of sampling:
  - Probabilistic sampling – known probability of someone being chosen
  - Non-probabilistic sampling – unknown likelihood of being chosen
- Non-probabilistic sampling is accepted in HCI research although some social science do not believe in it.
  - Combine with other research methods
- Choice dependent on the purpose of the research

Probabilistic sampling

- Census – a survey response from every member of the population.

- Random sampling – not all people are chosen to participate but it is known what the likelihood is of being chosen to participate

- Stratified sampling – appropriate number of responses from each subset of your user population

Non-probabilistic sampling

- This sampling is used when:
  - Not using a strict random sample
  - Not knowing the likelihood of an individual being selected
  - Not interested in population estimate
  - Not clearly defined population of interest
- Approaches:
  - Snowball recruitment – respondents recruit other potential respondents
  - Self-selected surveys – people click on links on website or social networking
  - Volunteer
- Don't forget to collect demographic data

Questionnaire design

- You may need different versions of the questionnaire for different populations
- Types of questions:
  - Open-ended Responses
  - Closed-ended Responses
    - Ordered
    - Unordered

Open-ended responses

- Useful in getting a better understanding of phenomena
- Must be carefully worded otherwise might lead to responses that are useless.
- Example:
  - *Why did you stop using the Banjee Software product?*
  - *How did you feel about the usability (ease of use) of the Banjee software?*
  - *Did the Banjee software allow you to complete the tasks that you wanted to complete?*

Closed-ended responses

- **Ordered Responses**
  - Number of choices can be given, which have some logical order.
  - Single choice selection
  - Examples: Ranking
  - Likert scale

2. The use of color is excellent:

Strongly agree	Agree	OK	Disagree	Strongly disagree
☐	☐	☐	☐	☐

What is your impression of using the website for www.veggieworld.com?

Please circle one number

Frustrating Satisfying

1 2 3 4 5 6 7 8 9

- **Unordered Responses**
  - Number of choices can be given but no order in responses
  - Either single or multiple-choice selections
  - Examples:
  - Preference applications
  - Demographic information

Which application do you use most often for text editing? (please select only one)

___MS-Word
___WordPerfect
___Google Docs
___OpenOffice Writer
___WordPad
___QuickOffice
___Other (please specify)

Overall structure

- Must begin with instructions:
  - On paper, should checkboxes and ovals be filled in, checked or 'X' placed in them?
  - Should all respondents fill out all questions?
  - Reminder who qualifies to participate and who does not

- Each section of the survey should have a heading. Questions related to a similar topic should be grouped together
- What path through the survey should the respondent take?
- If some questions are "contingent" make that clear using arrows, boxes, and indenting

Overall structure

- If the survey is electronic, are help links provided?
- Is contact info (e-mail, phone, web site, etc.) provided if the respondent has any questions?
- Be reasonable about the length of the survey
- Preview survey to make sure layout is preserved especially on different modes (e.g., different screens)
  - Paper survey has sufficient space for responses, questions are split between two pages
  - Electronic survey – displays correctly on different devices

Mode of administration

- Different ways of distributing surveys – paper or electronic or combination of both
- Selection depends on contact method with the user population of interest:
  - Physical visit or postal address – paper
  - E-mail address or forums – electronic
- Many different web-based tools:
  - Qualtrics
  - SurveyMonkey
  - Google Form
  - Microsoft Form

Deploying online questionnaires

- Plan the timeline
- Design offline
- Program/complete online template
- Test the survey to make sure that it behaves as you would expect
- Test it with a group that will not be part of the survey to check that the questions are clear
- Recruit participants

Existing surveys

- Tested and validated in research literature in HCI.
- Example survey tools for usability testing and evaluation:
  - System Usability Scale Questionnaire (SUS)
  - Computer System Usability Questionnaire(CSUQ)
  - Questionnaire for User Interaction Satisfaction (QUIS)
  - Website Analysis and MeasureMent Inventory (WAMMI)

Survey

- **Advantages**
  - Able to collect large number of responses quickly from population of users that is geographically dispersed
  - Does not require special equipment (for paper versions)
  - Low cost
  - Non-intrusive
- **Disadvantages**
  - Sampling is problematic if population size is unknown
  - Data is “shallow”
  - Unable to follow-up immediately
  - Biased data when the questions are related to patterns of usage rather than factual phenomenon

Data gathering techniques

- ~~Survey~~
- Interviews
- Focus groups
- Observations
- Contextual inquiry
- Ethnography
- Studying documentation

In-class activity

- Week 4 – In-Class Quiz
- 5 mins

Interviews

- Guided conversation which one person seeks information from another.
- Can be used in almost any phase of a project:
  1. Initial exploration
  2. Requirements gathering
  3. Evaluation and subjective reactions
- NOT appropriate if you are looking for information from large sample of population.
- Takes significant time and resources to conduct.

Types of Interviews



- **Unstructured**
  - List of topics or questions as guide.
  - Start of with initial question and let interviewee discuss topic of choice.
  - If conversation is stalled, introduce another topic from guide.
  - Allows interviewee to focus on topics/ concerns they find important
- **Semi-structured**
  - More room to get clarification
  - Start with a set of questions, which may be similar to questions used in a fully structured interview.
  - Probe depending on response
- **Fully structured**
  - Use rigid script to present question in a well-defined order
  - Easy to analyze
  - Difficult to follow-up if answer is unanticipated

Strategy – Which structure to use?

- **Unstructured/Semi-structured**
  - Appropriate when you do deep digging – search of critical comments, design requirements
  - Unfamiliar with problem domain or set of users
  - Participants educate you to understand their needs and potentially help you generate appropriate questions for subsequent structured interview.
- **Fully structured**
  - Appropriate when you hope to compare responses across individuals.
  - Example:
  - Understand user responses to designs/systems



Other forms of interviews

- Digital conferencing systems
  - Skype, Zoom, etc

- Some advantages are:
  - Participants are in their own environment
  - No need to travel
  - For sensitive issues, participants can be anonymous

Planning an interview

1. Identify objectives of the study
2. Select type of interview
3. Decide now how will you analyze the data
4. Write the questions
5. Test your questions
6. Determine players in the activity
7. Prepare activity materials

Creating the questions

- If you have many questions, consider breaking the interview into multiple sessions.
- Do not conduct sessions beyond two hours without any break.
- Word the questions so they are clear, understandable and impartial.
- Keep it short. Difficult for people to remember long, multiple-part questions.
- Avoid double-barreled questions that address more than one issue at a time or double negatives.

Running the interview

- **Introduction**
  - Introduce yourself, explain the goals, reassure about the ethical issues, ask to record, present the informed consent form, and capture demographic information
- **Warm-up**
  - Make first question easy and non-threatening.
- **Main body**
  - Present questions in a logical order, ask most important questions
- **A cool-off period**
  - Include a few easy questions to defuse tension at the end
- **Closure**
  - Thank interviewee, signal the end, for example: switch recorder off



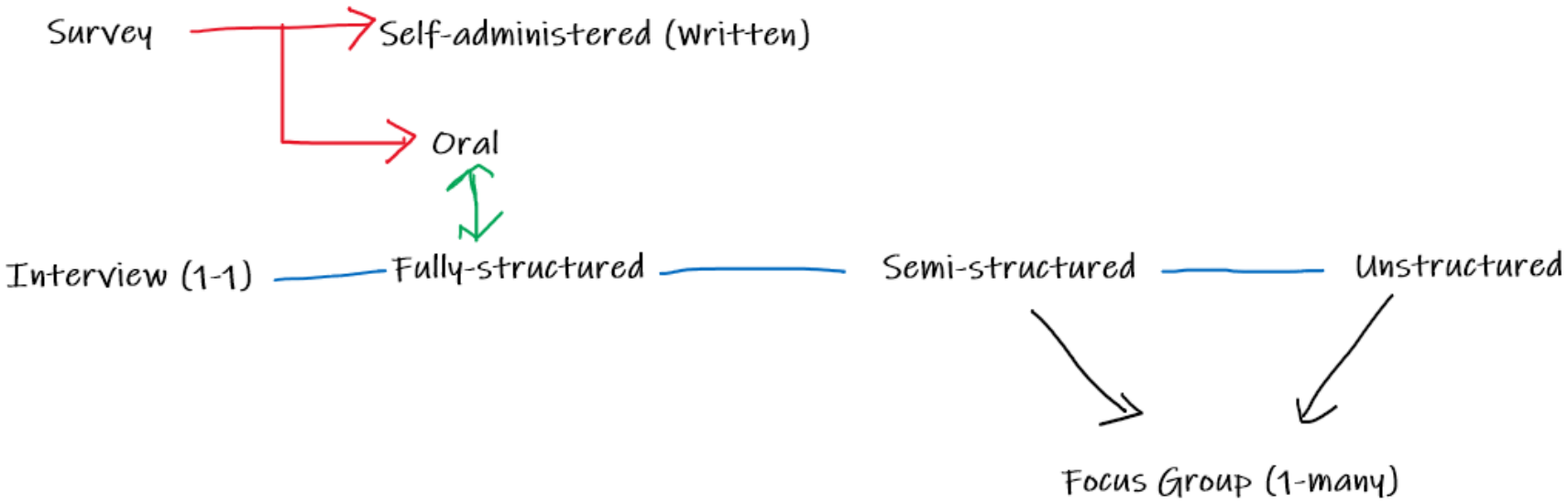
Interviews: Things to note

- Don't pre-empt an answer
  - "You seemed to like this use of colour …"
- The body language of the interviewer matters
  - Smiling, looking disapproving have a strong influence on agreement
  - Participant may agree with whatever the interviewer suggests in the belief that is what the interviewer wants to hear
- Prestige response bias: Participant tries to agree with the certain statements

Interview

- **Advantages**
  - Collect ‘deep’ data
  - Can be open-ended and exploratory
- **Disadvantages**
  - Potential unbounded discussions
  - High effort to conduct – skill, resources
  - High amount of data
  - Problems of recall

Survey – Interview – Focus group



Focus groups

- Interview people in groups
  - A representative sample of the target population
  - Normally, three to ten people are involved led by a trained facilitator
  - For example, in the evaluation of a university website
    - 2 x administrators, 3 x faculty, and 3 x students → one 'diverse' group
    - Groups of administrators, faculty and students → three 'homogenous' groups
- The facilitator guides and prompts discussion
  - Encourages quiet people to participate
  - Stops verbose ones from dominating the discussion
  - https://youtu.be/0sSZTWp21Fk

Focus groups

- Appropriate for investigating shared issues rather than individual experiences
- A pre-set agenda with the flexibility to follow unanticipated issues as they are raised
- Example:
  - https://youtu.be/yGsHq-mZI8U

Focus groups

- **Advantages**
  - Allows diverse or sensitive issues to be raised
  - Multiple points within a collaborative process
  - Good at gaining a consensus view
  - Increase interactivity between participants
- **Disadvantages**
  - Inappropriate for controversial topics
  - Depends highly on people in the group
  - High effort to conduct – skill, resources

Data gathering techniques

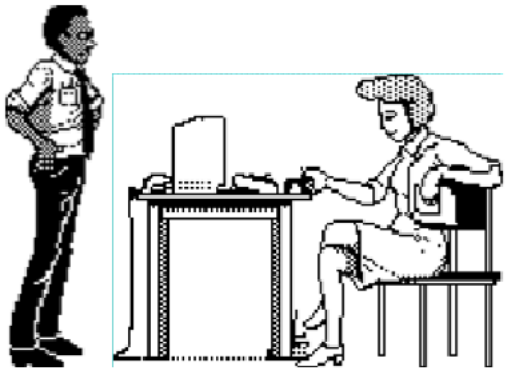
- ~~Survey~~
- ~~Interviews~~
- ~~Focus groups~~
- Observations
- Contextual inquiry
- Ethnography
- Studying documentation

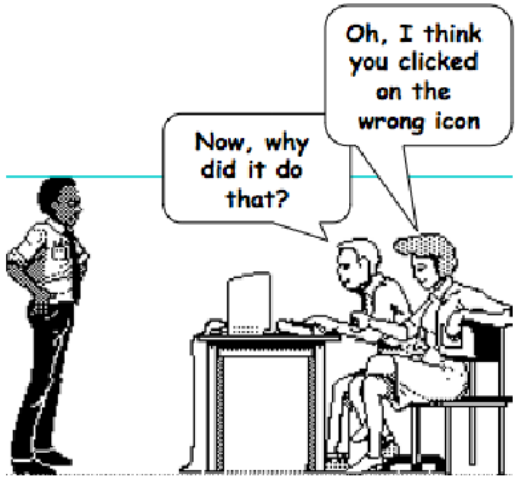
Observations

- **Direct observations**
  - Observed directly by the investigator as they perform their activities
  - Requires time and commitment from a member of the design team
  - Can result in a huge amount of data
- **Indirect observations**
  - Through records of the activity that are studied afterward
    - Diaries
    - Interaction logging
    - Video and photographs collected remotely

Direct observations

- Silent observation
  - Designer watches user while user is working
  - No communication during observation
- Think aloud
  - Direct user to say thought process
- Constructive interaction
  - Two people work on the task together and conversation is observed





Framework for observation

- Three easy-to-remember parts:
  - **The person**: Who?
  - **The place**: Where?
  - **The thing**: What?
- A more detailed framework (Robson, 2014):
  - **Space**: What is the physical space like and how is it laid out?
  - **Actors**: What are the names and relevant details of the people involved?
  - **Activities**: What are the actors doing and why?
  - **Objects**: What physical objects are present, such as furniture
  - **Acts**: What are specific individual actions?
  - **Events**: Is what you observe part of a special event?
  - **Time**: What is the sequence of events?
  - **Goals**: What are the actors trying to accomplish?
  - **Feelings**: What is the mood of the group and of individuals?

Indirect observations

- Interaction Logging
  - Software record user's activity in a log for examination later
  - Time spent on a page, mouse clicks
  - Unobtrusive to participants but issue of participants privacy if done without their knowledge
- Diaries
  - Good at studying usage patterns and when the activity is private
  - Users log information at regular intervals or when event happens
  - Two types of diaries:
    - Feedback – Data collected provides feedback for researchers
    - Elicitation – Data collected used to collect further information on the event at a later point
  - More accurate time recording than survey

Conducting a diary study

- Identify purpose of the study and its participants.
- Identify information that is to be collected.
  - Type of media capture -text, video, voice, images?
  - Choose media that will be most natural for the diarists in their everyday life.
  - Structure of the diary entries:
    - Fully structured –set of questions during each entry
    - Unstructured –general instructions provided and participants record entries in free-form.
  - Diary should not burden the lives of the diarists.
- Recruit participants
- Instruct participants of important information (goal of study, type of activities that are of interest, when to make diary recordings and definition of terminologies, duration of study)

Good reference book

Lazar, J., Feng, J., & Hochheiser, H. (2017). *Research Methods in Human-Computer Interaction* (pp. 105–131). Elsevier Inc. Chapter 6.

Overview of techniques

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

Data gathering techniques

- ~~Survey~~
- ~~Interviews~~
- ~~Focus groups~~
- ~~Observations~~
- Contextual inquiry
- Ethnography
- Studying documentation

Contextual inquiry

- Combination of interview and observation
- Four main principles:
- **Context**: Going to the user, wherever they are, and seeing what they do as they do it
- **Partnership**: User and interviewer explore user's life together
- **Interpretation**: Observations interpreted by user and interviewer together
- **Focus**: Guide interview setup and focus of inquiry.

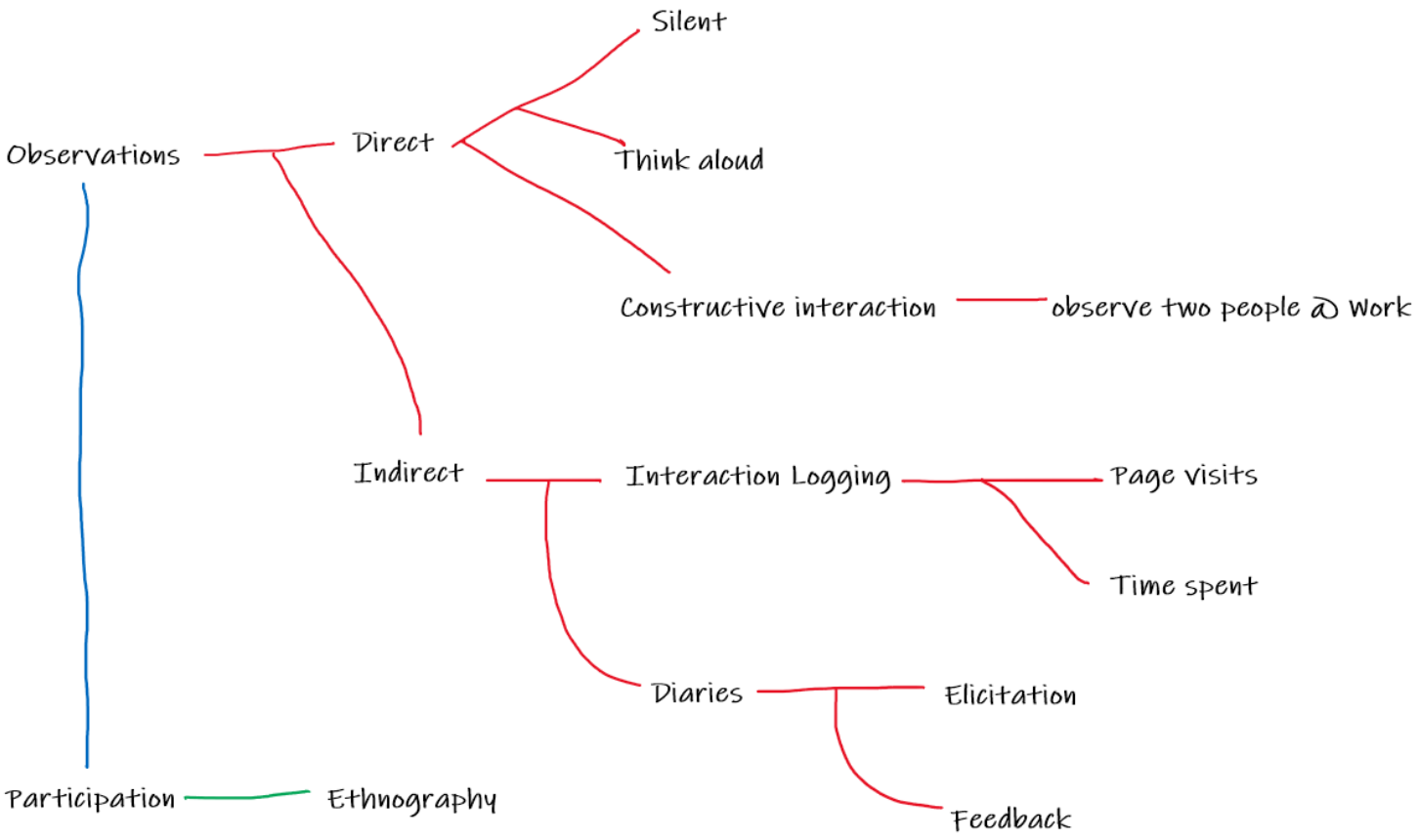
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Ethnography

- Combination of interview and observation
- Ethnographers immerse themselves in the culture that they study
- A researcher's degree of participation can vary (full participation or full observer) and affect study
- Requires cooperation of and acceptance from people being observed
- Requires skills to conduct (simultaneous collection and analysis of data) and skills on the job (full or partial participation)
- Example Research: https://dl.acm.org/doi/abs/10.1145/3290605.3300840

Observations – Ethnography



Data gathering techniques

- ~~Survey~~
- ~~Interviews~~
- ~~Focus groups~~
- ~~Observations~~
- ~~Contextual inquiry~~
- ~~Ethnography~~
- Studying documentation

Studying documentation

- Procedures and rules are often written down in manuals
- Good source of data about the steps involved in an activity and any regulations governing a task
- Not to be used in isolation
- Good for understanding legislation and getting background information
- No stakeholder time, which is a limiting factor for other techniques

Data gathering techniques

- ~~Survey~~
- ~~Interviews~~
- ~~Focus groups~~
- ~~Observations~~
- ~~Contextual inquiry~~
- ~~Ethnography~~
- ~~Studying documentation~~

Choosing the right technique

- Focus of the study
  - What is the purpose of the study?
  - What kind of data do you need and why?
- Participants involved
  - What are the characteristics of the target user group?
  - What type of access do you have to these people?
- Nature of technique
  - Does the technique require specialist equipment or training?
  - Do the investigators have appropriate knowledge and experience?
- Resources
  - What available resources (time, money, tools, manpower) do you have available?

Combining techniques

- Provide different perspectives of the situation:
- Example:
  - Observation – study context of the activity
  - Interview – views of target specific users
  - Survey – reach a wider population
  - Focus Group – consensus view

Summary

- Data gathering techniques can be used to gather requirements and feedback from users.
- All data gathering techniques have advantages and disadvantages.
- Important to select and use combination of data gathering techniques to gain different perspectives of the situation.

Required Reading

- Preece, J., Rogers, Y., & Sharp, H. (2019). Interaction design: beyond human-computer interaction (Fifth edition.). Wiley. Chapter 8
- Preece, J., Rogers, Y., & Sharp, H. (2019). Interaction design: beyond human-computer interaction (Fifth edition.). Wiley. Chapter 11.1 to 11.4.
- Benyon, D. (2019). Designing user experience a guide to HCI, UX and Interaction Design (Fourth edition.). Pearson. Chapter 7.