Design and Evaluation of Interactive Systems

(Conception et Evaluation des Systèmes Interactives)

Generative Design: Overview

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in|situ| lab, INRIA & U. Paris-Sud
3 December 2013

lectures adapted from Wendy E. Mackay

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place [DEIS] in the title of your emails

Website: https://www.lri.fr/~anab/teaching/M2Pro-DEIS/
Contains news, slides and other course material

Course structure

Lectures (in class)
- Present fundamentals & principles from different disciplines
- Relate design activities to each other and as a whole

Design activities (in class or at home)
- Individual and group
- each builds upon previous results (you cannot skip any)

Project (in class and at home)
- Groups of 3-4

Goal: produce a grounded video prototype

Course Schedule

Classes 1-4
- First semi-complete design cycle
- Christmas Break

Class 5
- Midterm: fist video prototype

Class 6-8
- Generative deconstruction
- Principled techniques for redesign

Class 9
- Final presentation (instead of exam)

Course project

You will create a video prototype of an original design
- of an interactive system that meets the needs
- of real users in a real setting

Projects involve in-class exercises and homework
- attendance is critical
- so is doing your homework!

Work in groups of 3-4
- some activities are individual (1/3 of your mark)
- others are in groups (2/3 of your mark)

Sudjested topitc next, you may choose your own (check with us)

Grading

Participation
- Class exercises
- Homework exercises

Final Presentation
- with Video Prototype

Final Report
- Executive Summary

Individual work 1/3, Group work 2/3

Mid-term video prototype (due 8 jan)

Executive summary (5 pages max) to describe the design
- Who is the audience?
- What is the design concept?
- Which design resources did you use?
- Initial scenario

Storyboard

Video prototype version1 (5-7 minutes)

Final presentation

Oral presentation
- 15 minutes:
  - design problem
  - user profile
  - design alternatives considered and rejected
  - final design
  - video prototype (maximum 5 minutes)
  - justification
- 5 minutes:
  - class discussion: every group asks at least one question

Also due: video prototype, transparencies, final storyboard

Final report

Executive summary of your project
10 pages maximum

Potential users:
who are they? (refer to your data)
what do they need?
Design concept:
what is the design concept?
what alternatives were considered?
why is this a good solution? (avoid marketing!)
Next steps

Also due: final exercises from the course

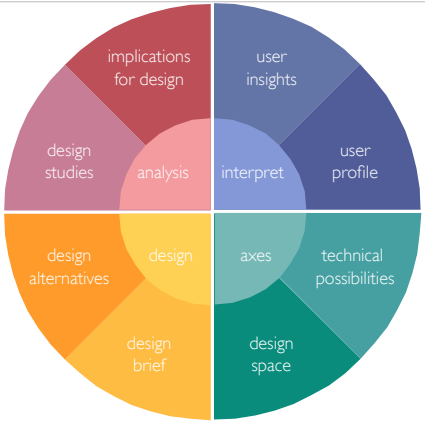
Generative Design

Discovery
Who is the user?

Invention
What is possible?

Design
What should it be?

Evaluation :
Does it work?



Why this course?

Computer scientists
are trained to find the solution to a technical problem

But they rarely ask:

Why this course?

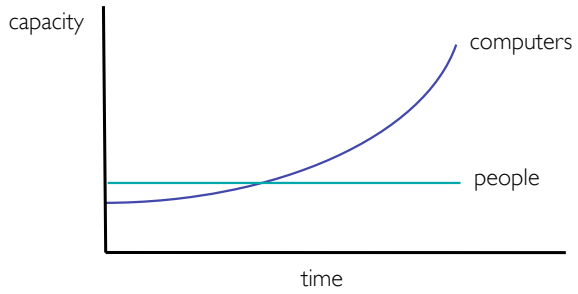
Computer scientists
are trained to find the solution to a technical problem

But they rarely ask:
Is this the right question?

This course will help you to
better understand the design problem
from the perspective of the user

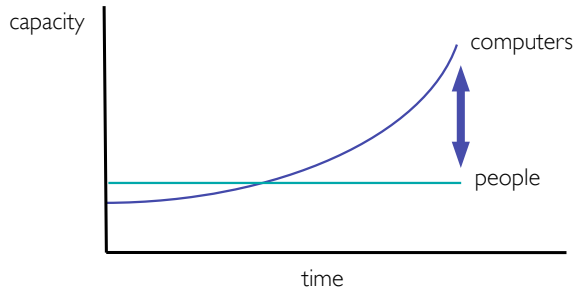
Which sometimes means redefining the problem

Computer capacity is increasing…

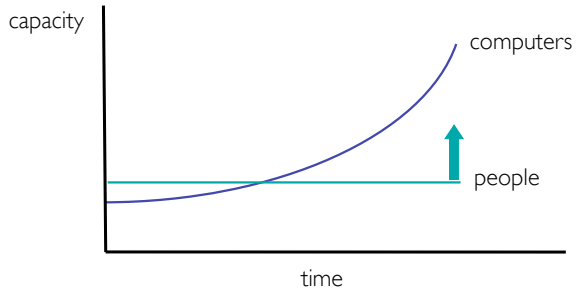


Computers are getting smarter …

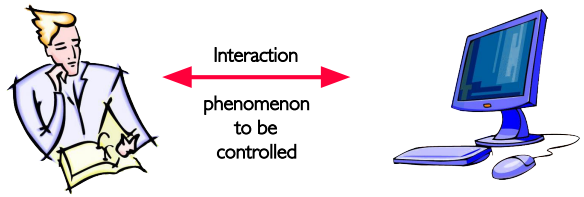
but not people!



Shouldn't we augment human capacity as well?



Human-Computer Interaction

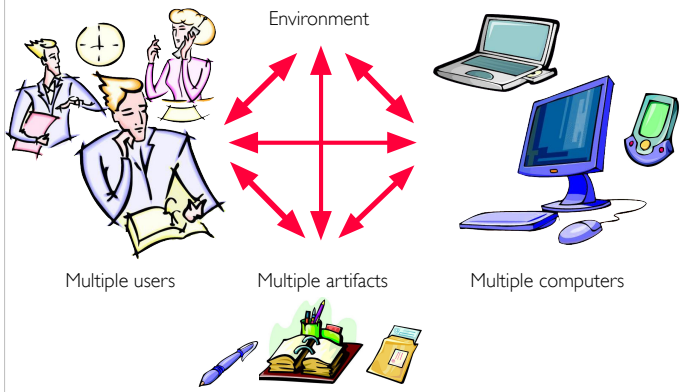


Capabilities: action, perception, cognition

Capabilities: computation, storage, input/output

Environment: physical, social, organisational, cultural, etc.

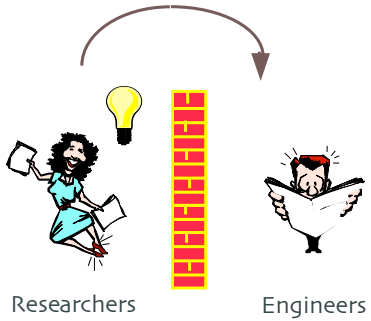
In the real world: *Situated Interaction*



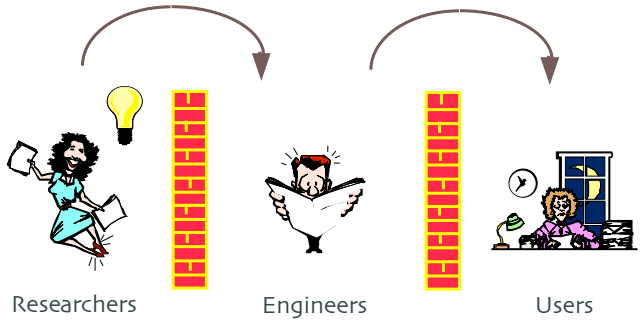
Designing interactive systems

Researchers

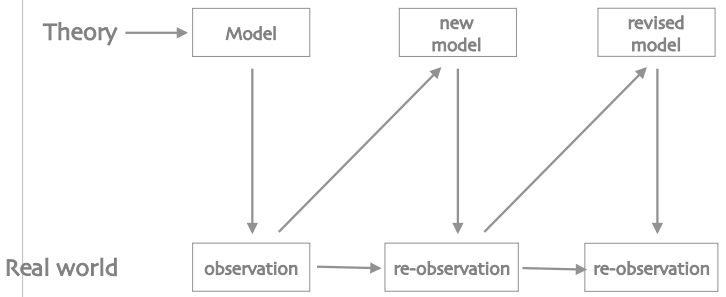
Designing interactive systems



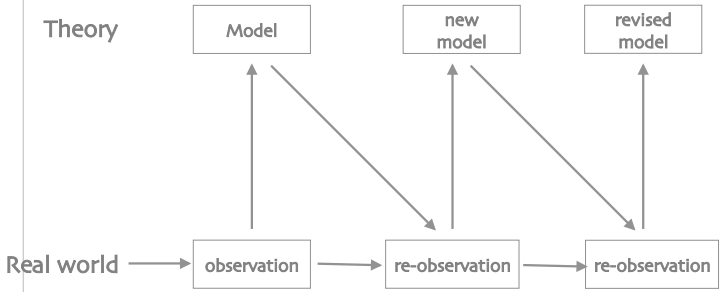
Designing interactive systems



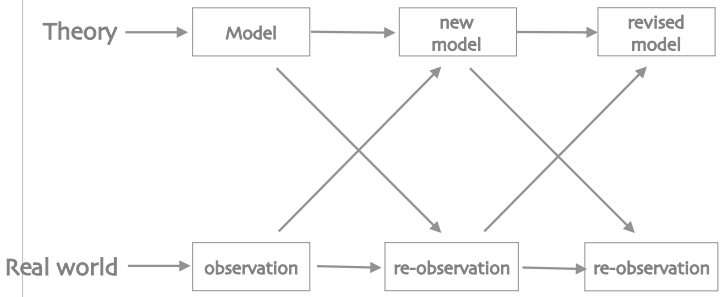
Psychology: Start with theory, test, revise, retest …



Ethnography: Start with observation, theory new observation…

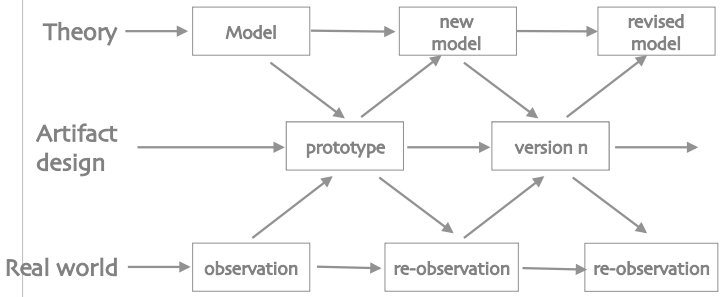


General scientific approach

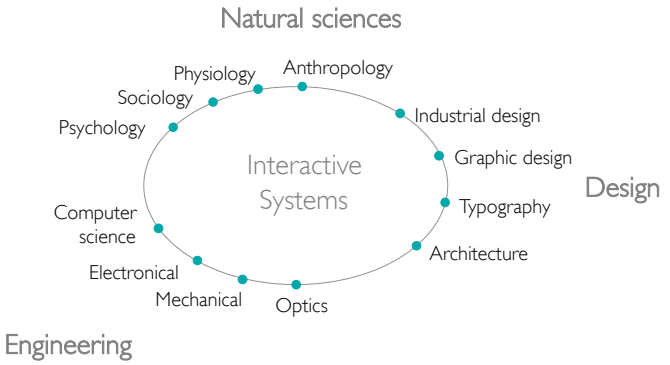


Design approach

Multi-disciplinary design approach

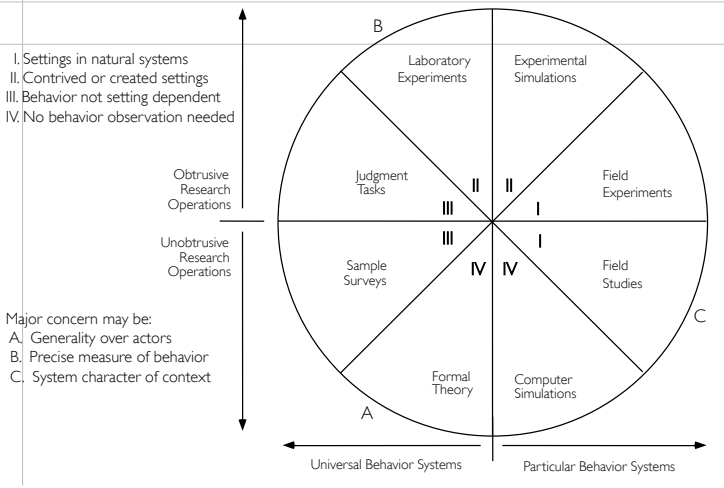


Multidisciplinary approach



Trade-offs

Runkel & McGrath, 1972



Multi-Disciplinary Design Methods

Understand the user	Analyze the user	Invent new ideas	Prototype the system	Evaluate the system	Redesign the system
"Fly-on-the-wall observation — Ethnography	Interactive Thread — HCI	Oral brainstorming — Psychology	Paper prototyping — Participatory Design	Focus group — Marketing	Generative Walkthrough — HCI
Critical incident interview — Human Factors	Contextual Inquiry — Anthropology	Design space — Design	Video prototyping — Participatory Design	Usability study — Human Factors	Technology probe — Design/Arts
Questionaire — Sociology	Task analysis — Human Factors	Sketching — Design/Arts	Wizard of Oz — Human Factors	Design Heuristics — HCI	Design Rationale — HCI
Cultural probe — Design/Arts	Scenario analysis — Activity Theory	Video brainstorming — Participatory Design	Software simulation — Computer science	Design walkthrough — Psychology	
Grounded Theory — Cognitive Psychology	Protocol analysis — Cognitive Psychology	Design room — Design/Arts	Design scenario — HCI	Design Critique (Crit) — Design/Arts	

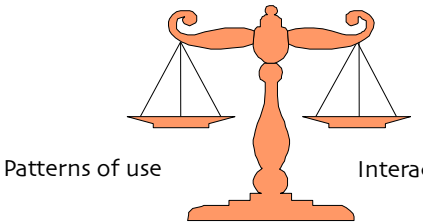
Triangulation

One technique is never sufficient
- Use different methods
- Take advantage of different types of expertise

Qualitative and quantitative
Objective and subjective
Local and wide-ranging
Your own and the literature

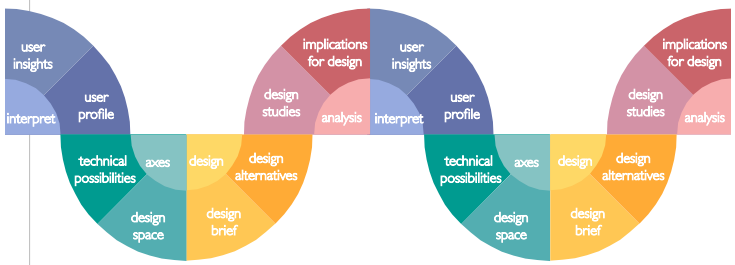
Achieving balance

Competing issues



Design is an iterative process …

Design activities produce ***resources for design***



If you create resources for design, use them!

Participatory Design

… focuses on situated interaction
between users and technology

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- … involves users throughout the design process

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Participatory Design

- … focuses on situated interaction between users and technology
- … involves users throughout the design process
- … is fundamentally generative not evaluative
- … values iteration and rapid redesign
- … explores breakdowns and the unexpected not just perfection

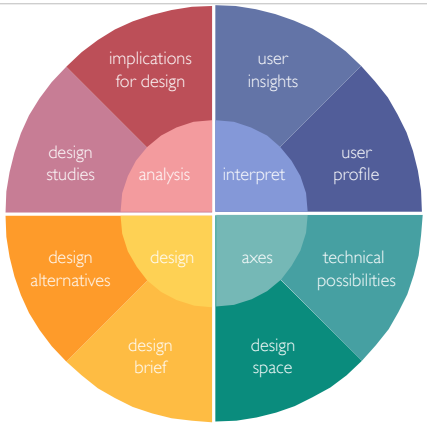
Generative Design

Each phase includes:

Collecting or sampling information

Analyzing information

Generating design resources

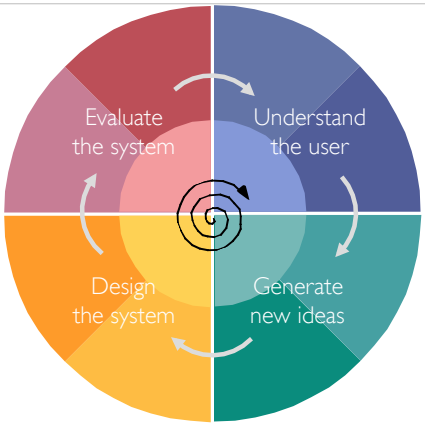


Four phases

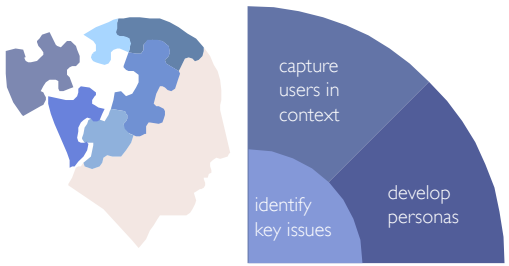
Each phase contributes to the other phases:

The process is iterative

Jump from any phase to any other phase as needed



Understand: Who is the user?

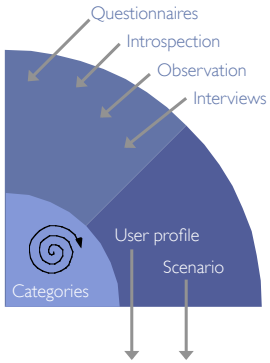


Understanding: Who is the user?

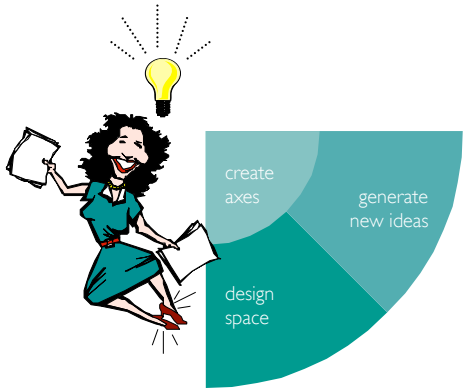
Collect or sample information
- Introspection
- Observation
- Interviews
- Questionnaires

Analyze information
- Grounded theory categories

Create resources for design
- Scenario
- User profile



Invention: What is possible?

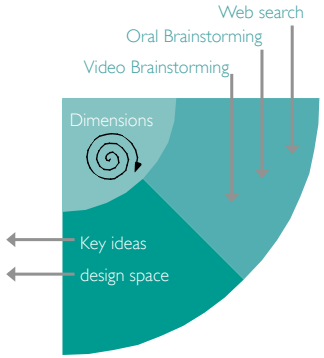


Invention: What is possible?

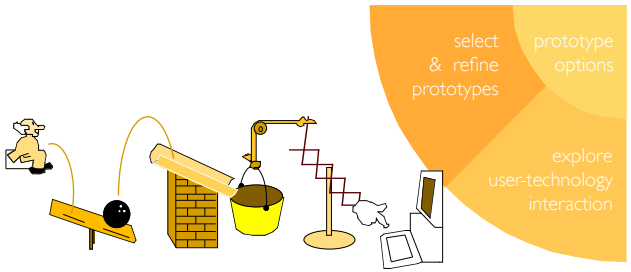
Collect or sample information
- Web search
- Oral Brainstorming
- Video Brainstorming

Analyze information
- Preference votes
- Technology dimensions

Create resources for design
- Key ideas
- Design space



Design: What should it be?

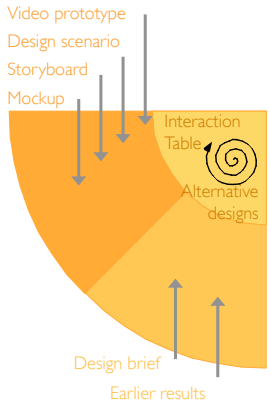


Design: What should it be?

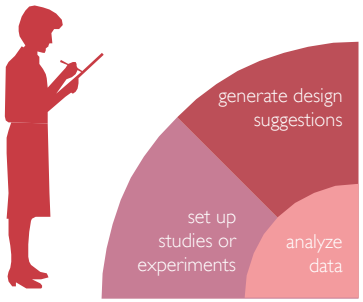
Collect or sample information
- Design brief
- plus results from earlier phases

Analyze information
- Interaction table
- Alternative designs

Create resources for design
- Design scenario
- Storyboard
- Mockup
- Video prototype



Evaluation: Does it work?

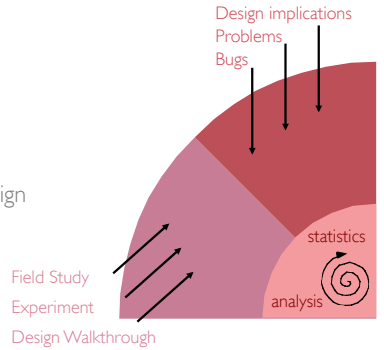


Evaluation: Does it work?

Collect or sample information
- Design Walkthrough
- Experiment

Analyze information
- Qualitative
- Quantitative

Create resources for design
- List of problems found
- Implications for redesign

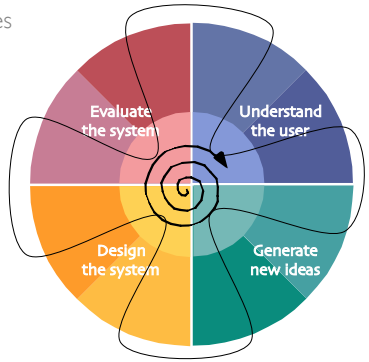


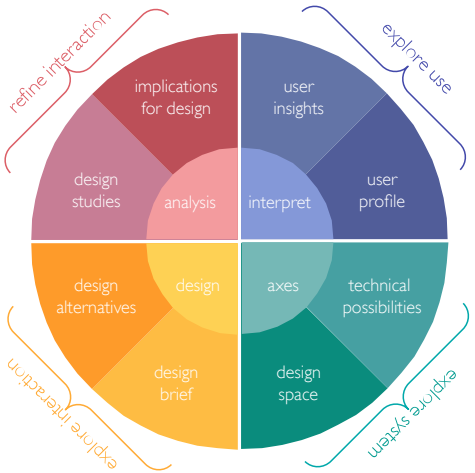
Emphasis on Iterative Design

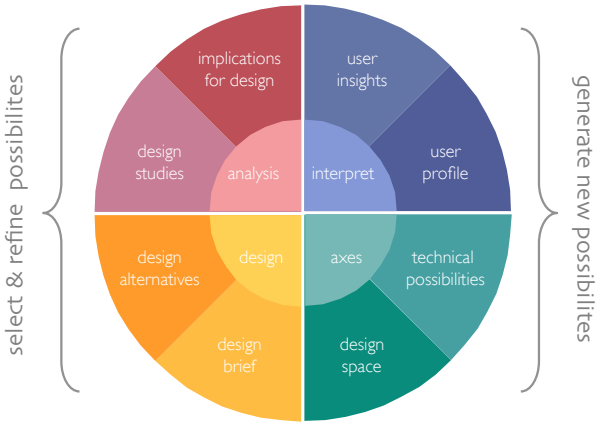
Every iterative design process includes redesign activities

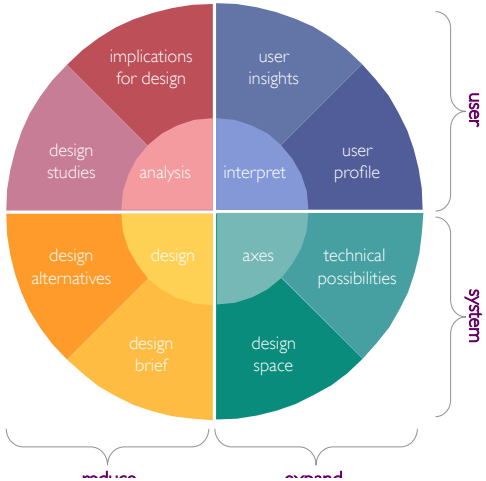
but don't just repeat the same exercises

reevaluate your design









Multi-disciplinary Design, this week

Lectures:
- Four phases of design
- Project description
- Phase 1: Understanding users

Class exercises:
- Interviews
- Introspection
- Questionnaires

Homework:
- Decide on situation and users
- Critical Incident Interviews

Design and Evaluation of Interactive Systems

Finding out about users

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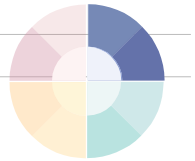
lectures adapted from Wendy E. Mackay

Understanding the user



Lectures: Phase 1: Understanding users

Class exercises:
- Introspection
- Grounded Theory categories
- User profile
- Persona
- User scenario

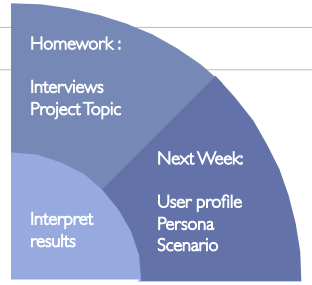
Homework:
- Group: Choose topic
- Individual: Critical Incident Interviews

Each session

Analyse the results from last week

Create one or more design resource

Begin collecting information for the next phase

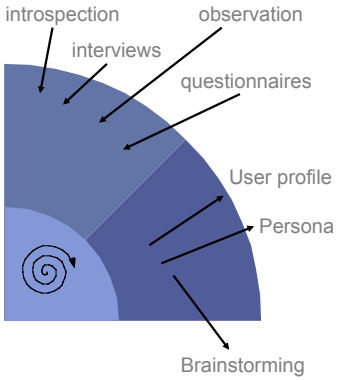


Today

Finding out about users
- Introspection
- Observation
- Interviews
- Questionnaires

Analyzing information
- grounded theory

Resources for design
- Use scenario
- User profile
- Persona



Techniques for finding out about users!

Do-it-yourself:

Observation:	Watch users in field situations
	Watch users in pre-arranged settings
Introspection:	Place yourself in the user's shoes
Questionnaire:	Distribute questions to many users
Interviews:	Ask individual users probing questions

Sampling from others:

Research literature:	Anthropology, Ethnography, Sociology
Marketing studies:	Business
Web videos:	Marketing
Documentaries:	Journalism

Introspection

The designer tries the system
- What works, what does not?

You can do this systematically:
- Begin with a clearly defined, real task
- Set aside a limited amount of time
- Make sure that you are not interrupted
- Begin the task
- Record while you talk aloud or take notes

Analyze what you did:
- Positive and negative aspects
- Surprises
- Ideas for making it better

Exercise : Introspection

Don't forget…

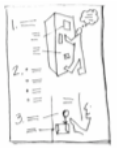
Introspection is very, very common
- but is the technique most susceptible to errors

This is a design method
- but NOT a scientific research method

If you use introspection as part of a design process:
- follow a protocol
- do not forget that your opinions and experiences are rarely the same as those of other users
- seek insights and inspiration, rather than "truth"

In situ observation

Observe and record how users perform the task today
Do not forget:
- All observers are biased
- Validity depends upon the details
- Observing ≠ interacting with users

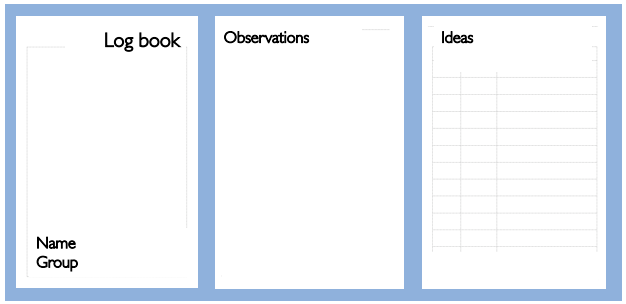


Consider ethical questions
- Ask for permission
- Accept 'no' for an answer
- Do not distribute personal data

Artists observe through sketches

Log books, Diaries and Journals

Capture your observations about people
Sketch ideas
Keep it with you and jot things down as you think of them



Observation in the lab

Ask users to perform specific tasks
- Basic observation
- Talk aloud protocol
- Pairs and shared discovery

Recording pros and cons

Paper:	Cheap, fewest details, incomplete
Audio:	Often useful, but cumbersome to analyze
Video:	Very detailed, may be too intrusive
	Lengthy analysis, permits later analysis
Logs:	Record every keystroke or mouse click
	Requires a computer, statistical analysis

Direct observation: User studies

Specify a specific activity
- Execute a series of tasks
- Solve a problem
- Follow a scenario

Always provide standard instructions
- Choose at least three real users

Data coding:
- Define the categories: discrete or continuous events
- Measure the degree of confidence

Interviews

Goals:
- Understand the tasks and activities of the user
- Identify the user's needs
- Obtain the user's perspective on the system

Suppositions :
- Reponses are subjective:
  - but their perceptions are important to know!
- Users often rationalize their responses
  - take this into account in your analysis
- Users understand their own experiences
  - but very few can design a better system …
- BUT … look for user innovations

Interviews: Considerations

Who is your real audience?
- User? Boss? Buyer?

What do you want to know?
- Facts or opinions?
- Details or generalities?
- Real stories or abstractions?

Distinguish among:
- Interviews - questionnaires - marketing surveys
- Each have different purposes

Interviews (and questionnaire): Question types

Directed or open
- Multiple choice or free response

Facts or opinion
- events, data vs. preferences and ideas

Specifics or generalities
- focused on something or abstract

Beginning or end
- Different question types belong at each point of an interview

How to ask questions (also for questionnaires)

The form of the question
- provides the form of the response (habitable sub-languages)

If you want specific, real answers,
- you must ask the questions correctly

If not, you will get vague general answers
- that provide little help with design

Careful!
- We are not conducting marketing surveys
- Our goal is to better understand users
  - to design a better system

Questions : two dimensions

Directed vs. open
- directed: limited response, imposed format
- open: unlimited response, free form

Specific vs. general
- specific: details related to a specific object, time or event
- general: abstractions, generally applicable

What are your questions for?

Designing a new system
- Interviews help you discover facts:
  - stories of use
  - data from users
  - examples of activities

Marketing a system
- Interviews help you discover opinion
  - user preferences
  - what they would like to buy

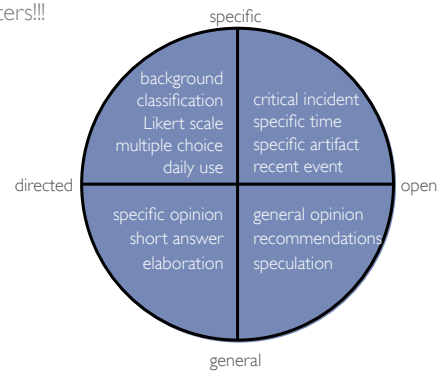
Choose questions that support design

Question order matters!!!

Start specific
then general

Start with directed
then open

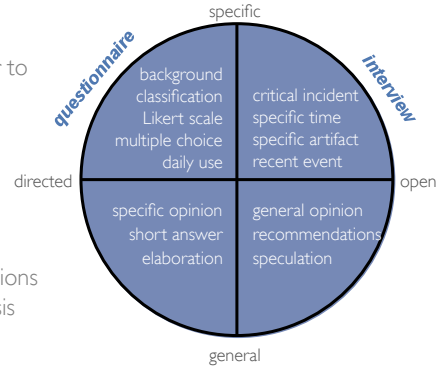
Start with facts
then opinions



Choose questions that support design

Interviews
- Few answers
- Can delve deeper to find out more
- Analyze by hand

Questionnaires
- Many answers
- Difficult to ask follow-on questions
- Automated analysis possible



Design an interview

Same questions, same format for everyone, but …
- as new questions arise, add them

Begin with specific, directed questions: name, job, etc.

Next, use specific, open-ended questions
- Critical incident technique asks about:
  - Recent memorable event (within a week)
- Or ask about:
  - Specific artifact that you point to (e.g. mobile)
  - Specific recent time or place

Get specific detailed stories

Specific and open questions

Help users reconstruct their memories

Critical incident technique
- Describe a recent, memorable event

Time specified by the interviewer:
- What happened, step-by-step, at that time (place, date, time)

Specific object
- Describe how this object was created or how did it get here and why?

Specific situation
- Describe the last time that you were in <specific situation> specified by the interviewer

Careful …

Do not ask for generalizations until after the interviewee has told you a specific story, based on their experience

Ask the user to generalize from specific artifacts or events:
- Is this typical? If so, why? If not, why not?

Conclude with general, open questions
- Allow the user to explain what they do in their own way

Interviews

Users think you want a lesson on how it is supposed to work
- You don't. You can read a manual for that.

Your goal is to get ***real*** stories that reveal both the positive and negative aspects of the current system

You want to help users remember things they would otherwise forget

You want to gain insights into how and why users do what they do

Information Lens

Filtering electronic mail (2-year study at Xerox PARC)

Users changed their ways of managing their email but
Users also changed how the system designers thought about the system

Specific, directed questions

1. How many messages did you receive today? (count them)
2. Is this a typical day? If not, why not?
3. How many times did you read your mail yesterday?
4. Did you read every message?
5. How many messages did you delete without reading?
6. How many filtering rules do you have?
7. Did any of them fire when you read your mail yesterday?

Specific, open questions

1. Within the last week, did you look for a specific mail message? Were you able to find it? Describe what you did to find it?

2. Within the last week, did you look for a specific piece of information within your email? Did you find it? Describe what you did to find it.

Critical incident Question:

3. Within the last week, did one of your filtering rules not work as you expected it to? If so, what did you do?

General, open questions

NEVER start with these … but ok after they have told you specific, detailed stories of their use of the system

1. Describe how you use your email.
2. Describe how you classify your messages.
3. When do you prefer to use:
   email, telephone, face-to-face meetings?
4. Has the Information Lens changed how you communicate with your colleagues?

One more time: Order is important !!!

Specific questions
before general questions

Directed questions
before open questions

Why?
Remember that the form of the question
influences (a lot!) the form of the answer
Users can be put in the correct frame of mind

Questionnaires

Goal: Obtain data from a large number of users

Careful:

Users are more or less likely to respond honestly

Questions may not really address the questions or needs its what you think they have (external validity problem)

Design a questionnaire

What information are you seeking?

Ask only what is necessary

Frame the questions correctly

Who is the audience?

50 - 1000 users … or more?

How will you send your survey?

Most often with a survey web app

But sometimes paper is better

How will you analyze your results?

Consider the statistical analysis first

Question styles in questionnaires

Background

Age, profession, years in the job

General information

How many years have you used this email system?

Directed questions

How many messages did you receive yesterday?

Multiple choice

I move messages to project folders

o never o rarely o often o always

Question styles in questionnaires

Scalar

I can easily manage my email

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
-2	-1	0	1	2

Ranking

Rank the following functions in order of usefulness

___ Blind copy

___ Automatic copy to a distribution list

___ Automatic to myself

Open questions

Describe how you use electronic mail.

Principles for designing questionnaires

Use parallel structure for sentences

Keep the order coherent, e.g. positive to negative

Zero can mean two things:
neutral, middle response
or "I do not know"

Consider adding a degree of confidence
Avoid asking 'obvious' questions

Ask the same question in two different ways
to see if you get the same result

Interviews vs. questionnaires

The same question types work for both
but the goals are different
and the analysis is different

Advantages of interviews:
easier to get in-context information
easier to get real-world stories
easier to probe deeply into an interesting situation

Advantages of questionnaires:
can ask lots of people
simple questions are easy to tabulate
often used for opinions

One more reminder

Directed, specific questions
are easiest to code (analyze)
belong at the beginning of the questionnaire
provide the fewest interesting results

Open, general questions
are very difficult to code and analyze
may provide very interesting responses
but also risk giving stereotypical responses

Consider a series that builds:

Do they build on each other?

Are they redundant or get at different issues?

What is the balance between:
Direct vs. Open?
Specific vs. General?
Factual vs. Opinion?
Design-oriented vs. marketing-oriented?

Design vs. Marketing

Designers need facts to inform the design
- examples of problems,
- stories about events,
- data about use

Marketing wants opinions
- what people like and do not like,
- what they think they want

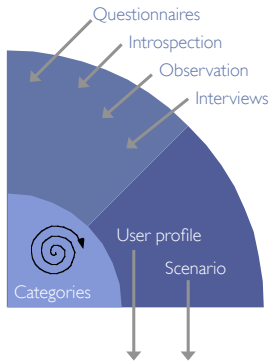
Emphasize facts first, then opinions
- Directed questions (specific or open-ended) often elicit facts
- General questions (specific or open-ended) often lead to opinions

Summary: Discovering who is the user

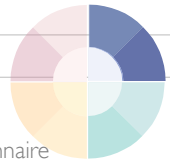
Collect or sample information
- Introspection
- Observation
- Interviews
- Questionnaires

Analyze information
- Grounded theory categories

Create resources for design
- Scenario
- User profile



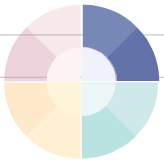
Many ways to find out about users



You can collect information yourself:!
- Observation, Introspection, Interview, Questionnaire
- (More advanced techniques:!
  - Focus group, Usability study, Logging study, Diary study …)

You can also take advantage of work done by others:
- Market studies, Government reports, Research literature,
- Youtube, Ads, Novels, Films, Cartoons …

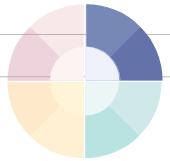
Many ways to analyze results



Analysis activities
- Grounded theory analysis!
- List of related examples!

You could also do a:
- GOMS analysis
- Contextual inquiry
- Task analysis
- Protocol analysis
- Log analysis
- Survey analysis

Many possible design resources



In this course, we'll talk about:
- User profile
- Persona
- Extreme character
- Use scenario

But you can also create:
- Requirements list
- Storyboard of use
- Clips of related examples
- Summary video

… and your own design brief

Homework (due Dec 11)

1. Group: Choose a topic for your project
   You need to identify a problem and a set of users

2. Individual: At least two interviews each
   Use at least one critical incident question
   Probe for details