HCI Bootcamp
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Wendy E. Mackay
mackay@lri.fr

Jérémie Garcia
garcia@lri.fr

web: http://insitu.lri.fr/People/HCIBootCamp

So far:

Base your design concept on:
- your user profile, grounded in your interviews

‘Animate’ your personas to:
- walk through the use scenario
- push the limits with your extreme characters

Create a design scenario:
- choose your favorite video brainstorm ideas
- illustrate what happens at each interaction point
- create a sequence of events in the storyboard
- shoot a video prototype to illustrate the concept in context
- flesh out the design with a function-interaction table

Today

Analyze your design from various perspectives:
- simple experiment

Redesign your system:
- generative walkthroughs
- identify critical points to change
- video prototype II

Evaluation
Does it work?
Evaluation: Does it work?

- Collect information
  - Design Walkthrough
  - Experiment
- Analyse information
  - Qualitative
  - Quantitative
- Resources for design
  - List of problems, issues
  - Implications for redesign

Simple experiment

**Goal**
Choose the best design alternatives by watching users try the prototype

**Procedure**
- Describe the design objective
- Identify several alternatives
- Choose the independent and dependent
- Specify the null hypothesis and make a prediction
- Set up the test conditions to compare each condition
  - Use at least three real users
- Analyse the results: are they significantly different?

Design a simple experiment

- Specify the **functionality** offered to users
  - What does the system do?
- Specify **alternative interaction techniques**
  - How does the user accomplish it?
- Specify the **independent variables** (factors)
  - Experimenter decides on the values
- Specify the **dependent variables** (measures)
  - User behavior determines the values
- Specify the tasks the user will perform (**operationalize behavior**)
  - Specify experimental and control groups
- Specify appropriate statistical tests
  - Is the difference real?

Example

- Compare linear and circular menus

Null hypothesis ($H_0$)

There is no difference in performance between users in terms of time or error when selecting an item from a linear or a circular menu regardless of type of menu, number of menu items or previous experience.
Specify the independent variables

Independent variables (factors) are those we want to vary or control. The combinations of variables define the conditions.

**Independent variables:**
- Type of menu: linear, circular
- Number of items: 3, 6, 9, 12, 15
- Expertise: expert, novice, intermittent

\[2 \times 5 \times 3\] = 30 unique conditions

**Caution:** Most user-related variables are dependent on the user’s behavior. User experience is an independent variable, chosen independently by the experimenter.

Specify the dependent variables

Dependent variables depend on the user’s behavior. Also called measures because they measure user’s behavior.

For a reliable statistical test, you need sufficient measures per condition.

- Rule of thumb: ~12 for small-n statistics (student’s t)
- ~30 for normally distributed tests

Dependent variable might include:
- Time to select an item
- Number of errors
- What else?

Operationalize the behavior

Trickiest part of the experimental design, but when it’s done well, it seems obvious.

Simplify the task as much as possible, to eliminate bias and external factors, without making it unrealistic.

Example: Fitts’ pointing task
- only one dimension (target = vertical band)
- reciprocal pointing (back and forth between 2 targets)
Run the experiment

Prediction:
Always write your subjective predictions before you discover the results.
Another example of looking for surprises.
Control any factors that might bias the results:
All subjects receive the same instructions.
All subjects perform tasks under the same conditions.
All instructions are simple and clear.
Informal contact kept to a minimum.
Double blind experiment:
Neither the experimenter nor the subject know which group receives which treatment.

Can our experiment be double blind?

Run the experiment

Obtain informed consent from the subjects.
Ensure that subjects remain anonymous.
Associate a number with each subject.
Choose conditions based on those numbers.
Gather experimental data.
Test that they are reliable and valid.
Minimize data treatment and preserve raw data.

Prediction ≠ Null Hypothesis

For this experiment:
I think that circular menus will be faster than linear menus regardless of experience and the number of menu items.

Other predictions:
Linear menu performance will decrease with more items.
Circular menu performance will drop as more items are added.

Collect data

Ensure that the data log is human-readable yet easy to analyze by both people and machines.

Start S1 E C-L 3-12-15-9-6 Mon 21 Nov 2012 15:45:54
Condition S1 E C 3 Mon 21 Nov 2012 15:46:35
# sujet expertise type taille item hit/miss tps(ms)
Trial S1 E C 3 2 Hit 1254
Trial S1 E C 3 1 Miss 885
...
Condition S1 E C 12 Mon 21 Nov 2012 15:54:22
Trial ...
End S1 E C-L 3-12-15-9-6 Mon 21 Nov 2012 16:23:55
Exercise: Creating an Experiment

Goal: Choose the best interaction technique among several alternatives

Procedure
- Identify the key independent variables (factors)
- Identify the key dependent variables (measures)
- Operationalize the behavior and define test conditions
- Run the experiment with at least 3 subjects
- Analyze the data: are they significant?

Design a simple experiment

Specify the functionality offered to users
- What does the system do?

Specify alternative interaction techniques
- How does the user accomplish it?

Specify the independent variables (factors)
- Experimenter decides on the values

Specify the dependent variables (measures)
- User behavior determines the values

Specify the tasks the user will perform (operationalize behavior)
- Specify experimental and control groups

Specify appropriate statistical tests
- Is the difference real?

Redesign

*How to improve it?*

Generative Design: a reminder

Discovery
- Who is the user?

Invention
- What is possible?

Design
- What should it be?

Evaluation
- Does it work?

Redesign
- How to improve it?
Design is an iterative process …

Create **design artifacts** that serve as resources for redesign.

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**Redesigning your design**

You’ve created a video prototype … NOW WHAT?

How can you improve it?

- Lengthen the scenario:
  - Add interaction points
- Modify the scenario:
  - Consider breakdowns, surprises, alternatives
  - Create an additional scenario
- Create a branching scenario
- Compare design alternatives in context

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**Improving your video prototype**

**Visual:**
- Explanatory intertitle cards
- Use pause for time-lapse effect
- Use transparencies and post-its for dynamic effects
- Zoom in, zoom out, then video while zooming in
- Stabilize the camera (tripod, support, body)
- Stabilize the background (postit notes or tape)
- Include detail: paper prototypes and story

**Auditory:**
- Limit background sound (find an empty room)
- Consider how much voice-over is needed
- “Three” “Two” “One” technique

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**Audiences for your design resources**

**Audience:**

- **Users**
  - Emphasis on:
    - Articulating design problems
    - Identifying design opportunities
    - Bottom-up, contextual descriptions
- **Management**
  - Describing design solutions
  - Justifying design solutions
  - Top-down, abstract descriptions
- **Team members**
  - Revealing design problems
  - Exploring design solutions
  - Both top-down and bottom-up

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Exercise: Lengthen your scenario

Goal:
- About 10 interaction points
- Add at least three today
- Include at least one breakdown

Check the mid-term assessment:
- Review your interviews and observations
- Review the results of the walkthrough

What is missing from your scenario?
- Breakdown?
- Repeated activity?
- New people?
- Set up features

Unanticipated behavior?
Combining features?
New situations?
Modification features

Iterative design means redesign

Within an iterative design process, redesign is more important than initial design.

do not just “do it again!” reflect on your designs in context.

Implications for design

Dourish argues that we should not force social scientists to generalize from specific field studies to create general implications for design but

We CAN bring social science insights to bear on specific design artifacts to enhance and explore the design space.

What are socio-technical principles?

Social scientists conduct extensive field studies and provide deep insights in the form of socio-technical principles about how people interact with technology in context.

But it is difficult to translate these principles into specific designs.
Generative Deconstruction

Apply socio-technical principles to generate grounded designs

*OBSERVE*
- use-technology-context
  - Specific anecdotes, breakdowns, surprises

*DECONSTRUCT*
- design problem
  - from abstractions to patterns

*Socio-technical principles*

*RECONSTRUCT*
- design solution
  - Revise design space
  - Explore design options

Examples: Socio-technical Principles

- **Situated Action**
  - beyond planning
  - Go beyond planned activities; Users decide how to act in unforeseen circumstances

- **Rhythms & routines**
  - identify use patterns
  - Build upon routine activities and spatial patterns; Users integrate systems into their daily lives

- **Peripheral awareness**
  - design the periphery
  - Design for both focus and periphery; Users vary degree of engagement

- **Co-adaptation**
  - re-interpret use
  - Expect users to re-interpret and customize; Enable capture and sharing of customizations

- **Distributed cognition**
  - “outside the head”
  - Let objects and other people reduce cognitive load for memory or communication tasks

So …

How do we incorporate socio-technical principles into the design process?

Crossing disciplines

- Technical training emphasizes:
  - solving pre-defined problems
  - but not articulating new design problems

- Social Science training emphasizes:
  - analyzing socio-technical phenomena
  - but not developing design solutions

Generative walkthroughs attempt to explicitly link socio-technical principles with the specifics of a design
Generative Deconstruction & Reconstruction

Observe users either:
- to understand what to design or
- to evaluate what has been designed

First *deconstruct* what is going on:
- Who is the user?
- What is the technology?
- What is the user’s context?
- What is the interaction like?

Then *reconstruct* the design
- to design a new technology or
- to fix an existing one

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Generative Walkthroughs: Creative redesign

**Structured walkthroughs**
Systematic critique of design artifacts, such as scenarios & storyboards

**Focused brainstorming**
Generation of novel ideas, based on socio-technical principles

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Exercise: Generative Walkthroughs

Analyze your storyboard

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Wendy E. Mackay
Inria
Reflecting on Post-It Notes

What is a ‘post-it note’?
What are they used for?
What are their most important properties?
Why do they work?
Have you seen any creative uses of post-it notes?

Exercise: Generative Walkthrough

Applying socio-technical principles using post-it notes

Socio-technical Principles

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situated Action</td>
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<td>&quot;outside the head&quot;</td>
</tr>
</tbody>
</table>

Situated Action
**Situated Action**

Sandy knows that she needs to meet with Fred this week, but doesn’t know exactly when. This post-it note is stuck to her calendar, in no particular spot. It acts as a reminder that she plans to talk to Fred, but she still needs to specify the precise time.

**Emergent action:**
Sandy knows that the dates may change, her system is flexible

**Co-localisation of artifacts:**
Sandy knows that when she next looks at the calendar, she’ll see the post-it.

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**Rhythms and Routines**

Ralph took a call from his son’s best friend, Tara.

He wrote a message on a post-it note and left it at his son’s place at the dinner table.

**Temporal rhythm:**
Ralph knows his son will come home at dinnertime

**Spatial routine:**
Ralph know his son’s place at the table

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**Rhythms & Routines**

**Peripheral Awareness**
Peripheral Awareness

Paul puts his chores on post-it notes on the fridge. He doesn’t look at them all the time, but when he has the sense that it’s “too yellow”, he knows it’s time to stop procrastinating.

Focused attention: Paul can read the note when he’s ready to act.

Peripheral awareness: Paul senses when the fridge is ‘yellow’ and he should act.

Distributed Cognition

Dan and Mary share a home computer. Dan leaves a post-it note with the list of commands needed to perform a specific function.

Memory aid: The post-it allows them to forget the details – they know where to find them.

Boundary object: Dan and Mary use the instructions differently.

Distributed Cognition

Co-Adaptive Systems
Co-Adaptive Systems

Ann gets a business card and is afraid to lose it so she uses a post-it note to attach it to her agenda

System adaptation: Connie understands the properties of post-it notes and uses them for a new purpose

Socio-technical Principles

Situated Action
- Go beyond planned activities; Users decide how to act in unforeseen circumstances

Rhythms & routines
- Build upon routine activities and spatial patterns; Users integrate systems into their daily lives

Peripheral awareness
- Design for both focus and periphery; Users vary degree of engagement

Co-adaptation
- Expect users to re-interpret and customize; Enable capture and sharing of customizations

Distributed cognition
- Let objects and other people reduce cognitive load for memory or communication tasks

Summary poster

Title bar:
- Project Title, Group members, Group number

Design Problem & Concept
- What is it for? What is the new idea?

User Profile, Personas & Scenario
- Who is it for? How is it used?

Storyboard segment
- How does it work in context for these users?

Design (“How to”) diagram
- How does it work?

Evaluation & Redesign
- Key improvements, Key justifications

Poster

Layout is up to you … or try this

SHORTER is better
- limit words
- highlight key points

Final section highlights the redesign process
## Final presentation

**Oral presentation**
- 15 minutes: (one slide per topic)
  - design problem
  - user profile (& personas)
  - final design concept
  - design ("how to") diagram
  - video prototype (maximum 5 minutes)
  - justification (key improvements alternatives considered)

**5 minutes:**
- class discussion: every group asks at least one question

## Turn in:

1. Cover Sheet: Group Number, Project name, Group Members
2. Video Prototypes I & II (two files, not a series of clips)
3. Storyboards I & I (should match videos)
4. Exercises: Individual interviews, user profile, personas, use scenario, grounded theory, interaction points, brainstorm ideas, web search, design alternatives, function-interaction table, design diagram, hypotheses, generative walkthroughs (2 socio-technical principles)
   + title cards (brainstorm and prototype)
5. Poster
6. Course evaluations (Maybe handed in separately)