Wednesday

Morning
Create paper prototypes
Ex #18 Shoot video prototype #1
Start poster

Afternoon
Evaluation lecture.
Ex #19 Design walkthrough
Ex #20 Hypotheses (experiment design)
Ex #21 Improvements
Redesign principles lecture

Summary poster

- Group: Project title, number, names
- Design Concept: What is the new idea?
- User information: Who is it for? How is it used?
- Storyboard: How do these users interact with it?
- Design diagram: How does it work?
- Evaluation: Key issues
- Redesign: Key improvements, justifications
Summary Poster

Summarize design resources

Shorter is better
limit words
highlight key points

Capture the design
and redesign process

Generative Design

Discovery
Who is the user?

Invention
What is possible?

Design
What should it be?

Evaluation:
Does it work?

Video Prototyping

Not the same as Video Brainstorming!
**Video Prototypes**

Set up Video Clipper:
- Titlecard: Prototype name, group, date
- Series of titlecards from storyboard
- Final credits: Group number, your names

Find a quiet place … but let us know where you are!!!
- Bring paper prototypes & supplies
- Whiteboards are helpful

Shoot clips into the storyboard
- If you make a mistake, reshoot

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**Evaluation**

*Does it work?*

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**Design Walkthrough**

Step-by-step evaluation of sequential material
- Goal: identify as many problems as possible

Similar to brainstorming:
- Do identify maximum quantity of problems

Different from brainstorming:
- Do not defer judgement
Design Walkthrough

Based on Structured Walkthroughs (Yourdon, 1979)

Goal: Find bugs in code

Technique: Systematic step-by-step analysis of a document by a small group

Principles:
- Line-by-line analysis
- Constructive criticism
- Limited time

Design Walkthroughs in the real world

Groups:
- peers
- not managers
- small 4-8 works well
- diverse include diverse perspectives

Participants adopt specific roles:
- technical error or problem?
- user hard to perform?
- manager function necessary?

Apply design rules, principles or perspectives:
- Norman’s rules
- Shneiderman’s rules

Design Walkthrough Roles

Each group evaluates another group’s video prototype
- Review group A evaluates Design group B
- Review group B evaluates Design group C ...

Design group chooses:
- Presenter Ensure both groups participate
- Show video
- Halt discussion, keeps to critiques
- Scribe Take notes

Everyone: Contribute feedback

Design Walkthrough

Appropriate for many types of material

- Originally for programmers to evaluate code

However it works well for:
- Text documents: articles, manuals, specifications, reports
- Design resources: design scenarios, storyboards, paper prototypes, video prototypes

Inria & Université Paris-Saclay
Design Walkthrough

Members of both teams make comments
Focus on material, not author
Be constructive, not destructive
Be specific, not general
Ask for clarifications first
next problems
finally suggestions

Examples:
“The text is too small to read”
“I can’t figure out where change the setting”
“That task takes four steps”

Design Walkthrough

Authors:
Listen to the problems,
Do not defend your design choices!
Do not discuss solutions!!
The review group is responsible for identifying problems
The design group is responsible for deciding if and what to change

Goal: Find as many issues as possible
Don’t solve them.

Design Walkthrough

Procedure:
Choose moderator and scribe
Show the full video
Show each interaction point
- Any critiques?
- Any suggestions?

When presenting, Remember:
Do NOT discuss: clarifications only
Do NOT defend: just note problems
Later, you can decide which feedback to implement

Experiment
## Experiment

**Goal**  
Choose the best design alternative by watching users try the prototype.

**Procedure**
- Describe the design objective
- Identify several alternatives
- Choose the independent and dependent variables
- Specify the null hypothesis and make a prediction
- Set up experiment to compare compare
- Use at least three real users
- Analyse results: Is one alternative significantly better?

## Design a simple experiment

**Specify:**
- Interaction technique: How does the user interact?
- Alternative techniques: What other techniques might work?
- Independent variables: Which techniques to compare?
- Dependent variables: What does the user do?
- Tasks to perform: What does the user do?
- Statistical tests: Which is better? Is the difference real?

Factors = independent variables  
Measures = dependent variables  
Operationalize behavior = specify testable actions

## Example

Compare linear and circular menus

State the null hypothesis (H₀):

“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”

## What kind of variable?

Independent variables = factors chosen independently by the experimenter

Dependent variables = measures depend upon the user’s behavior

Operationalize behavior = specify testable actions
Specify the independent variables (factors)

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

Specify the dependent variables (measures)

Dependent variables depend upon the user’s behavior, also called measures because they measure user’s behavior.

- For a reliable statistical test, you need enough 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)

Operationalize the behavior

Define the specific menu selection task.

Ensure that the conditions are as similar as possible:
- Same labels for the menu items
- Same location of the menu on the screen (centered)
- Highlight the item to select (to avoid searching for it)
Run the experiment
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

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

Prediction ≠ Null hypothesis
Always record your subjective predictions
before looking at the results

Null hypothesis example:
“Circular and linear menus perform equally well
under all conditions”

Prediction example:
“I think that circular menus will be faster than linear menus
regardless of experience and the number of menu items”

Other possible predictions:
- Linear menu performance will decrease with more items
- Circular menu performance will drop as more items are added
Create a data table

Every column has to contain all the measures for each condition

<table>
<thead>
<tr>
<th>Trial</th>
<th>Participant</th>
<th>Condition</th>
<th>Time</th>
<th>Error</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Circular</td>
<td>40</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Linear</td>
<td>48</td>
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<td>3</td>
<td>2</td>
<td>Linear</td>
<td>45</td>
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<td>2</td>
<td>Circular</td>
<td>57</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>Circular</td>
<td>42</td>
<td>No</td>
</tr>
</tbody>
</table>

Exercise: Plan 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?

Exercise: Design a simple experiment

Choose a single interaction point
Identify at least two additional alternative forms of interaction

Specify:
- Independent variables
- Dependent variables
- Null Hypothesis
- Prediction

Generative Design … is REDESIGN!

Discovery
- Who is the user?

Invention
- What is possible?

Design
- What should it be?

Evaluation
- Does it work?

Redesign
- How to improve it?
**Redesign**

*How to improve it?*

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**Redesigning your design**

You've created a video prototype … NOW WHAT?

*How can you improve it?*

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

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**Revised design concept**

Trade-off between power and simplicity:

*Less is More*

- Find a key object of interest for the user
  - Make it persist
  - Make it interactive

Example:

- Search for a route
  - Create a 'route' object
  - Create an interactive route object
    - modify, extend, transform
  - share, compare . . .
Improving your design

Does it empower the user?
- Allows user to express options, save preferences
- Choose among useful alternatives, reuse options

Or is it “AI magic”
- User gets ‘correct answer’ by some magic algorithm

Don’t forget: How does the user:
Set up: express preferences?
Breakdowns: know what is wrong?
- fix problems?
Consider repeated actions:
- Is it tedious to repeat similar actions?

Technical improvements

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” “ ” “ ” technique

Who is the audience for the video?

<table>
<thead>
<tr>
<th>Audience:</th>
<th>Emphasis on:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users</td>
<td>Clarifying design problem</td>
</tr>
<tr>
<td></td>
<td>Identifying design opportunities</td>
</tr>
<tr>
<td></td>
<td>Bottom-up, contextual descriptions</td>
</tr>
<tr>
<td>Management</td>
<td>Describing design solutions</td>
</tr>
<tr>
<td></td>
<td>Justifying design solutions</td>
</tr>
<tr>
<td></td>
<td>Top-down, abstract descriptions</td>
</tr>
<tr>
<td>Team members</td>
<td>Revealing design problems</td>
</tr>
<tr>
<td></td>
<td>Exploring design solutions</td>
</tr>
<tr>
<td></td>
<td>Both top-down and bottom-up</td>
</tr>
</tbody>
</table>

Exercise: Video prototype 2

Goal: Add at least three interaction points
- Add at least one breakdown
- Include at least two design alternatives

Review design resources: what is missing from your scenario?
- Breakdown?
- Unanticipated behavior?
- Repeated activity?
- Combining features?
- New people?
- New situations?
- Set up features?
- Modification features?
What to avoid

No auditory or haptic alarms:
  Do not create an ‘electronic nag’

No “artificial intelligence magic”
  Let the user explore the data
  Don’t come up with a magic solution

No hardware-only solutions
  Focus on the interaction with the software
  even if you have innovative hardware

No one-feature systems
  You must have a concept

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

Improvements

Users experience technology in the real world
  Never assume everything will be ‘perfect’

Consider:
  Technical breakdowns
    The wireless connection is down
  Situation breakdowns
    User is distracted while crossing the street
  Extreme breakdowns
    User cannot physically control the interface
Exercise: Improvements

Consider results of design walkthrough
Reassess your design concept
   Can you create a simpler, more powerful concept?

Explore breakdowns
   Identify at least three possible breakdowns
   How do they affect the design of your system?
   How can you address them?

Modify your design with the revised concept
   Include three new interaction points
   Show how to address breakdowns

Thursday

Morning
   Generative walkthrough
   Revised concept

Afternoon
   Storyboard #2
   Video prototype #2

For Monday
   Final poster
   Final video prototype
   Final presentation slides