Invention

What is possible?

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

- Analyze information
  - Preference votes
  - Design dimensions

- Create resources for design
  - Key ideas
  - Design space
How do you find the design concept?

Based on your studies of users, choose a problem to solve specific to your audience.

Generate a variety of ideas that offer potential solutions.

Create a design space to embody the set of alternatives.

Choose a concept to explore not just functionality, but also interaction.

Generate new ideas

Brainstorming:
Imagine different situations in which users might interact with technology in a new way that meets a need or helps them do something new.

Focus on interaction in context not just a list of functions.

Express interaction:

Several levels of representation

- **Text**: explain an idea in words (Standard brainstorming)
- **Sketch**: draw to illustrate an idea (Standard brainstorming)
- **Mockups**: create and interact with paper prototypes (Rapid prototyping)
- **Theater**: act out the idea (Rehearse video brainstorming)
- **Video**: capture the details of the interaction (Video brainstorming)

Oral brainstorming rules

**Phase I**

Generate the maximum quantity of ideas

Everyone participates

Record every idea

... and everyone contributes at least one stupid idea

**Phase II**

Reread all the ideas

Everyone has three votes: mark your favorite ideas

Rank the ideas according to the number of votes

Discuss these ideas with respect to your design concept

Don’t forget weird or unusual ideas
**Exercise: Oral brainstorming**

Each group should choose:
- **Moderator:** Ensures that everyone participates
  - Stops discussions and critiques,
  - Keeps the time
- **Scribe:** Writes every idea
  - Reads the ideas at the end

Remember:
- Generate the maximum number of ideas
  - without evaluating them
- Quantity is more important than quality
- Everyone must participate
- Everyone has to give at least one ‘stupid’ idea

**Brainstorming: What not to do**

- Discuss ideas
- Criticize ideas
- Argue why an idea is good/bad
- Ignore each other’s ideas
- Shift topics
- Jump to abstractions
- Get stuck

- Just state each idea
- Just ask a question to clarify
- Move to the next idea
- Use them to create new ones
- Stick to the key topic
- Keep it specific
- Think orthogonally

**Opposites Technique**

If you get stuck, push existing ideas in new directions

<table>
<thead>
<tr>
<th>Opposites</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>simple</td>
<td>complex</td>
</tr>
<tr>
<td>short</td>
<td>long</td>
</tr>
<tr>
<td>direct</td>
<td>indirect</td>
</tr>
<tr>
<td>good</td>
<td>bad</td>
</tr>
<tr>
<td>direct</td>
<td>indirect</td>
</tr>
<tr>
<td>text</td>
<td>graphic</td>
</tr>
<tr>
<td>funny</td>
<td>serious</td>
</tr>
<tr>
<td>process</td>
<td>objet</td>
</tr>
<tr>
<td>start</td>
<td>end</td>
</tr>
<tr>
<td>single</td>
<td>sequence</td>
</tr>
</tbody>
</table>

**Video brainstorming**

**Goal:** Capture the interaction between the user and the system being designed

For each idea:

- Choose a director who has complete control over:
  - The description of the idea
  - How to video the idea
  - Which assistants do what
- Scribe: fills out video title card and idea list, keeps materials
- Camera person: videos the title card and the action
- Makers: create the paper prototype
- Actors (talent): perform the interaction, record voice-overs
Exercise: Video brainstorming

Goals:
- Capture as many ideas as possible
- Illustrate the interaction: show the user’s experience

Explore a theme and variations

Only one director per idea

Do not waste time arguing,
the director decides
If you disagree,
be the director for take 2
Each idea is short:
these are not scenarios
Use post-its, transparencies, etc.

Generative Design

- Discovery
  - Who is the user?

- Invention
  - What is possible?

- Design
  - What should it be?

- Evaluation
  - Does it work?

- Redesign
  - How to improve it?

Design

What should it be?

Design requires choices

Prototypes help express specific concepts
at different levels of representation

Goal: quality, not quantity of ideas

Careful! Each choice limits options
But also poses new questions
and may suggest new possibilities
Design: What should it be?

<table>
<thead>
<tr>
<th>Collect information</th>
<th>Design brief</th>
<th>Analyse information</th>
<th>Resources for design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design brief plus results from earlier phases</td>
<td>Function-interaction table</td>
<td>Design scenario</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Storyboard</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Mockup</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Design brief</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Earlier results</td>
</tr>
</tbody>
</table>

Exercise: Design space

- Identify the key ideas
- Extract different design dimensions that characterize the ideas
- Place the ideas along the design dimensions
  - at least three ideas per dimension
  - generate new ideas if you find gaps
  - explore the intersections of different dimensions
- Select a subset of dimensions and ideas to create the design space

Design space
Design space

Creating a concept

Define your project within the scope of the design space

Identify a real, specific problem.
- Real problems tend to be complex and messy
- Look for a small, simple aspect of a real problem
- Rather than a stereotypical ‘toy’ problem

Trade-off between power and simplicity:
- Less is More

Be curious, be creative, seek surprises and new opportunities

Choose a concept

Observe users

Generate ideas

Create a design concept

Lego Znap

Pose design questions about how users will interact

Propose ways to address them

How to introduce ‘big moments’ into the model?
Lego Znap

How to encourage kids to add to their system?

Describe a design concept

How will the system work?
- Functionality: what should it do?
- User guide: how does it work?
- Scenario: what happens in real-world contexts?

Justification
- What are the alternatives?
- What are the advantages and disadvantages of this solution?

Iterating on a design concept

Based on the use scenario, personas and user profile together with the key ideas from your design space

Discuss your design concept:
- Consider how the users in the scenario will react
  - Does it respond to real user needs?
  - Is it specific?
  - Is it technically possible?

Build on your design resources:
- User perspective:
  - User profile
  - Personas
  - Use characteristics
  - Use scenario

System possibilities:
- Design problem
- Design space dimensions
- Key or favorite ideas
- Design space

Exercise: Design concept

What is your design concept?
Prototyping interaction

- **Design scenario**
  - Imagine the system from the user's perspective

- **Wizard of Oz**
  - Simulate the system live with a human operator 'behind the curtain'

- **Video Prototype**
  - Illustrate the use of the system in context
    - "sketch" dynamic, interactive user experiences

- **Simulation**
  - Create a working subset of the system

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What is a prototype?

**Prototype** = concrete representation of an interactive system

**Characteristics**
- **Representation:** form of prototype
  - sketches - simulations
- **Precision:** level of detail
  - informal - complete
- **Interactivity:** interaction
  - watch - interact
- **Evolution:** lifecycle of prototype
  - throw out - iterative

The choice of prototype depends upon the design phase and the specific needs of the designers

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Video supports every phase of design

1. **Observation**
   - Users in context
2. **Prototyping**
   - Design possibilities
3. **Brainstorming**
   - Explore new ideas
4. **Evaluation**
   - Users try new system

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**Interaction techniques**

**Design principles**

**Use scenarios**
### Prototyping helps the designer …

- Consider different design alternatives
- Ensure usability under diverse conditions
- Help users and other stakeholders imagine the interface
- Focus on problematic parts of the interface

### Representation

<table>
<thead>
<tr>
<th>Paper prototypes</th>
<th>Easy and fast to create and to throw away</th>
<th>Most useful at the beginning of the design process</th>
</tr>
</thead>
<tbody>
<tr>
<td>examples:</td>
<td>sketches for an idea for an icon,</td>
<td>storyboards, mockups of screens,</td>
</tr>
<tr>
<td></td>
<td>video prototypes of a complex interaction</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>On-line prototypes</th>
<th>Use the computer, longer to create, more polished</th>
<th>More appropriate later in the design process</th>
</tr>
</thead>
<tbody>
<tr>
<td>examples:</td>
<td>animations, interactive videos,</td>
<td>scripting languages, interface builders</td>
</tr>
</tbody>
</table>

### Precision

- Low fidelity (lofi) prototypes with little detail
  - Great for rapid exploration of ideas
  - example: paper sketches, SILK

- High fidelity (hifi) prototypes, very detailed
  - Good to communicate specific design considerations
  - example: dialog box with layout alternatives

### Details

- A system can be good in theory but unusable in practice because of flaws in the interface … even small ones
- Good prototypes let designers work with different sets of details at the same time
- Good prototypes allow users to envision the final system; but also to feel comfortable suggesting changes

Note: A detailed representation is not always precise. It is possible to omit aspects that have not yet been decided.
### Level of Interactivity

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-interactive (fixed)</td>
<td>No interaction, but can show potential interaction</td>
<td>a video clip showing user interacting with a device</td>
</tr>
<tr>
<td>Low interaction (pre-determined path)</td>
<td>Can test several alternative forms of interaction</td>
<td>designer shows a screen shot, user indicates her action, the designer shows the result</td>
</tr>
<tr>
<td>High interaction (open)</td>
<td>Users interacts with the system, with some limitations</td>
<td>Wizard of Oz or computer-based simulation</td>
</tr>
</tbody>
</table>

### Wizard of Oz

The designer/wizard interprets the actions of the user and controls the responses of the system.

The user experiences what the 'real' system might be like.

The system may be:
- non-existent
- partially built
- completely functional

Best for certain types of interaction (based on wizard's reaction time).

Wizard of Oz:
- Designer 'plays computer' to create an interactive experience for the user
- Useful for creating video prototypes but also for creating live experiences that rapidly explore different design alternatives.

### Evolution

- Rapid prototypes: Early exploration of diverse alternatives
  - Easy to create, check, throw away afterwards
  - Example: paper prototype or interface like SILK
- Iterative prototypes: Create successively more refined modules
  - Example: series of prototypes, successively more detailed
- Evolving prototypes: May become the final product
  - Different completed sections are successively added
  - Example: a software module has functionality added before being added to the final system
## Prototyping strategies

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td>Complete one layer of functionality at a time</td>
<td>Develop the details of the interface without a working database</td>
</tr>
<tr>
<td>Vertical</td>
<td>Complete functionality of part of the system</td>
<td>Develop the spelling checker first</td>
</tr>
<tr>
<td>Task</td>
<td>Create functionality necessary for a single task</td>
<td>Develop the interface for adding and editing an image</td>
</tr>
<tr>
<td>Scenario</td>
<td>Create functionality needed to run a scenario</td>
<td>Develop the functions needed to edit three images and spell-check a document within a design scenario</td>
</tr>
</tbody>
</table>