D-Lab

Spring

2010

Development through Dialogue, Design and Dissemination
Today’s Class

• Logistics
• Design Box Presentations
• Design, Innovation, Invention and the Design Process
• Discussion
  – Readings
• Case Studies
Some Logistics

- Turning in Homework
- Course website
- Textbooks
Technology Boxes

- Which one is your favorite?
- Which one exemplifies the trade-offs that were made
- 2 minutes or less!
Design, Innovation and Invention
**invent**: to be the first to think of, make, or use something

**design**: to work out or create the form or structure of something
Innovation

Clear plastic bottles poking through roof capture sunlight to illuminate windowless rooms

http://www.youtube.com/watch?v=C8S3764DmIP4
Harder problems lead to better inventions

Shawn Frayne
Challenges in Design

- Tradeoffs
- Dynamics and long-term effects of use
- Details
- Time Pressures
- Economics
- Use and mis-use
- Ethics
The Design Process

- Information Gathering
- Problem Definition
- Design Specifications
- Idea Generation
- Analysis & Experimentation
- Concept Evaluation
- Detail Design
- Fabrication
- Testing & Evaluation
The Creativity Caveat

• Don’t let the process detract from the product
The Changing Approach
The Design Process

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Design Specifications

- Translate customer needs into quantitative design performance targets
- Define internal basis for measuring success
- Capture the necessary characteristics for a successful product
- Provide a basis for resolving trade-offs
### Translating Customer Needs

<table>
<thead>
<tr>
<th>Need</th>
<th>Design Attribute</th>
<th>Units</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy assembly</td>
<td>Assembly time</td>
<td>seconds</td>
<td>Floyd</td>
</tr>
<tr>
<td>Safe</td>
<td>Structural safety factor</td>
<td></td>
<td>Lisa</td>
</tr>
<tr>
<td>Safe</td>
<td>Fatigue life</td>
<td>cycles</td>
<td>Nathan</td>
</tr>
<tr>
<td>Magical</td>
<td>Works like magic</td>
<td>subjective</td>
<td>Meta</td>
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</tbody>
</table>
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Brainstorming Method

- generate lots of ideas
- explore all classes of solutions
- develop new perspectives
- generate usable information
Brainstorming Rules

- Defer judgment
- Build upon the ideas of others
- One conversation at a time
- Stay focused on the topic
- Encourage wild ideas
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# Pugh Chart

<table>
<thead>
<tr>
<th></th>
<th>Nail</th>
<th>Ring Shank</th>
<th>Staple</th>
<th>Screw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate</td>
<td>S</td>
<td>S</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Cost</td>
<td>S</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Holding</td>
<td>S</td>
<td>+</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Effort</td>
<td>S</td>
<td>S</td>
<td>+</td>
<td>-</td>
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Design for Developing Countries
“Brute force engineering options often meet the criteria but somewhere there is a profound solution, which is simple, cheap, and beautiful. Hold out for this as long as possible.”

-Kurt Kornbluth
former D-Lab Instructor
Battery-operated field incubator
$1250

Thermo-electric field incubator
$500

Phase change incubator
$100

Commercial incubator photos (left and center) © source unknown. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.
The Phase Change Incubator

[Graphs showing temperature change over time, with phases labeled as 'Solid' and 'Liquid'.]
Guiding Principles for DfDC

• Identify functional requirements
• Encourage participatory development
• Value indigenous knowledge
• Promote local innovation
• Strive for sustainability
Technology Case Studies
Coming up...

• Project Selection (Mar 1)
  – Design challenge descriptions due for review by Wednesday, Feb 17
  – Slides due by noon on Wednesday, Feb 24
• Readings on course website
• Homework 1 (due Feb 10)
• Homework 3 (due Feb 10)