Announcements
- Tesla field trip confirmed for 3/3, leave Stanford at 2pm
- Projects from 2015 posted.

Project deadline – Next Wednesday
- Form teams, decide project, 1 paragraph project problem statement due 1/25 at midnight!

Lecture
- The Design Process

Speaker
- Lee Redden, Blue River Technology
THE DESIGN PROCESS
IDEAS ARE NOT PRODUCTS

What is missing from this picture?

Problem Statement

What gets built.
FROM IDEA TO PRODUCT

Problem Statement

Design Process
ORIGIN OF IDEA

Designer – Client – User Triangle
THE DESIGN PROCESS: 5-STAGE DESCRIPTIVE MODEL

- Client Statement
- PROBLEM DEFINITION
- CONCEPTUAL DESIGN
- PRELIMINARY DESIGN
- DETAILED DESIGN
- DESIGN COMMUNICATION
- Final Design

Research
INFORMING A DESIGN PROCESS

- Thinking Strategically
  - Decompose larger problem into smaller sub-problems

- Formal Design Methods
  - Objective Tree
  - Pairwise Comparison Charts (PCC)
  - Metrics
  - Functional Specifications
  - Performance Specifications
  - Morph Charts
INFORMING A DESIGN PROCESS (cont)

- Acquiring Design Knowledge (Research)
  - Literature – including Codes & Regulations, Patents, etc.
  - Benchmarking (competitive products)
  - Reverse engineering
  - Interviews – informal & formal
  - User surveys & questionnaires/Focus Group
  - Brainstorming
INFORMING A DESIGN PROCESS (cont)

- Analysis & Testing
- Getting Internal Feedback
  - Regular Scheduled Meetings & Formal Design Reviews
- Getting External Feedback
  - External experts
  - Focus groups
FUZZY FRONT-END

Client Statement

PROBLEM DEFINITION

CONCEPTUAL DESIGN

PRELIMINARY DESIGN

DETAILED DESIGN

DESIGN COMMUNICATION

Final Design
EXAMPLE: DESIGN A SAFE LADDER

Simple, straight-forward design objective?

?
9 Types of Ladders according to the American Ladder Institute:

- Articulated Ladder
- Combination Ladder
- Extension Ladder/Extension Trestle Ladder
- Fixed Ladder
- Job-Made Wooden Ladder
- Mobile Ladder
- Platform Ladder
- Single Ladder
- Step Ladder/Step Stool Ladder
LADDER TYPE BY DUTY RATING

Type 3
200lbs
Light-Duty Household Ladder

Type 2
225lbs
Medium-Duty Commercial Ladder

Type 1
250lbs
Heavy-Duty Industrial Ladder

Type 1A
300lbs
Heavy-Duty Industrial Ladder

Type 1AA
375lbs
Extra Heavy-Duty Industrial Ladder

Source: http://www.thepaintedsurface.com/images/ladderrating.gif
## Metal Ladder Types by Length

<table>
<thead>
<tr>
<th>Ladder Type</th>
<th>Max Length</th>
<th>Special Reqs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Section Ladder</td>
<td>30’</td>
<td>Wider than 12”</td>
</tr>
<tr>
<td>Extension Ladder</td>
<td></td>
<td>Overlap stops required. Wider than 12”</td>
</tr>
<tr>
<td>2-Section</td>
<td>48’</td>
<td></td>
</tr>
<tr>
<td>&gt; 2-Section</td>
<td>60’</td>
<td></td>
</tr>
<tr>
<td>Step Ladder</td>
<td>20’</td>
<td>Insulating, nonslip pads. Locking device.</td>
</tr>
<tr>
<td>Platform Ladder</td>
<td>20’</td>
<td></td>
</tr>
<tr>
<td>Trestle Ladder/Extension</td>
<td>20’</td>
<td></td>
</tr>
</tbody>
</table>
A Quick Check on lowes.com website:

- Over 362 Types of Ladder
- Least Expensive Ladder - $39.32
- Most Expensive Ladder - $1,073.55

Suddenly designing a safe ladder seems much more complicated than it first appeared...
PROJECT PROBLEM STATEMENT

- 1 Paragraph statement: What is the problem your project is solving?
- Choose appropriate scope
- Be specific
- Do not include the solution in the problem description
- Due Next Wednesday – 1/25 – at midnight
THIS WEEK’S ASSIGNMENT

- Form Team
- Choose Project
TODAY’S SPEAKER

LEE REDDEN
Blue River Technology