ME 4054W: SENIOR DESIGN PROJECTS

Class: 2-Tues
Customer Needs
Notes

• Clarifications
  – Non-Disclosure Agreements
  – Intellectual Property Agreements

• Syllabus / Logistics Questions?

• Textbook Loans
  – Jeanne Sitzmann, ME 1120

• Reminder: Google Site & Roster Due Thurs
Class Agenda

• Identifying the Customers
• Developing Customer Needs
  1. Gather Customer Information
  2. Translate into Customer Needs
  3. Organize Needs
  4. Establish Relative Importance of Needs
  5. Reflect on Results
Who are the customers?

• Customer defined multiple ways
  – End user
  – Those affecting the buying decision
  – Those interacting with the product

• Understanding who the customers are is important
  – Design specs focus on needs of critical customers

• Ex: Smart phone
  – End user/purchaser → critical customer
  – Seller
  – Service provider, etc.
Who are the customers?

• Commercial products have broader set of customers

• Consider an excavator:
  – Name some of the customers
  – What is important to them?
Who are the customers?

Consider as many customers as practical. The relative importance of their wants and needs will be determined later.
Who are your customers?

In Your Project Teams:

• Generate a list of the customers of your project
Some ways to determine needs…

- My advisor said, “Do it this way”
- Team member Sam said, “Gosh, I would buy one!”
- Marketing said, “Here are the specs”
Another way to determine needs...

- Determine *who* the customers are
- Determine *what* information should be gathered from customers
- Determine *how* that information should be gathered

And then, *translate* that information into product requirements and engineering specifications
Step 1: Gathering Customer Information

- Interviews
- “On the job” observations
- Surveys
- Focus groups

Gather and report raw data; no interpretations... yet!
Interviews

• Great for getting lots of information quickly
• Interviews ideally should be done with all “customers”
• Have an interview script. Review it with your team and advisor, but “go with the flow” if the interviewee is providing useful information.
• Suppress preconceived hypotheses about the product technology. Focus on wants and needs.
• Be alert for surprises and the expression of latent needs.
Interviews

• It is best to have two team members participate in interviews. One can focus on asking questions and the other on listening and taking notes.

• Take notes of everything, not just what you want to hear. Record direct quotes, too.

• Interviews can be hard to schedule; be flexible

• Be mindful of people’s time; ask for a specific amount of time and stick to it

• Interviews can be done in person or over the phone
Interview Example: Rescue Spreader

- Interviewing Conventional and Lead Users
- Generated Unanticipated Results
Interview Question Exercise

In Your Project Teams:

• Generate 5 potential interview questions to ask your customers
Observations

• GREAT method!
• Be a “fly on the wall”
• Observe environment where design will be used
• Take notes
• Best way to understand the end user
• Important for engineers to observe…and not simply rely on what others say
Surveys

• Hard to create a good questionnaire
• Keep it short
• Minimize essay questions (interview instead)
• Need large sample size for quantitative data
• Screen respondents...you want the right sample
• Web surveys...only if you direct people to it
• Mail surveys...time scale wrong for ME4054
Focus groups

- Generates group discussion
- Can resolve conflicting views
- More than just getting people together
- Needs a skilled moderator
- Sometimes done in special facility with 1-way mirror and design team watching
- Requires planning, scheduling, and often budget
- Logistics are challenging for an ME 4054 project
What to do with the information…

• Collect information as raw data; do not interpret as you take notes
• See the text for methods to organize and translate raw data into information you can use to guide the design of your product
• Always check information against your common sense
Step 2: Translating into Customer Needs

General Guidelines

• *What* not *How*
• Preserve detail
• Positive, not Negative
• Attributes of the product:
  “The rescue spreader is lightweight”
• Avoid *Must* and *Should*
Example: Design of a Cordless Screwdriver

Steps:
1. Gather data from customers
2. Translate into “needs”
3. Organize into a hierarchy
4. Establish relative importance
## Step 2: Translating into Customer Needs

<table>
<thead>
<tr>
<th>Question/Prompt</th>
<th>Customer Statement</th>
<th>Interpreted Need</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical uses</td>
<td>I need to drive screws fast, faster than by hand.</td>
<td>The SD drives screws faster than by hand.</td>
</tr>
<tr>
<td></td>
<td>I sometimes do duct work; use sheet metal screws.</td>
<td>The SD drives sheet metal screws into metal duct work.</td>
</tr>
<tr>
<td></td>
<td>A lot of electrical; switch covers, outlets, fans, kitchen appliances.</td>
<td>The SD can be used for screws on electrical devices.</td>
</tr>
<tr>
<td>Likes—current tool</td>
<td>I like the pistol grip; it feels the best.</td>
<td>The SD is comfortable to grip.</td>
</tr>
<tr>
<td></td>
<td>I like the magnetized tip.</td>
<td>The SD tip retains the screw before it is driven.</td>
</tr>
<tr>
<td>Dislikes—current tool</td>
<td>I don’t like it when the tip slips off the screw.</td>
<td>The SD tip remains aligned with the screw head without slipping.</td>
</tr>
<tr>
<td></td>
<td>I would like to be able to lock it so I can use it with a dead battery.</td>
<td>The user can apply torque manually to the SD to drive a screw. (!)</td>
</tr>
<tr>
<td></td>
<td>Can’t drive screws into hard wood.</td>
<td>The SD can drive screws into hard wood.</td>
</tr>
<tr>
<td></td>
<td>Sometimes I strip tough screws.</td>
<td>The SD does not strip screw heads.</td>
</tr>
<tr>
<td>Suggested improvements</td>
<td>An attachment to allow me to reach down skinny holes.</td>
<td>The SD can access screws at the end of deep, narrow holes.</td>
</tr>
<tr>
<td></td>
<td>A point so I can scrape paint off of screws.</td>
<td>The SD allows the user to work with screws that have been painted over.</td>
</tr>
<tr>
<td></td>
<td>Would be nice if it could punch a pilot hole. (!)</td>
<td>The SD can be used to create a pilot hole. (!)</td>
</tr>
</tbody>
</table>

**Customer:** Bill Esposito  
**Address:** 100 Memorial Drive  
Cambridge, MA 02139  
**Telephone:** 617-864-1274  
**Willing to do follow-up:** Yes  
**Interviewer(s):** Jonathan and Lisa  
**Date:** 19 December 2002  
**Currently uses:** Craftsman Model A3  
**Type of user:** Building maintenance
## Step 2: Translating into Customer Needs

### Guidelines for writing needs statements:

<table>
<thead>
<tr>
<th>Guideline</th>
<th>Customer Statement</th>
<th>Need Statement—Right</th>
<th>Need Statement—Wrong</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;What&quot; not &quot;how&quot;</td>
<td>&quot;Why don’t you put protective shields around the battery contacts?&quot;</td>
<td>The screwdriver battery is protected from accidental shorting.</td>
<td>The screwdriver battery contacts are covered by a plastic sliding door.</td>
</tr>
<tr>
<td>Specificity</td>
<td>&quot;I drop my screwdriver all the time.&quot;</td>
<td>The screwdriver operates normally after repeated dropping.</td>
<td>The screwdriver is rugged.</td>
</tr>
<tr>
<td>Positive not negative</td>
<td>&quot;It doesn’t matter if it’s raining; I still need to work outside on Saturdays.&quot;</td>
<td>The screwdriver operates normally in the rain.</td>
<td>The screwdriver is not disabled by the rain.</td>
</tr>
<tr>
<td>An attribute of the product</td>
<td>&quot;I’d like to charge my battery from my cigarette lighter.&quot;</td>
<td>The screwdriver battery can be charged from an automobile cigarette lighter.</td>
<td>An automobile cigarette lighter adapter can charge the screwdriver battery.</td>
</tr>
<tr>
<td>Avoid &quot;must&quot; and &quot;should&quot;</td>
<td>&quot;I hate it when I don’t know how much juice is left in the batteries of my cordless tools.&quot;</td>
<td>The screwdriver provides an indication of the energy level of the battery.</td>
<td>The screwdriver should provide an indication of the energy level of the battery.</td>
</tr>
</tbody>
</table>
Customer Needs Exercise

In Your Project Teams:
• Put yourself in the role of your customer
• Generate a list of customer needs

General Guidelines
• What not How
• Preserve detail
• Positive, not Negative
• Attributes of the product:
  “The rescue spreader is lightweight”
• Avoid Must and Should
Step 3:
Organize the needs into a hierarchy

- Print each statement on a card or Post-It note
- Eliminate redundant statements
- Group the statements according to the similarity of needs they express
- Choose a label for each group
- Consider “supergroups” of 2-5 groups
- Review and edit the organized needs statements
Step 4: Establish the relative importance of needs

• Two basic approaches
  – Consensus of the team
  – Further customer surveys

• A numerical ranking process is a common tool. For example:
  – 5 - The feature is critical
  – 4 - The feature is highly desirable
  – 3 - The feature would be nice to have, but is not necessary
  – 2 - The feature is not important
  – 1 - The feature is undesirable
Step 5: 
Reflect on the results and the process

• Have we included all of the important types of customers?

• Did we miss anything in our information gathering process? Are there any follow up interviews needed?

• What do we know now that we didn’t know when we started? Did we find any surprises?

• How can we improve the process?
The bottom line…

It makes no sense to create a design that nobody other than the design team wants!

Gathering “voice of the customer” is a continuous process
Class Wrap-Up Exercise

In Your Project Team:

• Determine what methods you will use to determine your customer needs. Why are these most effective?

• Short Presentation on All Exercises to Class
  – Who is Customer, Interview Questions, Customer Needs, Methods

• Capture responses from all exercises and post on Google Site as a working document