2.009 Product engineering processes

people don’t know what they want they want what they know
how the customer explained it

what the customer really needed
A product opportunity

**idea + user need + market + doable**

3-ideas presentation
Identifying opportunities

idea + user need + market + doable

Processes:

individual creativity strategies
Identifying opportunities

idea + user need + market + doable

Processes:

Individual creativity strategies
why raise the bar?

“the best way to get a good idea is to get a lot of ideas”

Linus Pauling, 1901-1994
Chemist, Nobel prize winner
Nobel peace prize

Nature of chemical bonds
Identifying opportunities

idea + user need + market + doable

Processes:

individual creativity strategies

brainstorming

1. Defer judgment
2. Encourage wild ideas
3. Go for quantity
4. Build on the ideas of others
Identifying opportunities

idea + user need + market + doable

Processes:

individual creativity strategies
brainstorming
one-on-one/few discussions
Identifying opportunities
idea + user need + market + doable

Processes:
individual creativity strategies
brainstorming
one-on-one/few discussions (idea
secondary research (treasure hunt)
Treasure hunt feedback

overall, pretty well done!

first in: Silver A at 4:07 pm Wednesday
last in: Blue A at 11:44 am Thursday

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Question 1: You are investigating a UV sensor for use in HAZMAT operations and need to find some facts and specifications. You want to be sure your device is appropriate for HAZMAT situations and know there is a standard specification for ruggedness for HAZMAT instruments. Hint: standards and handbooks are great for finding this kind of information.

(a) If your device is defined as hand-carried, what should its maximum weight (kg) be? What is its maximum size? According to the ASTM standard specification for ruggedness for instruments used during HAZMAT operations, the maximum weight for a hand-carried device should be 2.3 kg. The maximum size in sum of sides should be 40 cm, not including attachments such as handles, nipples, filter cartridges, and hoses. (2) [y] + q

(b) If you're using this hand-carried device in the field, what temperature range in °C should it be functional in? According to the ASTM standard for ruggedness for HAZMAT instruments, the standard temperature range for a hand-carried device is -34 to +49 °C. (1) [y] + q

+ 2 citation

Question 2: You are trying to estimate the size of the market for your revolutionary new product, which is a fire alarm. It would be helpful to get some statistics on the size of the fire & smoke alarm manufacturing industry in the United States. Note: to cite this answer, provide the name and URL of the resource you used.
Treasure hunt

feedback

well done!

first in: Sliver A at 4:07 pm Wednesday
last in: Blue A at 11:44 am Thursday

2.009 PINK A Treasure Hunt Answers

Answers highlighted in pink, citations are underlined

Question 1
You are investigating how to best design a lifeboat that is capable of finding survivors in the water with a searchlight. You need additional information to ensure your lifeboat is built correctly.

1a) What height should the searchlight be? (The height from the base to the top of the light shall not exceed) 19 inches (483 mm)

1b) How long should the searchlight be capable of being operated? (No less than) 3 hours of continuous use or 6 hours of intermittent use

2 Citation for #1:

Question 2
You are trying to estimate the size of the market for your revolutionary new product, which is a device for controlling air pollution. It would be helpful to get some statistics on the size of the global market for air pollution control equipment.
Treasure hunt

feedback

top sections:
incorporated the question into their response
provided all of the requested information, plus additional context
provided correct, consistent citations
provided a nicely formatted, easy to read document
used resources efficiently (and asked for help!)
Treasure hunt
results

top scavengers: silver b

blue a
Treasure hunt
some team lessons

how did your section manage delegation?
Identifying opportunities
idea + user need + market + doable

Processes:
individual creativity strategies
brainstorming
ask, one-on-one/few discussions (idea fair)
secondary research (treasure hunt)
in-context observation of users
Identifying opportunities
observing people, observing things
Identifying opportunities
observing people, observing things

you are a detective looking for clues
why observe users?
you will learn something!
increase your odds for a successful product
right now…
  identify leads for opportunities
define product goals

observing people:
5 PM today in 3-333
Observation exercise
the opportunity-finding process has just begun!

each person in your section will sign up to observe at one of several place options

based on your observations, report at least one new, product opportunity to the team in lab next week

at the end of class, organize as section and complete ‘observation places’ signup form

who is going where page in case you want to work in across-team groups of up to 3 (recommended)
Identifying opportunities
idea + user needs + market + doable

Processes:
individual creativity strategies
brainstorming
ask, one-on-one/few discussions (project fair)
secondary research (treasure hunt)
in-context observation (observation exercise)
ingineering (feasibility) estimation
Estimation exercise
some practice

estimate the usable energy in a D size battery

2 minutes
blank index card
name and section on top of page
no computers or mobile devices
hand in to center isle
Usable energy in a D cell solution example

Develop a model

simple, familiar, analogous

\[ E = P \times t \]
Usable energy in a D cell solution example

Apply some numbers, check units

\[ E = P \times t \]

Flashlight bulb: 5W
Battery life: 3 hr
(10800 s)
D cells: 2

\[ 2E = 5 \text{ J/s} \times 10800 \text{ s} \]
\[ E = \sim 3 \times 10^4 \text{ J} \]
Identifying opportunities
idea + user need + market + feasibility

gineering estimation
order of magnitude calculations, back of the envelope

why?
explore the feasibility ideas and potential degree of difficulty quickly, even though many details are unresolved

analysis analog of an idea sketch

Something that requires practice (and creativity)
Feasibility estimation

general approach

1) you have an idea!

2) what worries you? (critical feasibility questions)

3) develop/ideate analogous models

4) apply quantities, checking units

5) decide if answer seems believable
Good news everybody!
I have an idea
An idea!
battery powered, hand-held foam cutter

is it feasible?

Step 2
key “is it possible” question

name on index card
1 minute
no computers or mobile
An idea!
battery powered, hand-held foam cutter

is it feasible?
key question?
how big for reasonable use time? how much battery? power?

Steps 3 + 4
develop an analogous model
some numbers
name on index card
1 minute
no computers or mobile
An idea!

Battery powered, hand-held foam cutter

light bulb 100 W
sphere dia. ~4 cm
area ~ 50 cm\(^2\)
need ~2 W/cm\(^2\)

wire dia. 0.1 cm
wire length 15 cm
wire area ~5 cm\(^2\)

power: 2 W/cm\(^2\) x 5 cm\(^2\)
~10 W

key question?
how big?
power?
An idea!
Battery powered, hand-held foam cutter

what next?
feasibility test
(sketch model)

power ~10 W
reasonable: yes
A sketch model!
battery powered, hand-held foam cutter

what next?
sketch model
and last…

some logistics

observing people: 5 PM today in 3-333

over the weekend:
read chapters 3 and 4 in text
read details for the 3-ideas presentation

if you have not received email from me yet…
add drwallac, drwallace as safe sender
now!

organize for observation exercise

one section member completes web signup form
who-is-going-where summary online

scored treasure hunt submissions will be emailed to your section