2.009

Class and Lab Schedule (Syllabus)

Date	Class	Lab	Assigned	Due this day	Due in your lab
Wed. **Sept. 5**	2.009 Introduction (.pdf) Failed prototype test (.mpeg)	No lab this week	Lab section signup Design notebook *Reading:* Read chapters 1 and 2 in textbook		
Fri. **Sept. 7**	Creativity and project introduction (.pdf) Creativity strategies cheat-sheet (.pdf) Brainstorming tutorial (.pdf) Project ideas from class brainstorming		Brainstorming *For sketching help see the sketching tutorials* Idea fair	**Special tutorial** on idea sketching. All students welcome. Sketching materials will be provided. 4-5 PM, room TBA.	
Sat. **Sept. 8**				**Lab section signup** (due at 5 PM)	
Mon. **Sept. 10**	Teams (.pdf) Team-building challenge (.mov) Team-building challenge roles (.pdf) Running a meeting primer (.pdf)	Week 1 lab instructions: *Electing officers and ideation*	3-Ideas presentation Project timesheet	**Idea fair** (7 PM) Idea fair logistics Presentations from the fair	**Brainstorming**
Wed. **Sept. 12**	Meetings and finding information (.pdf)		Treasure hunt (instructions and resources)		
Thurs. **Sept. 13**				**Treasure hunt** (due at noon) Treasure hunt results	
Fri. **Sept. 14**	Customer observation and estimation (.pdf)		Observation exercise *Reading:* Read chapters 3 and 4 in textbook	**Special tutorial** on how to observe and learn from potential users, 4 PM, room TBA.	

Date	Class	Lab	Assigned	Due this day	Due in your lab
Mon. **Sept. 17**	3-idea presentation and estimation challenge (.pdf)	Week 2 lab instructions: *Exploring ideas and preparing for the 3-ideas presentation*		**Special workshop** on designing using sourced parts: *Session I, design and source.* 7 PM in Pappalardo lab.	**Observation exercise**
Wed. **Sept. 19**	Sketch models (.pdf) For help with sketch modeling techniques, please see the sketch modeling tutorials		Sketch model review		
Thurs. **Sept. 20**				**Credit card training,** All financial officers must attend. 4 PM, room TBA. **Special tutorial** by Justin Lai and Geoff Tsai on building a design portfolio—tips from professional designers, 7:15 PM, room TBA.	

Date	Class	Lab	Assigned	Due this day	Due in your lab
Fri. Sept. 21	Student holiday Lab will be open if your team wants to meet and work on posters				
Sun. Sept. 23	You will be able to schedule plotter time in the Pappalardo lab				
Mon. Sept. 24	3-idea presentation introduction (.pdf) 3-idea presentation results, team idea areas	Week 3 lab instructions: *From opportunity area to concepts*		**3-Ideas presentation** (1 PM)	**Design notebook** **Project timesheet** All team officer positions should be finalized
Wed. Sept. 26	Ideas feedback (.pdf) What 2.009 students should know about patents (.pdf) Component library launch				
Thurs. Sept. 27				**Special tutorial.** Feeling rusty as we head into a key solid modeling phase for 2.009? 4 PM in 35-125 with product designer Eric Sugalski **Special Workshop** on designing using sourced parts: *Session II, build and test.* 7 PM in Pappalardo lab	
Fri. Sept. 28	Product teardown (.pdf) Teardown activity instructions (.pdf) *Results from class:* Teardown results Teardown in 60 seconds (.mov) *References:* Plastics identification Plastics identification symbols Costing guidelines (*MIT only, certificates required*) *Case studies by David Meeker (MIT only, certificates required):* Erasure benchmarking study Costing case study			*Reading:* Chapter 4 in the textbook (if you have not read it already)	**RFP training,** All financial officers must attend. 4:00 PM, room TBA.

Date	Class	Lab	Assigned	Due this day	Due in your lab
Mon. Oct. 1	Sketch model review logistics Build challenge (.pdf)	Week 4 lab instructions: *Preparing for the sketch model review*		**SI communication workshop** with cr instructors. All system integrators must attend, other class members are welcome. 7 PM, room 12-134. **Special tutorial** on finding information for your product with course librarians. All information officers must attend. 7 PM, room 14N-132 **Special Tutorial** by Sangbae Kim. A hands-on introduction	

to micro-controllers. 7 PM, room 3-270.

Wed. Oct. 3   Project consulting

Thurs. Oct. 4   Sketch model review introduction (.pdf)

     Review results: Sketch model results

                                               Sketch model review (7 PM)

Fri. Oct. 5   Sketch model feedback and challenge instructions (.pdf)   Peer review 1

     Tips for successful projects (.pdf)   Mockup review

                                         Team review A

Mon. Oct. 8   Columbus day holiday   Week 5 lab instructions: *Identifying and resolving key risks*   **Design notebook**

                                                   Project timesheet

Wed. Oct. 10   Mockups, customer needs, and human use (.pdf)   *Reading:* Chapter 5 in textbook   **Peer review 1** (9 PM)

                                                   Team review A (9 PM)

Thurs. Oct. 11   **Special Tutorial:** Top down design using Solidworks. This tutorial, by Eric Sugalski, will teach the CAD methods used in industry to create robust multi-user assemblies, dynamic mechanism layouts, and complex industrial designs.

Fri. Oct. 12   *Family weekend* Specifications (.pdf)   *Reading:* Chapter 16 in textbook

     The homer   Lab instructor review I

     Results from class: Specification exercise

Date	Class	Lab	Assigned	Due this day	Due in your lab
Mon. Oct. 15	Scheduling and time estimation (.pdf) *Results from class:* time estimation experiment	Week 6 lab instructions: *Preparing for the mockup review*		**Lab instructor review** (5 PM)	
Tues. Oct. 16					
Wed. Oct. 17	Mockup review pointers (.pdf) Detailed logistics Time to work in lab				
Thurs. Oct. 18	Mockup review introduction (.pdf)			**Mockup review** (7 PM)	
Fri. Oct. 20	Mockup feedback, critique, and ethics (.pdf) A tale of two critiques, worse and better (.mov) ASME code of ethics *Results from class:* Team codes of ethics		Peer review 2 Technical review Assembly model		

Date	Class	Lab	Assigned	Due this day	Due in your lab
Mon. Oct. 22	Product architecture (.pdf)	Week 7 lab instructions: *Making the decision!*	Code of ethics	**Peer review 2**	**Design notebook** **Project timesheet**
Wed. Oct. 24	Design for assembly (.pdf)		*Reading:* chapter 9 in textbook	**Code of ethics** (draft, 5 PM)	
Fri. Oct. 26	Project consulting Assembly review overview (.pdf)			**Code of ethics** (final version, 5 PM)	

Date	Class	Lab	Assigned	Due this day	Due in your lab
Mon. Oct. 29	Product form (.pdf) Chicken chart! (.pdf)	Week 8 lab instructions: *Clarifying the system vision, design details*			
Tues. Oct. 30				**Assembly model** (5 PM, digital files for red, green, blue and yellow teams)	
Wed. Oct. 31	Assembly review Assembly review introduction (.pdf) *Results from class:* Assembly review				
Thurs. Nov. 1				**Assembly model** (5 PM, digital files for pink, orange, purple and silver teams)	
Fri. Nov. 2	Assembly review Assembly review introduction (.pdf) *Results from class:* Assembly review				
Mon. Nov. 5	Safety, technical review and debugging process (.pdf)	Week 9 lab instructions: *Resolving design details and prototyping*		**Special Tutorial** on product costing by David Meeker. This will put you in position to have a good cost estimate for your final presentation. 7 PM, Pappalardo lab. Part 1 of 2, see schedule for part 2)	**Design notebook** **Project timesheet**
Tues. Nov. 6					
Wed. Nov. 7	Project consulting				
Thurs. Nov. 8				**Special industrial design consultation** by Jeremy Vanhill. This consultation will help you resolve the usability and vision for your product's embodiment. (see the detailed description for schedule)	
Fri. Nov. 9	Work period in lab		Peer review 3 Team review B	**Special tutorial.** The communications instructors will provide pointers on how to	

obtain user feedback and assess usability. 3:30 PM, room 12-134.

Date	Class	Lab	Assigned	Due this day	Due in your lab
Mon. Nov. 12	Veterans day: student and staff holiday.	Week 10 lab instructions: *Building the prototype*			Tool officers organize team area cleanup
Wed. Nov. 14	Final presentation overview I (.pdf)			**Peer review 3** **Team review B** (all due 9 PM)	
	2011 final presentation compendium (.mov)				
	Annotated final presentation example (.mov, 25 Mb)				
Fri. Nov. 16	Project consulting		Final presentation		
Mon. Nov. 19	No formal class due to evening presentation	Week 11 lab instructions: *Technical review and planning the rebuild*		**Technical review** (7 PM)	**Design notebook** **Project timesheet** (submit prior to thanksgiving holiday)
Wed. Nov. 21	no class/work period	Teams need to meet to plan, but lab times are optional this week. Professor Wallace will schedule time to meet with each team			
Thurs. Nov. 22	Thanksgiving holiday				
Fri. Nov. 23	Thanksgiving holiday				

Date	Class	Lab	Assigned	Due this day	Due in your lab
Mon. Nov. 26	2.009 business case (.pdf) Product costing /economics model (.xls)	Week 12 lab instructions: *Prototype rebuilding, presentation designing*	*Reading:* chapters 15 and 11 in textbook	**Special Tutorial** on product costing by David Meeker. The goal is to work on a cost estimate for your final prototype. 7 PM, Pappalardo lab. (part 2 of 2)	
Wed. Nov. 28	Presentation design (.pdf)		Practice sessions		
Thurs. Nov. 29				**Special Tutorial** by Beth Marcus on product naming. 7PM, Pappalardo lab.	
Fri. Nov. 30	Design reviews			**Special Tutorial** by Jolene de Verges on finding images for presentations. 4 PM in room 14N-123.	
Mon. Dec. 2	Final presentation logistics	Week 13 lab: *the final push*		**Special Tutorial** by Sarah Kaiser on Photoshop and Illustrator. 7PM, Pappalardo lab.	
Wed. Dec. 5	Presenting data (.pdf)				
Fri. Dec. 7	Time work in lab, or presentation practice sessions			**Practice sessions** (5-9 PM, room 3-270)	

Date	Class	Lab	Assigned	Due this day	Due in your lab

Mon. **Dec.** **10**	No class due to evening presentations See the final presentation logistics	Week 14 lab: *wrapping up*		**Final presentation**
Wed. **Dec.** **12**	Last day of classes! Final presentation reflection Lab cleanup, course evaluation, and dinner		Final peer review	**Design notebook** **Project timesheet**
Fri. **Dec.** **14**	Final exam period			
Sat. **Dec.** **15**				**Final peer review** (noon)
Tues. **Dec.** **18**				Final grades meeting for instructors

Electric garden cart
- degree handle
- load cell
- user studies

Mini Quiz
(same as online)

Lots of wrong right ans

But even more wrong answers

So many things to test

David Wallace - Instructor

Tech + Lab instructor

CI
TAs

Motivation

+ creativity

+ informed craft

= innovation

Design

    Creativity   to see view points   - lateral

    Capability   - informed

    Creativity to execute   - Synthesis

Paper example

    Opposite side of door

    create incentive

    huge sheet of paper

      Fold in middle

      (challenge paper assumption)

    Use people that can't move

③

Process
 Strategies so likly to be sucessful

Class
 16-18 team
 Functional alpha prototypes
 2 instructors
 4-6 mentors
 1 comm

Process
 planning
 concept design
 System design
 detail design
 testing production

(1)

brainstorm
Sketch
foam model
energy model
___

Drought
    generate ideas
___

Concept development
    CAD model
    test certain aspects
    more detailed modeling

Detailed Dev
    Make it really work
___

At start — explore a lot of options shallowly

milestones

9/24   4 min for 6 ideas
                 3 ideas each half

10/4   Soft models

10/18   Makeup Presentations
                 2 ideas
                 Make sure can do

12/10   product + biz case

———————

by Fri : sign up for lab assignments

2.009 Product engineering processes

Welcome!

powered garden cart automatically follows user

2.009 Product engineering processes
A mini quiz

Put your name on the top of an index card

Which object is different from all the others?

a
b
c
d
e

2.009 Product engineering processes
A mini quiz

Which object is different from all the others?

b

Congratulations!
The only one with all straight lines

2.009 Product engineering processes
A mini quiz

Which object is different from all the others?

c

Congratulations!
The only one that is asymmetric
The one made from two same shapes

4 Introduction

9/5

2.009 Product engineering processes
A mini quiz

Which object is different from all the others?

a

Congratulations!
The only one with no points

2.009 Product engineering processes
A mini quiz

Which object is different from all the others?

d

Congratulations!
The only one made with line and arc

2.009 Product engineering processes
A mini quiz

Which object is different from all the others?

e

Congratulations!
The only one that is the projection of
a triangle onto a curved surface

Welcome!

to product engineering processes
a place where there are many right answers

products for the developmentally disabled

Welcome!

there are many right answers

... and even more wrong answers
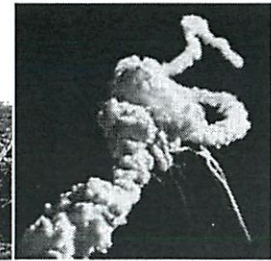
it's not easy, but...
we are here to help you succeed

course instructor   teaching assistants   administrative assistant

lab instructors

communication instructors

+ 36 mentors!
information/staff menu

technical instructors   librarian

Building a machine for innovation
team recipe

   motivation

+ creativity

+ informed craft

+ process

        = innovation

Machine for technical innovation
What's the recipe?

motivation

+ design

+ process

= innovation

'Design'

Creativity to *see* many unique viewpoints

Capability to understand/analyze/model/test viewpoints

Creativity to *generate solutions* from viewpoint

C1: lateral thinking (main message of the mini quiz)
C2: informed (most of your formal education) + craft
C3: synthesis from a viewpoint (constraints)

2.009 Developing/engineering products
A mini quiz for the '3rd C', generating solutions

Put your name on the top of an index card

Think of a way to put a sheet of paper on the floor so that when two people stand on it, facing towards each other, it is impossible to touch.

Some rules:
cutting or tearing the paper is not allowed
tying up the people is not allowed

One solution:

Another solution? hang ...challenge assumptions

Another solution? use two people that cannot move

2.009 Developing/engineering products

'Design'

Creativity to *see* many unique viewpoints

Capability to understand/analyze/model/test viewpoints

Creativity *generate solutions* from a viewpoint

Machine for technical innovation
What's the recipe?

motivation

+ design

+ process

= innovation

2.009 Developing/engineering products

'Processes'

a collection of strategies to help ensure that you have a high likelihood of being successful.

on time, every time.

2.009 Product engineering processes
The class

Develop new product ideas
Provide teams of ~16-18 students with the opportunity to experience the need-finding, innovating, prototyping, and business development cycle in a simulated but very realistic environment. Fully functional alpha prototypes are designed and fabricated by student teams.

Improve our 3Cs (design)
Practice being creative and constructing physical and analytical models for reasoning about creative alternatives.

Processes
Learn strategies for the 3Cs and apply them to product development and working in large teams.

2.009 Product engineering processes
goals for today

How is the course organized?

What will I experience?

What are the milestones (grading)?

Product engineering processes
How is the class organized?

Lab (product development activity)

2 instructors	2 instructors	2 instructors	2 instructors	2 instructors	2 instructors	2 instructors	2 instructors	technical managers
16-18 students	16-18 students	16-18 students	16-18 students	16-18 students	16-18 students	16-18 students	16-18 students	design team
mentors: 4-6 design 1 comm.	mentors: 4-6 design 1 comm.	mentors: 4-6 design 1 comm.	mentors: 4-6 design 1 comm.	mentors: 4-6 design 1 comm.	mentors: 4-6 design 1 comm.	mentors: 4-6 design 1 comm.	mentors: 4-6 design 1 comm.	consultants
discipline-specific mentors								consultants
1 course librarian								consultants
5 lab staff								consultants

Class (development process and design methods)

1 course instructor	CEO
3 course TAs	aides

Product engineering processes
How is the class organized?

planning	concept design	system design	detail design	testing	production

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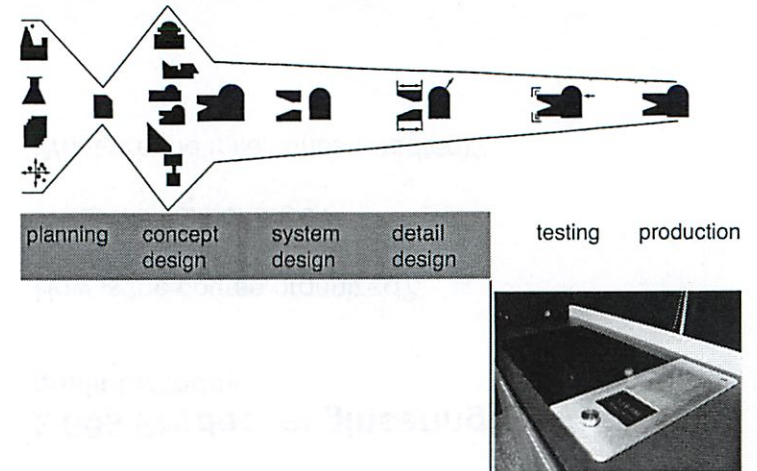
Product engineering processes
Beyond 2.009

Braille label maker
"the home", fall 2008

inexpensive, high quality printing, fast
after 2.009: patents
started company (6dot)
funded on kickstarter
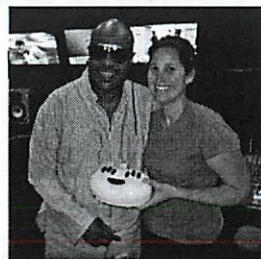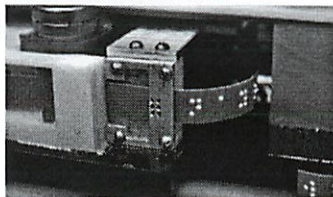
Product engineering processes
Beyond 2.009

HelmetHub
"on-the-go", fall 2011

urban bicycle rentals, but no helmets!
after 2.009: patent application
started company (HelmetHub)
mass challenge incubator

Product engineering processes

How is the class organized?

process

design techniques

product definition

physical modeling

What will I experience?

Idea development

Modeling activities

idea generation

market and customer estimates

sketch models

feasibility estimates

Idea generation

5 minute exercise

Write your name on the top of the sheet of blank paper.

Quivira National Wildlife Refuge in Hudson, Kansas
August 7, 2012

generate *as many ideas as possible* to mitigate…

droughts

Your ideas will be collected at the end of 5 minutes.

What will I experience?
Concept development

Modeling activities
concept development

mockups

market analysis

feasibility analysis
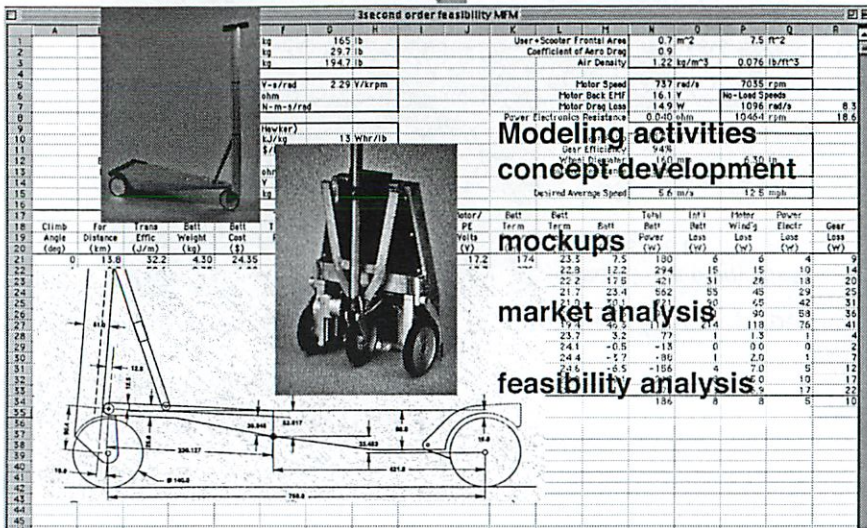
What will I experience?
Detailed development
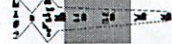
making it **really** work
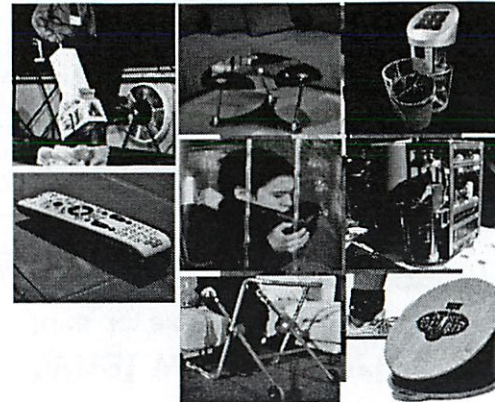
Modeling activities
- detail design
- detailed analysis
- user testing
- prototype fabrication

A set of modeling activities
Rigor in breadth and depth

estimation to detailed analysis

sketching to solid modeling and CAE

soft, sketch models to alpha prototypes
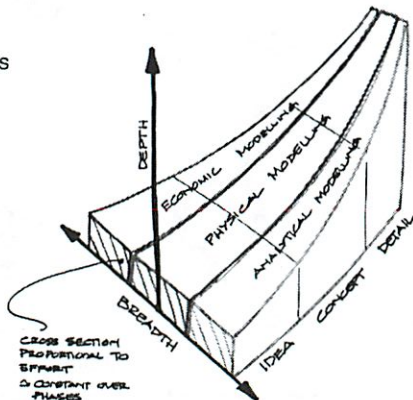
What are the milestones?
3-ideas presentation (September 24)

4 minutes for 6 ideas

defines team's focus area for the rest of the term!

elevator speech scenario
http://web.mit.edu/2.009/www/keyDates.html

What are the milestones?
Sketch model presentation (October 4)

4 design concepts, quick and dirty
technical, market, and customer needs data

efficient exploration of ideas

What are the milestones?
Mockup presentation (October 18)

2 product concepts per team
technical feasibility/operational principles
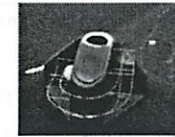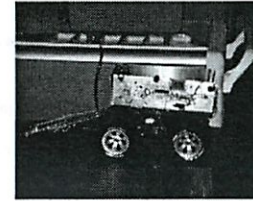
identify and resolve critical issues

Process check!
Oct 18! the term is half over and we still have not made our final idea selection?

Why waste all this time exploring ideas? Just tell us what the design problem is and we will do the detailed engineering.

One of the 3 Cs

The C that is being outsourced!
see the "creativity!" link on the course home page

Creative thinking is key to technical innovation

A series of exploration, experiments and learning that develops the insight to know what to do

What are the milestones?
Technical review (November 19)

demonstrate functional alpha prototype
discuss remaining areas for improvement

detailed engineering assessment

What are the milestones?
Final public presentation (December 10)

presentation to a wide audience: classmates, academics, and industry

a complete package: presentation quality, product design, business case
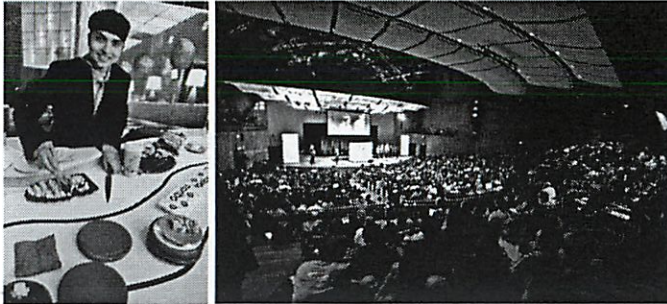
product launch

What are the milestones?
Feedback

all course staff review each team
results discussed in class
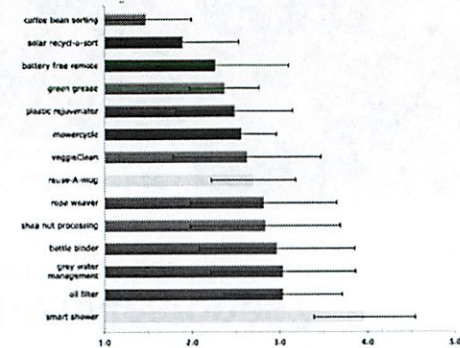
What are the milestones?
Grading

Deliverable	% Course Grade	Assigned To ...
Brainstorming	5	Individual
Design notebook	10	Individual
Peer review	10	Individual
Instructor leverage	5	Individual
3-Ideas review	5	Section
Sketch model review	15	Section
Mockup review	15	Section
Assembly model	5	Team
Technical review	20	Team
Final presentation	10	Team

What are the milestones?
Schedule and details

Home > Class and lab schedule
Class and Lab Schedule (Syllabus)

Date	Class	Lab	Assigned	Due this day	Due in your lab
Wed. Sept. 5	2.009 Introduction (.pdf)	No lab this week	Lab section signup		
			Design notebook		
	Failed prototype test (.mpeg)		Reading: Read chapters 1 and 2 in textbook		
Fri. Sept. 7	Creativity and project Introduction (.pdf)		Brainstorming For sketching help see the sketching tutorials	Special tutorial on idea sketching. All students welcome. Sketching materials will be provided. 4-5 PM, room TBA.	
	Creativity strategies cheat-sheet (.pdf)		Idea fair		
	Brainstorming tutorial (.pdf)				
	Project ideas from class brainstorming				
Sat. Sept. 8				Lab section signup (due at 5 PM)	

Where do I find course information?

http://web.mit.edu/2.009

Information Schedule Teams Team manual Project Resources Gallery

2.009 Product Engineering Processes

COURSE ANNOUNCEMENTS

Welcome class! Fall 2012
2.009 overview for the week of September 5

First class is Wednesday Sept 5, 1-2 PM in 10-250.

- key dates for the term!
- the course text is Product design and development by Ulrich and Eppinger

2011 final presentation,
3 minute compendium (.mov)

2.009 project gallery

press space bar for larger pictures, use
vance, or use controls below

- Of interest: (archive)
- HelmetHub in the news
- 2.009 angry birds (.mov)
- 2.009, a graphic novel
- Elika, classroom to showroom, continuing a 2.009 project.

celebration (4/23)

search

2.009 Product engineering processes

Preparation for this Friday

lab section registration:
> You MUST register online for a lab section before Saturday at
> 5 PM—see the 2.009 home page
> Please help each other not miss this deadline

review: course goals and syllabus

read chapters 1 and 2 in text

buy a design notebook

Friday
the project theme

?

9/5

2.009

Home > Design notebook

Design Notebook (physical and online)

background, physical notebook, online notebook, submission

You are required to keep an up-to-date design notebook throughout the term... this is an essential design practice that documents the history of your work.

Your design notebook contributes to a significant portion of the individual component of your final grade.

Notebooks are required in professional practice—they are important legal documents. They should also be **something that you are proud of**... something that you could show to a potential employer.

A few example pages from the notebooks of previous 2.009 students are on the right. You can click on the images to see the full sized pages.

Physical notebooks:
The notebook should be either a **8.5x11 spiral-bound book** (to make scanning easier) or a **standard-bound engineering notebook**. Unlined notebooks are preferred.

Use your design notebook to document all of your work and contributions towards your team's project. Do not use the notebook for lecture notes. Notebooks are working documents, but they must provide a *comprehensible* trail for your product development effort. Illegible notebooks will receive a failing grade.

Please be sure to write the date on each page when you make entries.

Your lab section instructor will review your notebook every second week during your lab period, as indicated throughout the course schedule (review dates are linked on the deliverables page).

Online notebooks:
In addition to a physical notebook, you will submit digital images of two pages from your notebook every two weeks. These submissions are used to make an on-line 'highlight' notebook, accessible through the team pages. You may want to make special two week summary pages in your notebook for the online submission.

The online notebook allows classmates to follow your contributions when completing peer reviews, and also will be used by your lab instructor.

Please review the detailed instructions on how to submit your notebook and digital images.
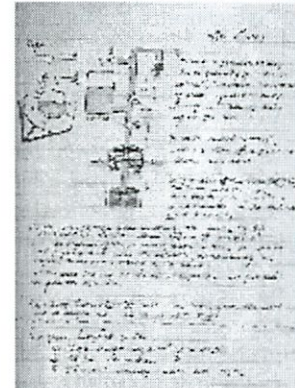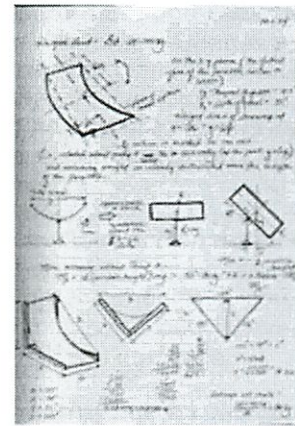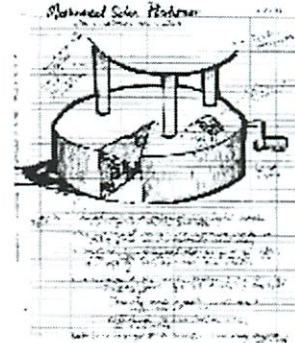
discovery
- look at same things, + think something different

mini quiz

me   Offical

creativity   2. Creativity
tech resources   1. motivation
oppetunity   ~~technology~~
resarces   4. process
                                        3. informed craft

(that seems kinda biased - just their exact answer

Least creative 6ol from yesterday
Why didn't people see the others?
b is obvious answer

It's scary to only have 1 idea

don't stop at 1st idea

Competion will have same one

4 people put more than 1

"So look for _more_ right answers

Turn VII to ~~PILX~~ VIII

w/ 1 stroke

IX~~I~~ to 6

└ SIX

Context Switch!

Or 1 × 6

↑ math symbol now!

Multiple viewpoints!

Ways to mitigate drought
- mode 4-5
- Tim Jenks 14
  - Won an iPad

- Class 154 ideas/min
- avg 1.1 idea/min/person
  - └ slow?

Want more ideas
- └ greater chance good idea

How?
- Creativity to see from diff viewpoints
  - Class, labs, dorms, food, student life
- Capability to understand viewpoints
  - narrow them
- Creativity to address view points uniquely
  - 10 ideas for each

Blocks

viability

less topic knowledge

Outside USi

too complex up front

~~basically~~ mental laws

1. not logical
2. follow rules
3. be pratical
4. fun is frivolus
5. not my area
6. don't be foollish
7. to err is wrong
8. avoid ambiguity ← quickly fix mistakes

left brain : systematic + analytic   ← mostly mental locks

right   : intuitive + associative

So <u>defer all judgements</u> ✳
     ↳ do it later

tell left brain to be quiet!

4 blocks — only touch one other block

```
 _____
|    |      |
|____|_____|
|    |      |
|____|_____|
```

```
 _____        _____
|   |    |      |   |    |
|   |    |      |   |    |
|___|____|      |___|____|
```
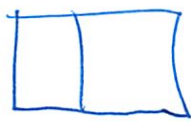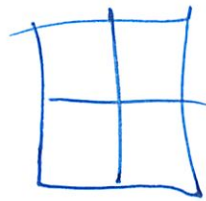
don't impose conditions not true
     ↳ challenge assumptions

✳ <u>challenge</u> assumptions

(6)

4 trees equidistant

```
   `     `
   `     `
```

Or   pyrmid

Project

Vacive cooler
    L narrow chain
    Must stay refrigerated

Water dispenser
table

Strategy

within a theme   Clean eргy
                   home
                   emergeny
                   food
                   on-the-go

Outdoors

 Farming

 nature

 back yards

 urban

 transport

 adventure

 Seed planter

 grills

 Sport

 recreation

 environment

Need project sustainment plan

Something people want

 Crowd saving methods

$6500

now - Dec 12

Crowd source funding

teams
    -start in 2 halves

Workflow
    don't do peaks
    do long sustained

1500-2000 hrs / team

not much correlation b/w hrs and outcome

hw due at 1st lab mtg

Michael Plasete

(58)

Farming
Reveation
Animal Husbentry
Motorcycle
Bike

Trucking
Autos
Cars
Highway
Treirs
Tracks
Stations
Airparts
airplanes
Construction
bulldozer
Pile driving

Wood working
backpacking
tents
hiking
national parks

Sports
base ball
basketball
Soccer
tennis
quidditch
squash
Swimming
Summer
beach
resat
travel
hotel

pool
towel
lounge
aglaulture
berries
bananas
work
saftey
time tracking
information
power lines
transformers
repairs + maintne
Cleaning
Show
theater
parks
dogs

"discovery consists of looking at the same thing as everyone else and thinking something different"

Albert Szent-Gyorgyi 1893-1996
Nobel prize winner
Physician

Director of Muscle Research, Woods Hole
Cell respiration, biological combustion,
muscle contraction
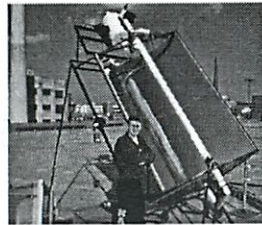
solar powered water pump

2.009 Product Engineering Processes

Today

Wednesday's class exercises
Strategies to enhance creativity
Project theme for 2012
Preparation for next week

2.009 Product Engineering Processes
But first...

Put your name on the top of a blank index card

?

+ ?

+ ?

+ ?

= innovation

2.009 Product Engineering Processes
But first...

Put your name on the top of a blank index card

motivation

+ creativity

+ informed craft

+ process

= innovation

Which object is different?
Frequency of answers

creative:
seeing things differently
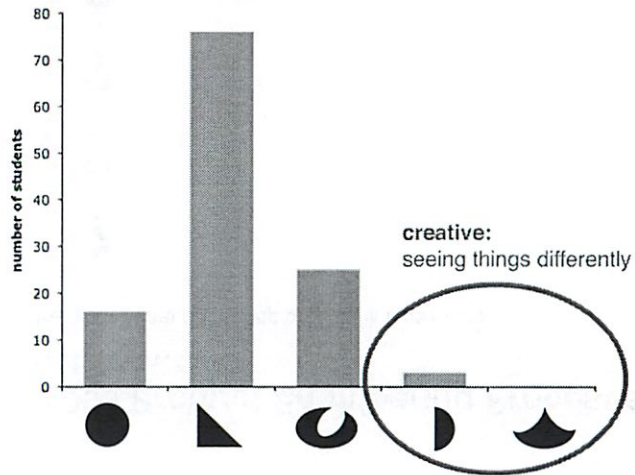
Which object is different?
The least creative solution

why?
believe there is **only one right answer**
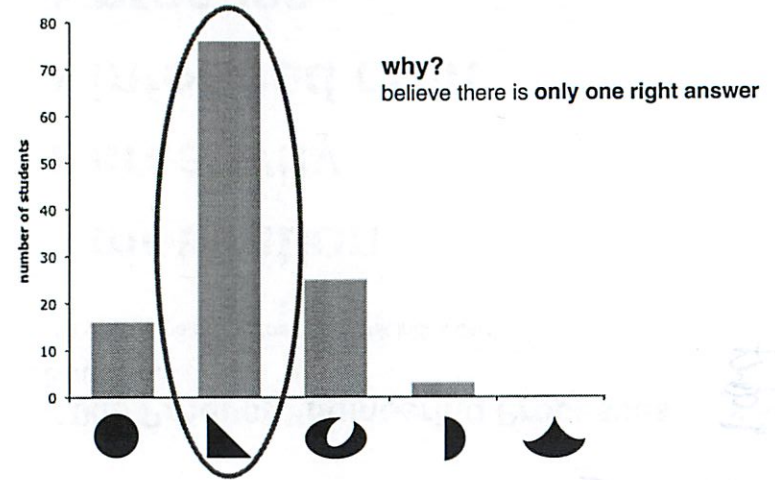
"nothing is more dangerous than an idea when it is the only one we have"

Emile Chartier

French Philosopher, metaphysics

1868-1951

Metaphysics?
Writings of Aristotle on physics, as arranged by Andronicus of Rhodes three centuries after Aristotle's death.
Branch of philosophy that attempts to understand the fundamental nature of reality.

Which object is different?
Seeing things differently

Candace Chen
Dan Bloch
Franco Montalvo
Majix Linjaioi

believe in more than one right answer

Jack Wanderman
Jay Sirgar
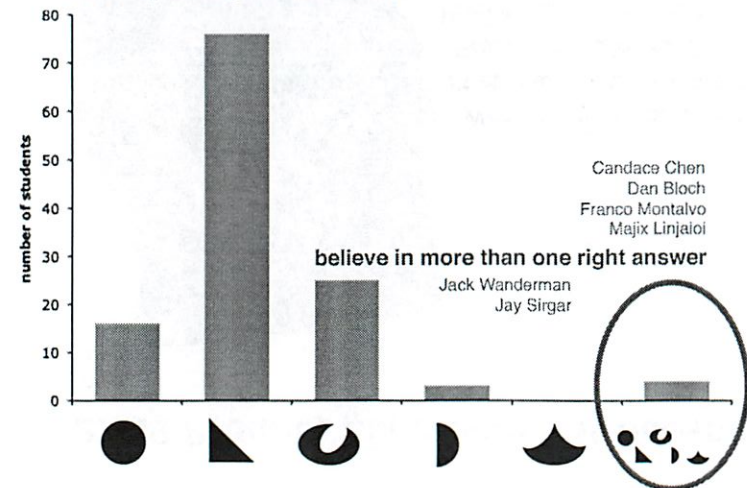
creativity strategy #1

look for
the next right answer

Creativity

Exercise

Using only one stroke, turn the Roman numeral seven, shown below, into an eight.

VIII

Creativity

Exercise

Using only one stroke, turn the Roman numeral 9, shown below, into a 6.

SIX

Context (viewpoint) shift from Roman numerals to Latin characters and English

Creativity

Exercise

Using only one stroke, turn the Roman numeral nine, shown below, into a six.

IX6

Context (viewpoint) shift from Roman numerals to Arabic numerals and mathematics

creativity strategy #2

look from
multiple viewpoints

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
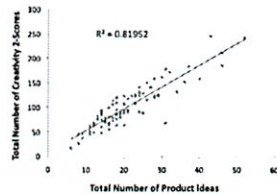
Ways to mitigate drought
Number of ideas per student

entire class: 154 ideas/minute
average ~ 1.1 ideas/minute/person
target ~ 4 ideas/minute

Tim Jenks

number of ideas

Nancy Ouyang
Andrew Sommer
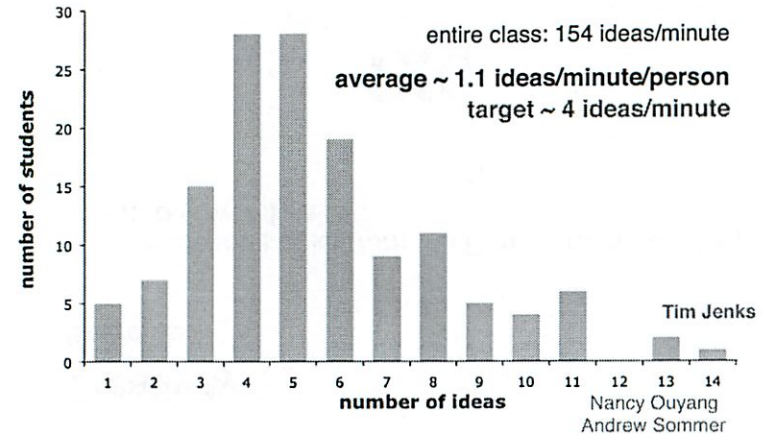
Ways to improve MIT experience
2007

number of ideas

How?
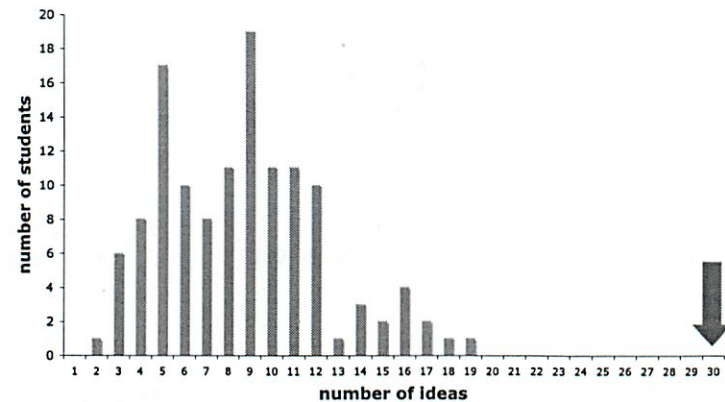
Creativity to see many unique viewpoints
strategy 2: look from multiple viewpoints
classes, labs, dorms, food, student life, campus, people...

Capability to understand/analyze viewpoints
select promising viewpoints
labs, dorms, food

Creativity to address viewpoints uniquely
solutions for each viewpoint
food: snacks in classes, free meal plan, stocked kitchens, ...

Ways to mitigate drought
What made it hard to think of ideas?

average ~ 1.1 ideas/minute/person

number of students (y-axis), *number of ideas* (x-axis)

Mental locks
Thoughts that prevent ideas from flowing

There is only one good answer
That's not logical
Follow the rules
Be practical
Play is frivolous
That's not my area
Don't be foolish
Avoid ambiguity
To err is wrong
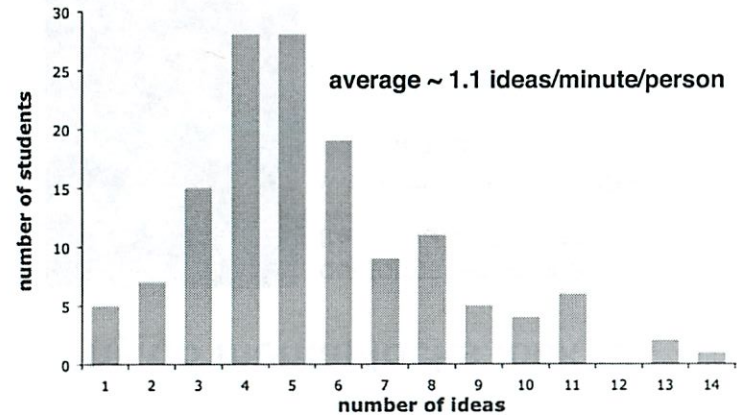
Why do mental-locks lock?
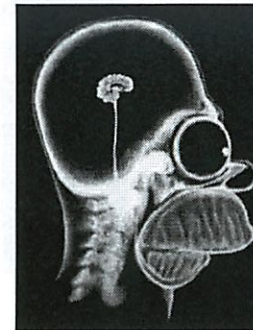
a typical professor's brain
(but not mine)

Why do mental-locks lock?
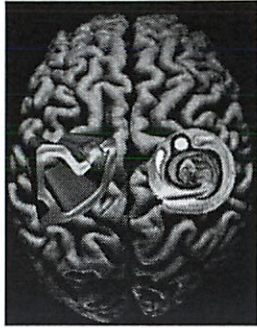
left:
primarily systematic, analytical

right:
primarily intuitive, associative

Mental locks
All left brain (analytical) thinking

There is one good answer
That's not logical
Follow the rules
Be practical
Play is frivolous
That's not my area
Don't be foolish
Avoid ambiguity
To err is wrong

creativity strategy #3

defer all judgments

tell the left side of your brain to be quiet

Why do mental-locks lock??
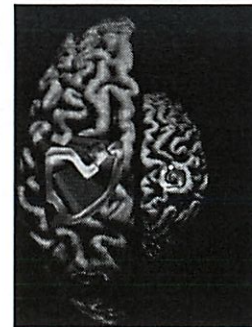
our formal education
trains the left hemisphere

we learn to suppress the
right hemisphere

Creativity

Practice

arrange 4 blocks
so that each block touches only one other block
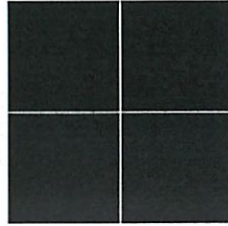
creativity strategy #4

challenge assumptions

question assumed boundaries or norms

Clouseau: Does your dog bite?
Hotel Clerk: No.
Clouseau: [bowing down to pet the dog] Nice doggie.
[dog bites Clouseau's hand]
Clouseau: I thought you said your dog did not bite!
Hotel Clerk: That is not my dog.

The Pink Panther Strikes Again (1976)

Creativity

Practice

arrange 4 blocks
so that each block touches only one other

a quick question

I have been asked to plant 4 trees
equidistant from each other
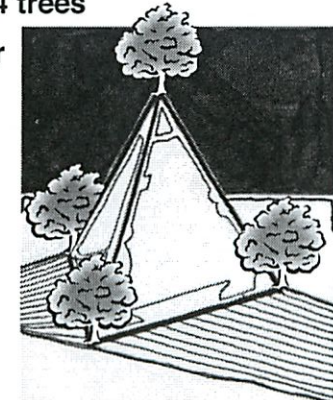
what about a hill?

Project
Context

You are part of a successful product development firm that prides itself on being at the cutting edge.

Project
Firm heritage

Projects your firm has done in the past include...

Project
Innovation strategy

Each year your company challenges a select group of teams to propose and develop new products, all positioned within a broad theme.

2007 **clean energy**

2008 **the home**

2009 **emergency**

2010 **food**

2011 **on-the-go**

and in 2012...

outdoors!

outdoors!

agriculture/gardening

recreation

novelty

out

sport

environment

outdoor living

transportation
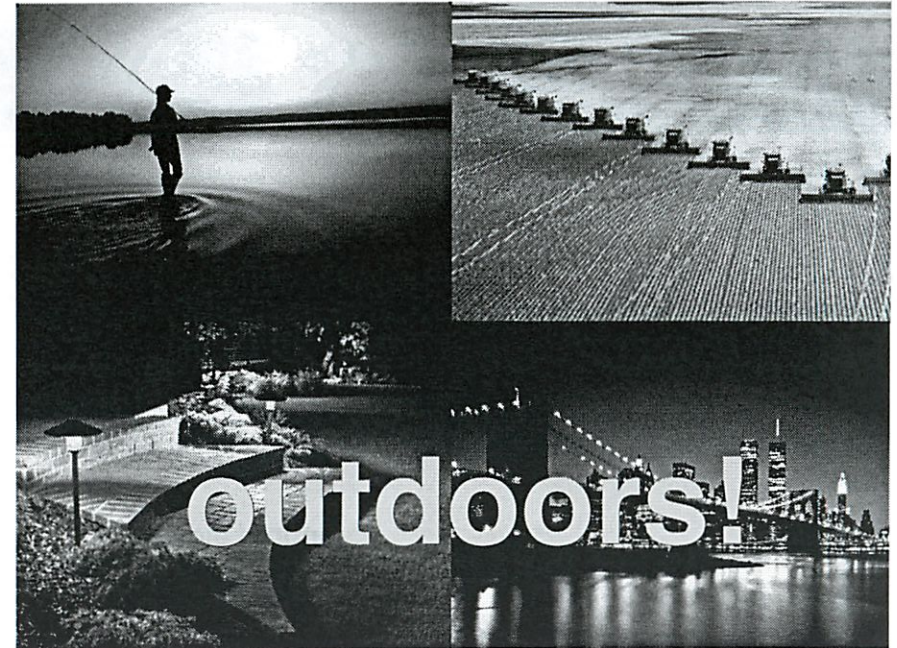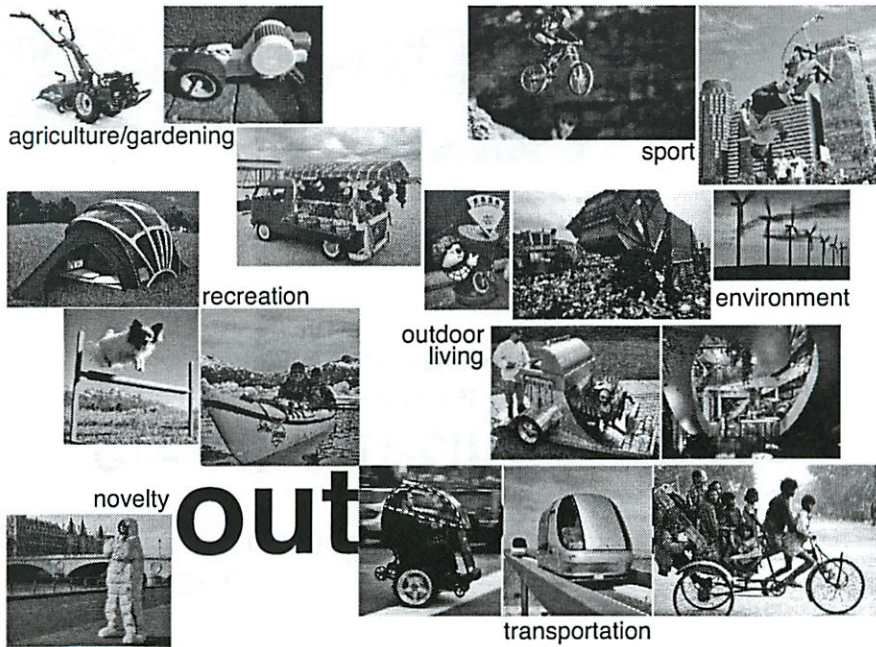
Project
Your charge

Explore opportunities, develop ideas, an alpha prototype

Under-served client, products distributed on a non-profit basis, highly profitable mass-produced goods

A realistic plan for how the product can be produced and sustained
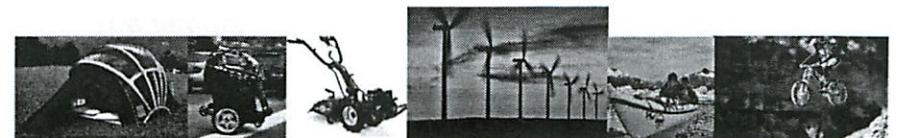
Project
Something people want

Crowd-sourcing methods

will be used to assess interest in products amongst a
very large number of potential users
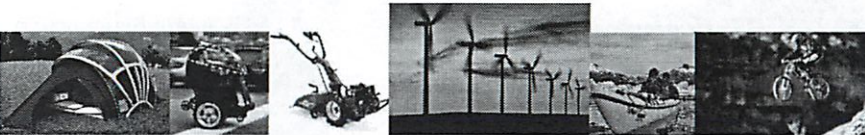
Project
The budget

Your team has a budget of **$6500**
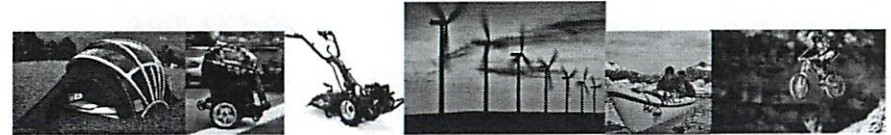
Project
The timeline

We start **now!**

We finish with a prototype launch on December 10
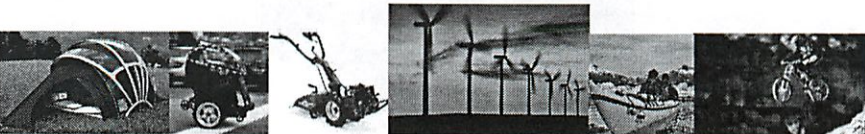
Project
A feasible product

Your final presentation will be a launch event for

Crowd-sourced funding
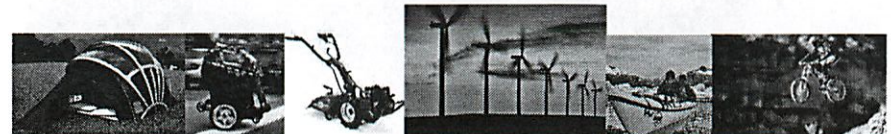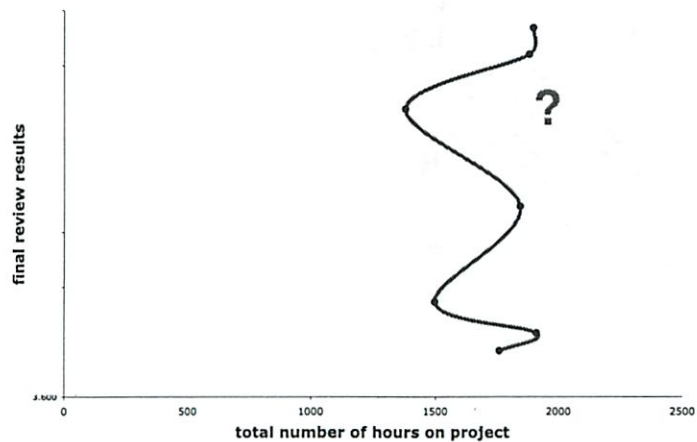
Project
Workflow: cooperative competition

one team

Section A — 1 lab instructor, 8 students — 3 ideas
1 lab instructor, 8 students
Section B — 3 ideas
4-6 mentors

1 idea → Section A → 2 sketch models → 1 concept mockup → Team → team concept → alpha prototype

Section B → 2 sketch models → 1 concept mockup

three ideas presentation
sketch model review
mockup review
final selection
assembly drawing
technical review
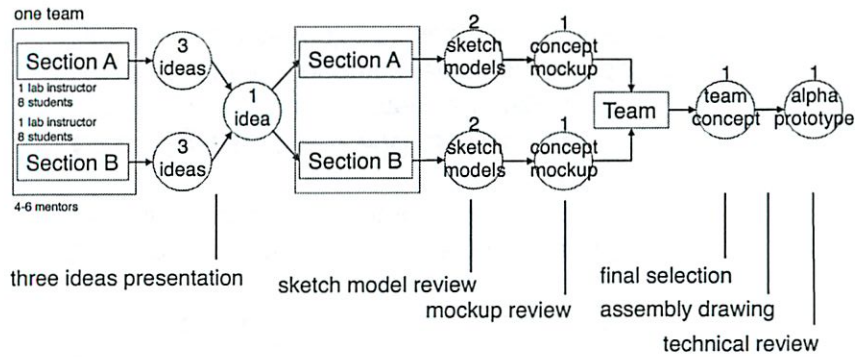
Workflow
Each stage builds on prior effort

capacity
100%
Homework
For real
sketch
mockup
technical
public
time
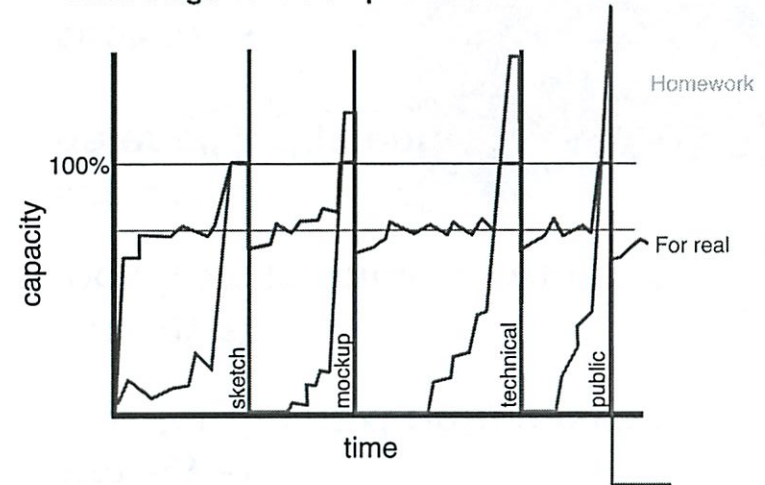
Effort and results
2008: total hours spent by team *vs.* final outcome

final review results
?
total number of hours on project
0   500   1000   1500   2000   2500

Effort and results
2008: hours spent on ideation *vs.* final outcome

final review results

importance of rigor in breadth

hours spent on research/brainstorming during ideation phases
0   20   40   60   80   100   120   140

Labels on diagram: DEPTH, ECONOMIC MODELLING, PHYSICAL MODELLING, ANALYTICAL MODELLING, BREADTH, IDEA, CONCEPT, DETAIL, CROSS SECTION PROPORTIONAL TO EFFORT, A CONSTANT OVER PHASES
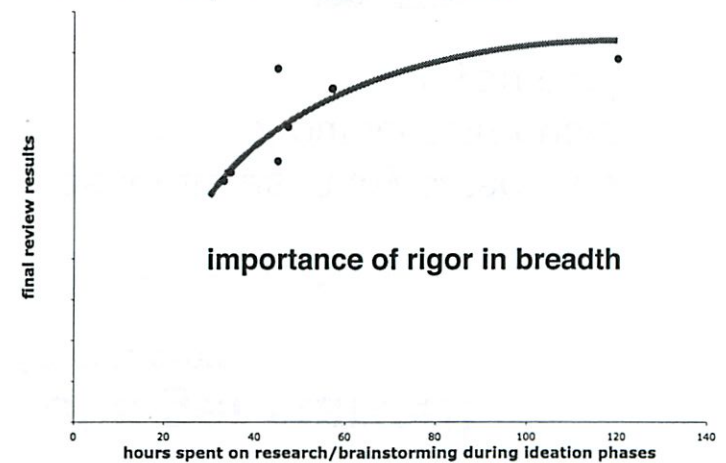
Let's get started!
5 minute exercise

Put your name on the top of a sheet of paper

generate as many categories of outdoor products as you can!
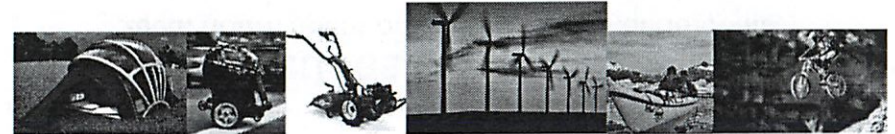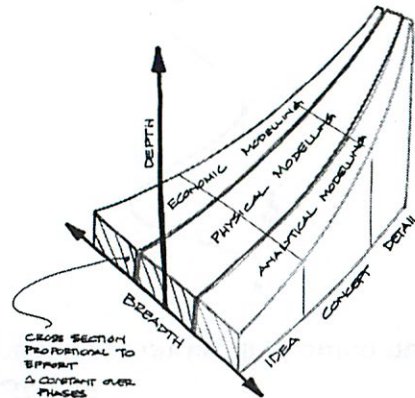
And finally...
Preparation for next week... see homepage

Brainstorming deliverable: a significant task
Idea sketching tutorial at 4 PM in 32-144

Lab signup by 5 PM Saturday
Lookup your lab assignment Sunday night
Read about the Monday evening project idea fair
Read about notebook and submission process

http://web.mit.edu/2.009

strategy #1
look for the next right answer

strategy #2
look from multiple viewpoints

strategy #3
defer all judgments
tell the left side of your brain to be quiet

strategy #4
challenge assumptions
question assumed boundaries or norms
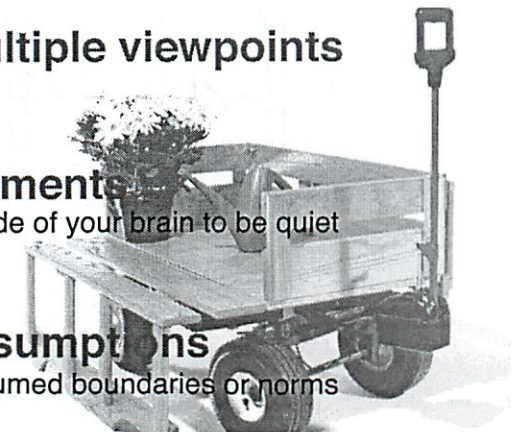
Generating Many...
Brainstorming Tutorial

A group problem-solving technique that involves the spontaneous contribution of ideas from all members of the group

Purpose: generate lots of ideas, explore all classes of solutions, develop new perspectives, generate usable information, have fun

5-7 people: large enough to keep momentum going, small enough to keep all engaged

Brainstorming
Setup

Breakout into groups of 5-7

Seat participants around a table

Place appropriate props on the table

Provide each participant with a problem statement and stack of 8.5"x11" plain paper

Elect a facilitator to record ideas on an easel visible to all participants

Brainstorming
Process

Participants familiarize themselves with the problem statement and props

When a participant has an idea, quickly sketch it on an 8.5x11 sheet (using a marker), and describe it very briefly (one sketch per page)

The facilitator records every idea with a headline (name) on the easel, and the participant writes the headline on their sketch

Brainstorming
Rules

Defer judgment

Build upon the ideas of others

One conversation at a time

Stay focused on the topic

Encourage wild ideas

Brainstorming
Evaluation of results

Pinup all sketches with headlines on the wall

Groups solutions into classes

Develop a set of assessment criteria (around 6)

Rank concepts on each criteria using a - S + scale relative to a well understood benchmark solution

Pick 3-5 promising ideas for further exploration

Brainstorming
Evaluation of results

	NAIL	RING SHANK	STAPLE	SCREW
RATE	S	S	+	—
COST	S	—	+	—
HOLDING	S	+	—	++
EFFORT	S	S	+	—

strategy #1

look for the next right answer

strategy #2

look from multiple viewpoints

strategy #3

defer all judgments

tell the left side of your brain to be quiet

strategy #4

challenge assumptions

question assumed boundaries or norms
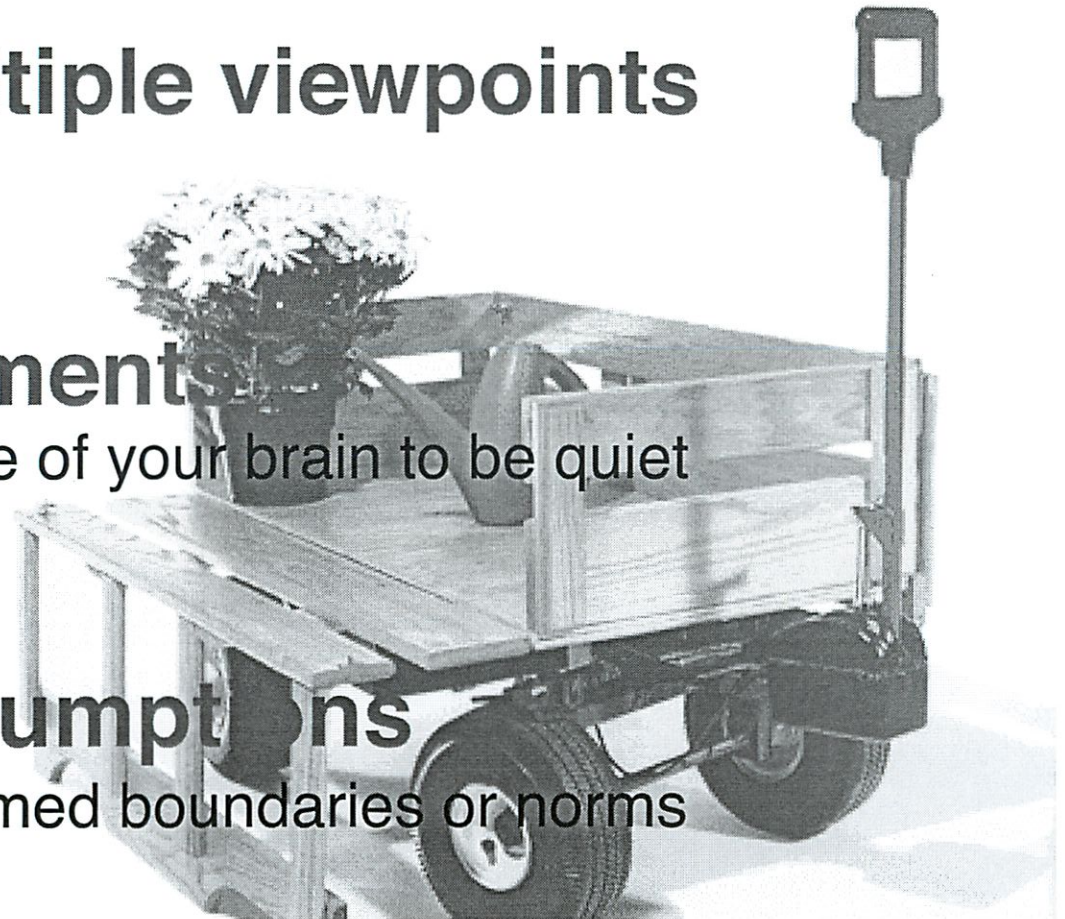
Sketching

(he started early)

Feel confident + loose

ghosting — hover over

Draw light 1st

Vanishing point

    1 point perspective is dramatic

    2 point is more common

   Don't be afraid to move paper

  Generally — vanishing pt is off the pg

     exagerated when on pg

Horizontal lines straight horiz

Darkness matters

Can add shading

Use basic shapes as building blocks for other shapes

Watch the line darkness!

Should be visable 10 ft away ~ presentation ex

Your own ones See thought process

Shading + Volume helps forms pop out

Think where light from
   —Closest = bright
   — Futhest = darkest

(Reminds me of elementary school ...)

(How do people draw so light?)

Vanshing pts — at tips of peipoheal vision

No detail yet

(I should measure more)
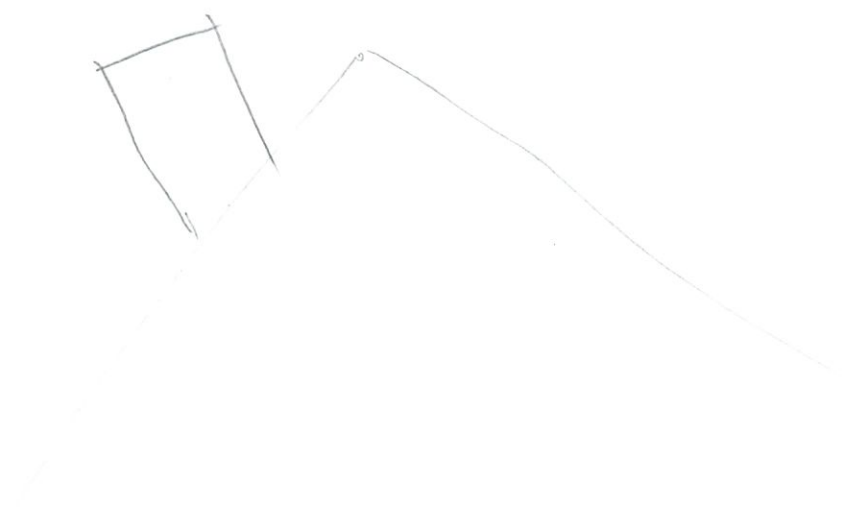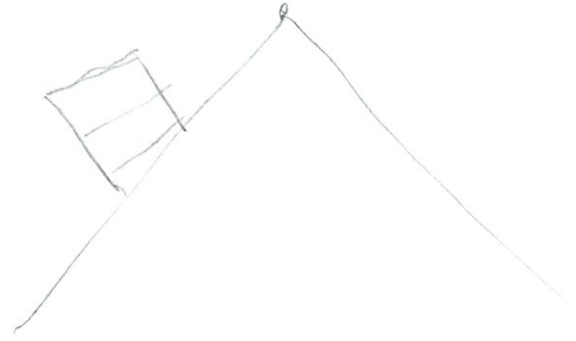
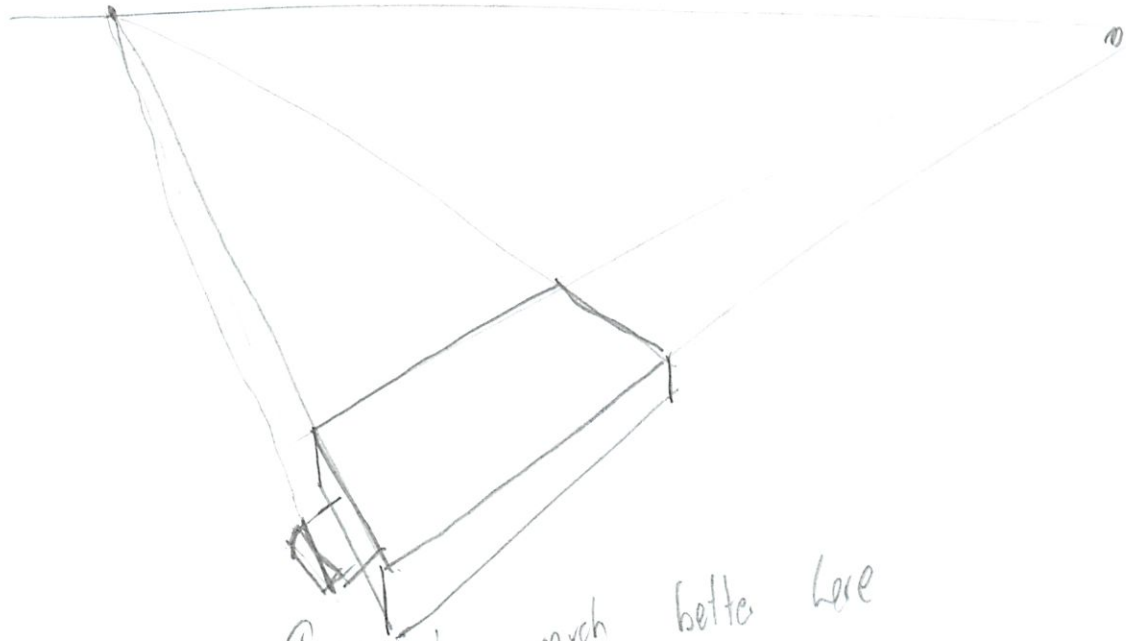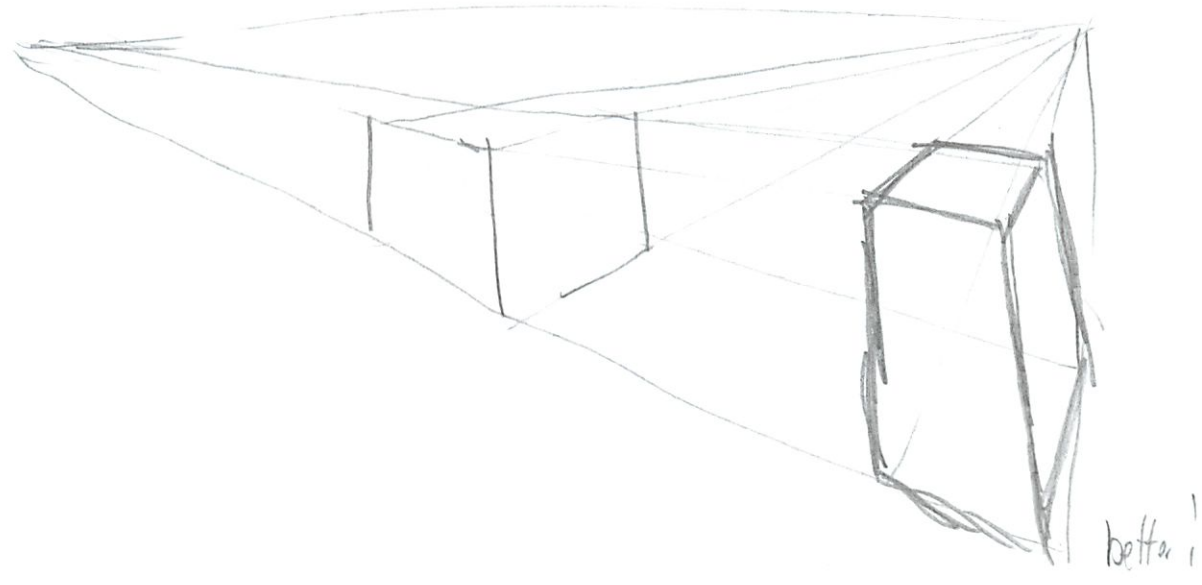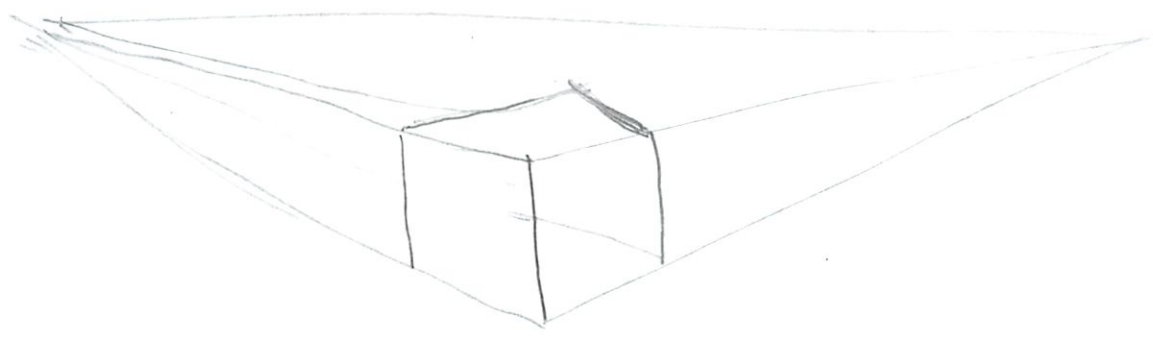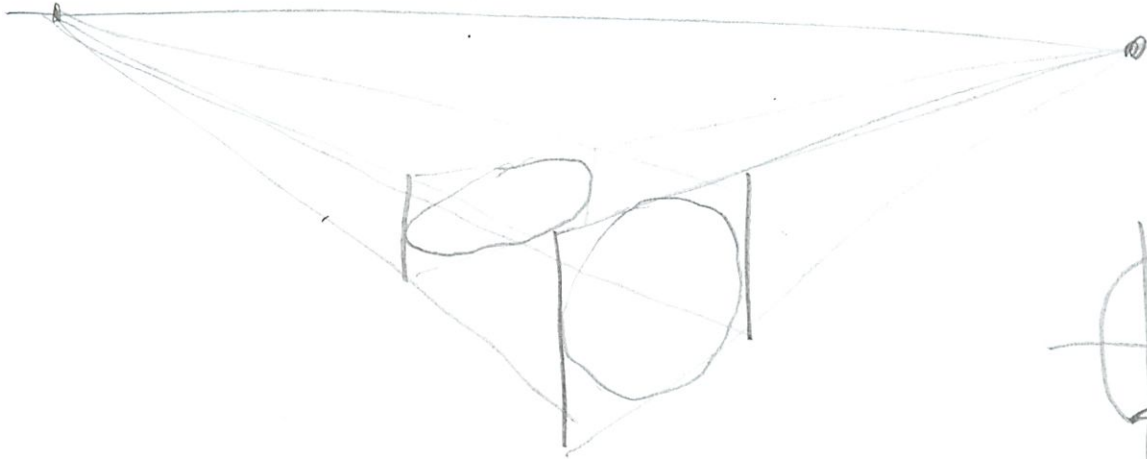Be relaxed when sketching — not too much detail/polish
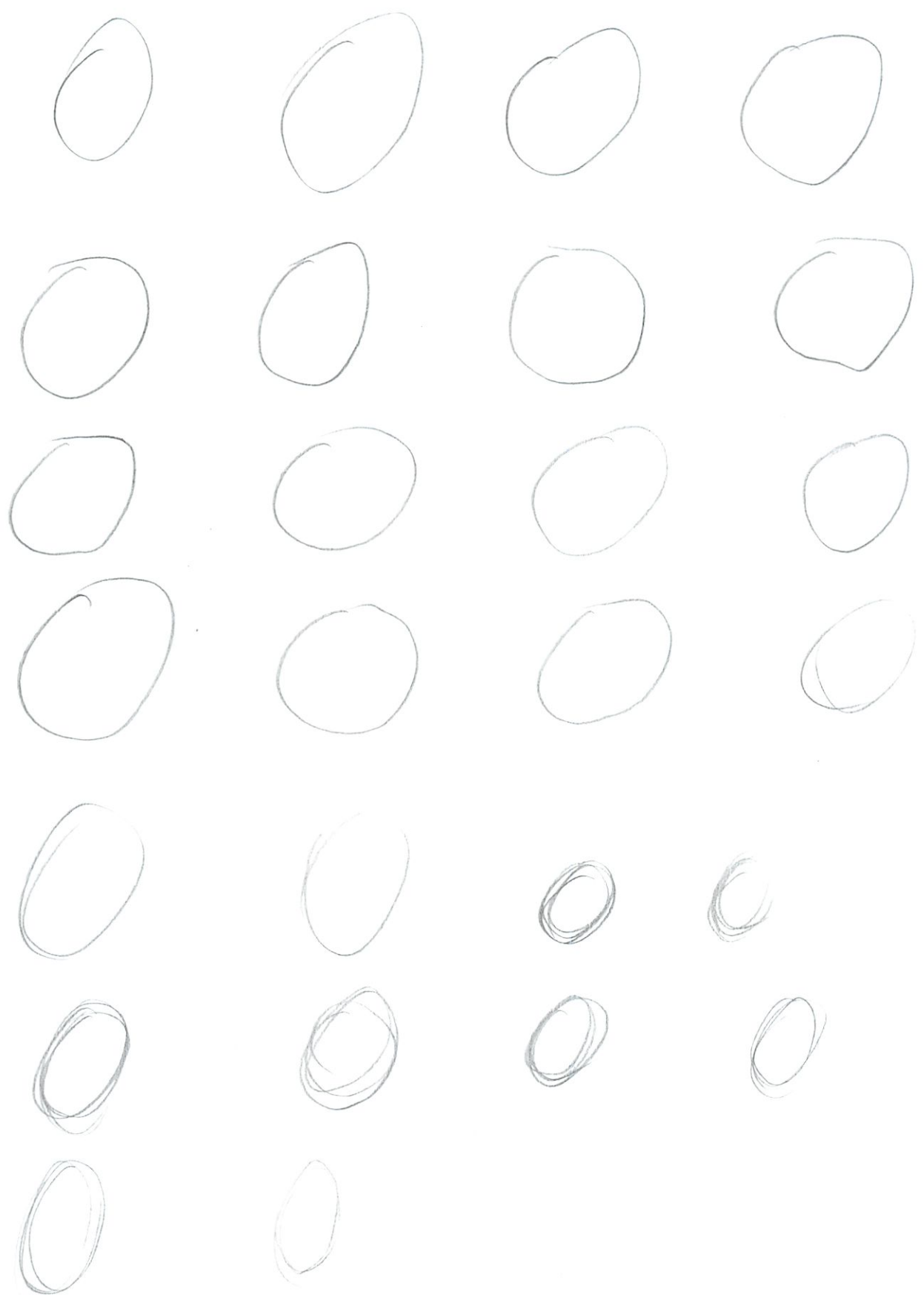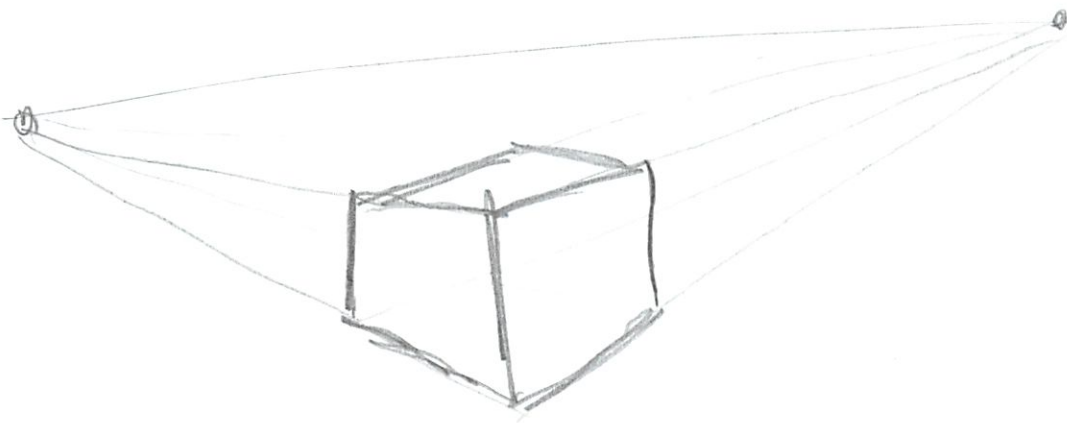
④
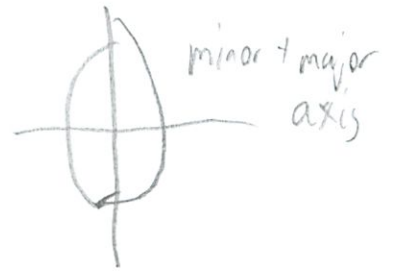
Jump Dive Birds Eye view
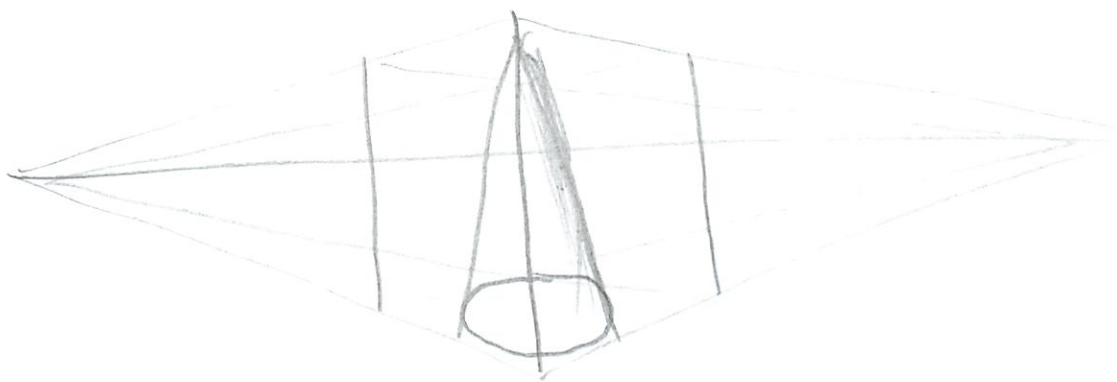

This is much better here
is real cooler

(5)

better

6

minor + major
axis
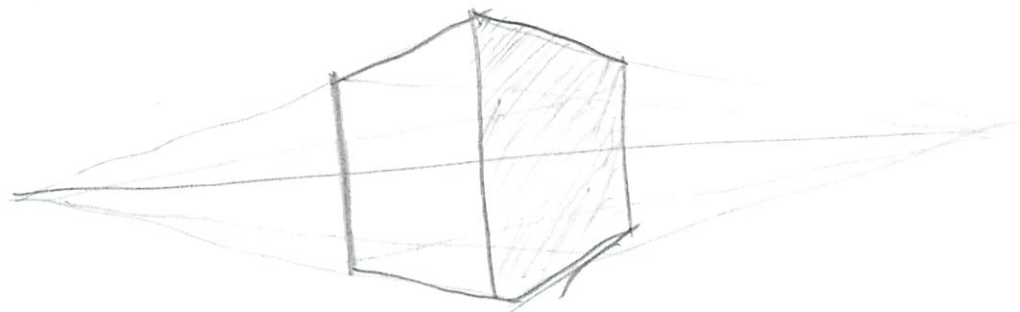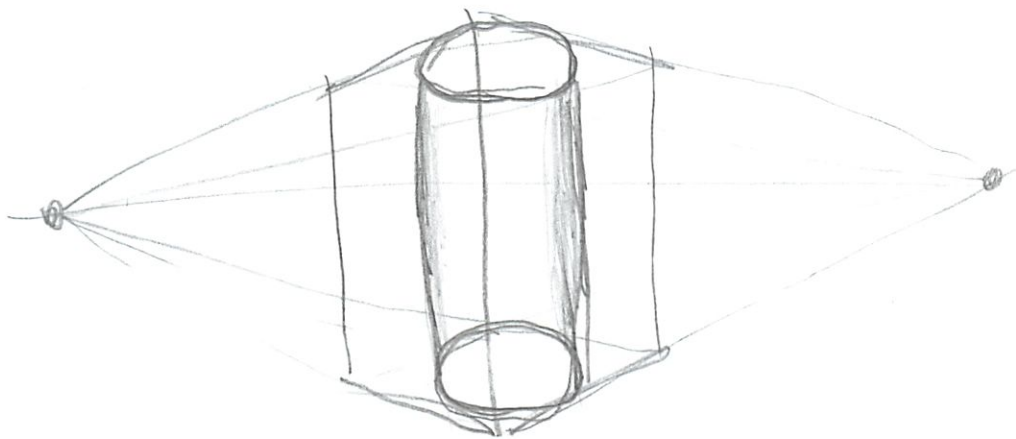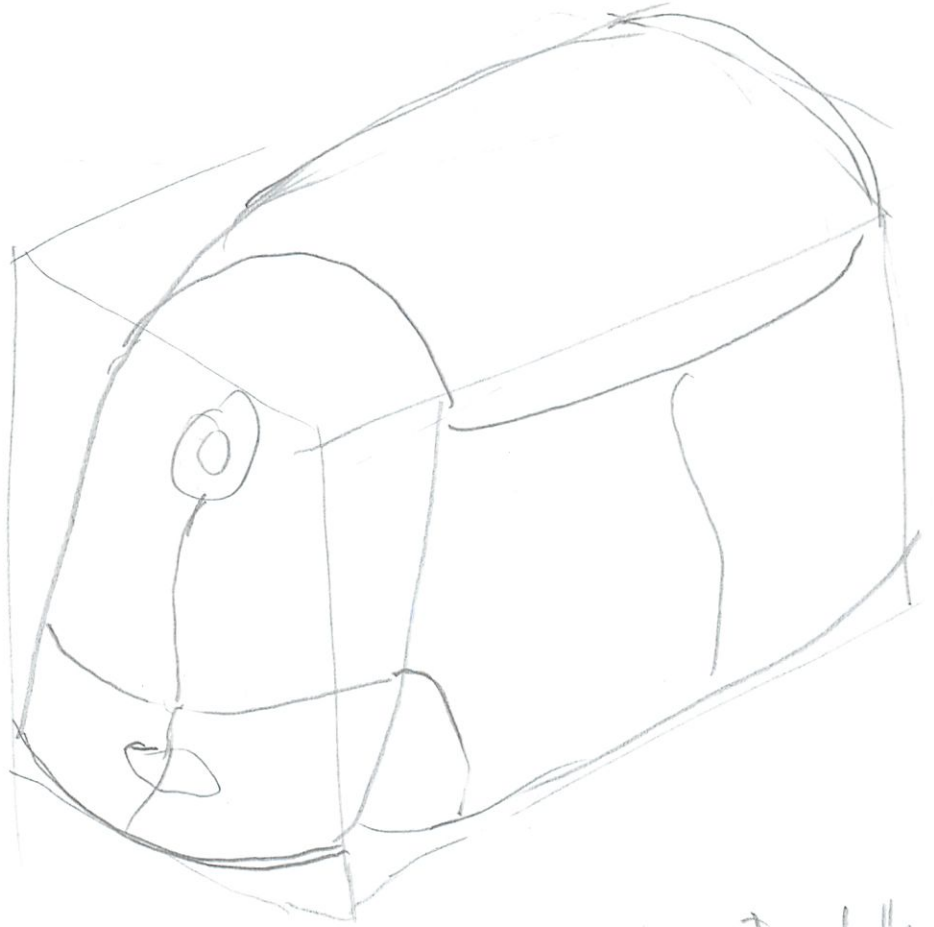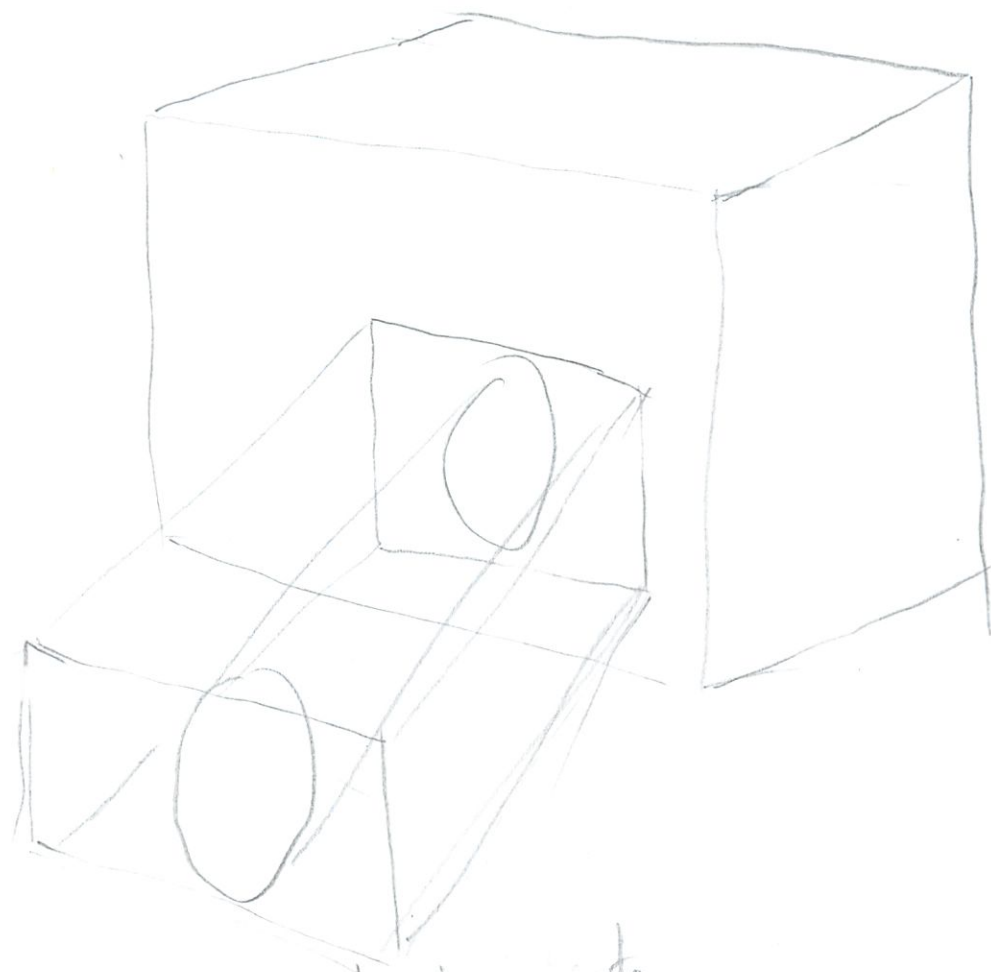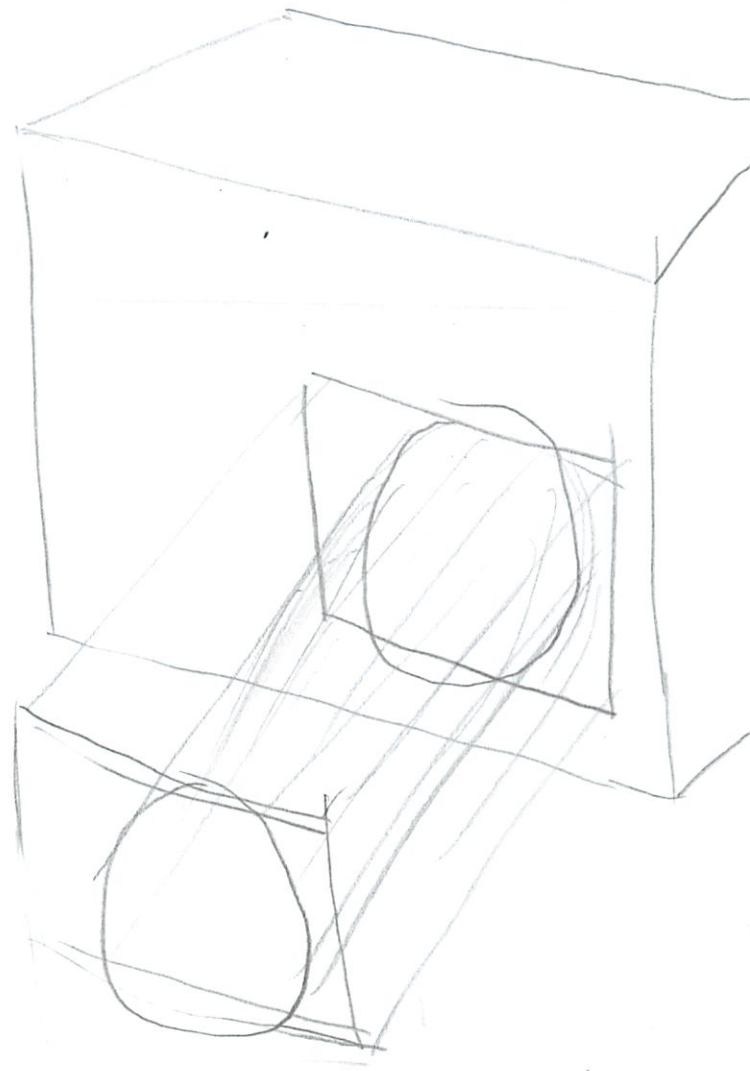
box not really right

I actually really
like!

9

1 panel way to
small
need to redraw

(10)

Still too small

think more about
shading
└ Shade dark
parts

9/7

2.009

Home > Brainstorming

Brainstorming

background, requirements, grading and submission

Background

The goal is to obtain hundreds of project idea options within your team.

This deliverable is critical because your initial ideas form the foundation for your team's direction throughout the entire term! Shortcuts now really do lead to stress and disappointment later.

The ideas you generate will be pooled with ideas from your teammates, as well as those proposed by potential customers at the idea fair. This idea generation process leads to the concepts that your section will propose at the 3-ideas milestone.

Requirements

Generate and select ideas:
Generate a list of wide-ranging ideas and simple 'doodle' sketches or annotations in your design notebook. You may want to printout the creativity strategy cheat-sheet. It is also a good idea to review the project theme description before you start.

You should come up with a minimum of 20 ideas—if you have many, many more you may have a pleasant surprise. Once you have a sufficient number of ideas, pick your top 5 using an idea selection method of your choice. All top 5 ideas that you choose should be ones that you would be happy pursuing over the rest of the term with your team.

Consider the thoughtfulness of the ideas and the breadth of what you are proposing—provide a range of project directions. Be sure to do some preliminary research to help ensure that your top 5 ideas are technically feasible, and that something exactly like it is not already on the market. Minimally, you must perform a web search. If an identical product exists, please do not propose it.

Refine your top 5 ideas:
Prepare a simple annotated sketch to explain each of the 5 ideas. The images on the right link to a small gallery of idea sketch examples. **Each annotated idea sketch must be on a separate sheet of 8.5x11 paper**, or use a full page in your notebook. If you use sheets of paper you should tape them into your notebook.

Please make sure that your 5 idea drawings are understandable from at least 10 feet—you will be pinning them up in your lab meeting. You might review the sketching tutorials or attend the sketching tutorial on Friday afternoon.

Grading and submission process

The brainstorming deliverable is a significant portion of the individual component of your final grade. The brainstorming deliverable is due at the start of your first lab, as indicated in the course schedule.

Photocopies of your sketches will be collected for grading at the end of your first lab. The list of ideas generated in your notebook will also be checked by your instructor during the first design notebook review. The thoughtfulness of your ideas, originality, diversity, and clarity of communication will be used as grading criteria.
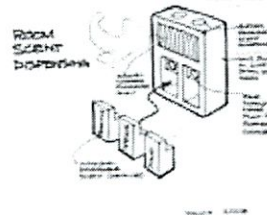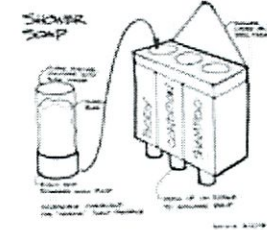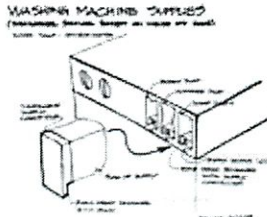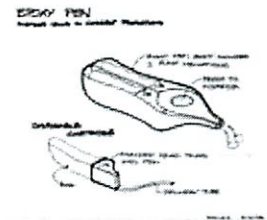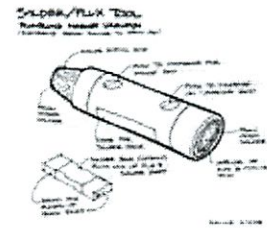
Please review the **detailed instructions on how to submit** your brainstorming assignment.

2.009

Home > Lab section signup > Section assignments

Results of Lab Section Assignments

The current team assignments are listed below. **70%** of the class received their first choice, **27%** received their second choice, and **3%** received their third choice.

However, if you still have an irreconcilable conflict, please email Professor Wallace ASAP with details. We will try to work things out overnight and if not, see him at **9:30 AM** Monday, September 10 in Room 3-458. Please bring documentation illustrating your schedule and the specific conflict

Last updated: Sunday, 9/9/12, 7:55 PM.

Red Team: Tuesday 2PM - 5PM

A	B
Anne Warren	Dan Bloch
Bee Vang	Gabe Blanchet
Brigitte Morales	Julia Titarelli
Ernesto Reza	Missy Showers
michael buchman	Oscar A. Viquez Rojas
Monica Isava	Plaz Plasmeier
Sean Fannin	Rachel Fraunhoffer
Shannon Yang	Sebastian Denault
Shaun Salzberg	Xenia Antipova

Green Team: Tuesday 7PM - 10PM

A	B
Ahmed Alnemer	Arash Kani
Aleksandra Kudriashova	Charlotte Herhold
Chris Gerber Gerber	Dan Goodman
Chris Hammond	Jackson Wirekoh
Devin Dee	Lauren Kuntz
Julia Kimmerly	Princess Len Carlos
Megan Uberti	Stephen Frost
Paul Lazarescu	Tim Jenks
Trevor Zinser	Vahe Taamazyan

Blue Team: Wednesday 2PM - 5PM

A	B
Alex Clayton	Andrew Yang
Cindy oh	Ben Pyle
Jack Wanderman	Eric Del Castillo
Jacob Bailey	Evie Adams
Margie Trevino-Garrido	Felipe Carrillo
Phillip Daniel	Kenya Mejia
Reineman	Majid Linjawi
Shuo Wang	Ranjeetha Bharath
Wanni Tsai	Richard Yoon

Yellow Team: Wednesday 2PM - 5PM

A	B

Audrey Bosquet	Aaron Fittery
Blair Gagnon	Conrad Bastable
Carolyn Coyle	Eduardo Russian
Daisy Yan Yuen	Fareeha Safir
Geoff Dawson	Justin Colt
Jay Sircar	Leslie Meyer
Kathleen Kraines	Philip Crain
Keneth Pinera	Steph Cooke
Steven Huynh	Steven Carreno

Pink Team: Wednesday 7PM - 10PM

A	B
Alexander Ivanov	Anastasia Uryasheva
Camille Everhart	Andrew Sommer
Cory Robinson	Bridger Maxwell
Dima Vasilev	Franco Montalvo
Grant Iwamoto	Hui Xia
Icy Morozova	Jeff Lin
Kameron Chan	Manuel Legrand
Paulina Mustafa	Nancy Ouyang
Thao Phan	Vanessa Trevino

Orange Team: Thursday 9AM - 12noon

A	B
Anna Christensen	Hannah Gramling
Bethany Lemanski	Janille Maragh
Daniel de Paula Lopes	Jesse Toapanta
Emi Ferreira-Yang	Kelsey Brigance
Katie Inman	Michelle Deng
Melvin Salinas	Nate Robert
Rachel Fernandes	Peter Britton
Rustem Feyzkhanov	Ron Rosenberg
Ryan Madson	Sara Comis

Purple Team: Thursday 2PM - 5PM

A	B
Alejandro Aguirre	Alexey Boyko
Angela Hojnacki	Chase Olle
Cecilia Cantu	Elina Hu
Jason Pier	Frederick Moore
Jeremy deGuzman	Jill Oliveira
Katrin Lengold Kotenko	Laura Matloff
Kuljot Anand	Ned Burnell Burnell
Nathan Porter	Nick Torgerson
Nifer Fasman	Sarah Southerland

Silver Team: Thursday 2PM - 5PM

A	B
Ari Umans	Chris Rullan
Casandra Ceri	Greg Puszko
Eric Hernandez	Kathryn Greskoff
Ira Zhelavskaya	Lauren Lo
John Reynolds	Matt Hohenberger
Lia DiGiovanna	Molly McShane
Ray Tilden	Veronica Barrera
Sareena Avadhany	Wyatt Ubellacker

People that think they are creative are
    (I need to do more in this area
    Disney turned out not really)

    People can become more <u>Creative</u>

    Need the I-can-do-it spirit

<u>Last</u> <u>week</u>   motivation
          + Creativity   most people got 1
          + informal craft   Creativity
          + Process

<u>Today</u> Team

<u>Creativity</u>   defer judgments
              rest right ans
              multiple viewpoints
              challenge assumptions

larger T in ideas if list viewpoints then ideas

(these reviews are good to remember old info)

brainstorm at least 20 ideas

    top 5 sketch

    quick feasibility + market research

importance of rigor in breadth

Project idea fair 7PM - 8PM

    Challenges related to field

    each assigned to 2 session

    interperate into carefully

    +North face @ 8PM

③

Team

more than a group
ideally structured
ideally different by

Common goal
depend on each other ←

---

diff viewpoints
get stuff done
Special skills
the emotional support

---

need for team work grows w/ challenge
↑ team grows better as larger

dream team

Shared
Values

- Meaningful purpose
- Clear performance goals
- Communications
- Complementy skills
- Mutual accountability
- Well defined work approach

CEO's list of good teams

(how applies to Exec)

Positive

- take initiative
- results oriented
- attention to detail
- clear guiding philosophy
- effective comm
- support structure
- inc stakeholders

Negative

- intonality
- high level of praise
  — hollow
- strong mental set
- org politics

Primer on how to run meetings
online
_____

Task: Build tallest freestanding ballon structure

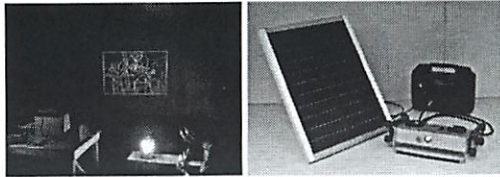Select a manager - no role

Pick a role - secret

Reflection at end

2.009 Product engineering processes

Are you creative? (check as appropriate)

Yes ☑   No ☐

People who believe they are creative, are; people who don't, aren't.

LED microfilm projector

"if you think you can do a thing or think you can't do a thing, either way you're right."

Henry Ford
Founder of Ford Motor Company, father of modern mass production
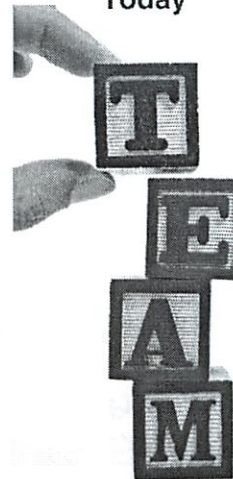1863-1947

2.009 Product engineering processes

Last week

motivation project theme and context

+ creativity idea generation strategies

+ informed craft

+ process typical PD milestones/structure

2.009 Product engineering processes

Today

mini-quiz from Friday
brainstorming milestone
project idea fair (tonight)
teams
teamwork challenge
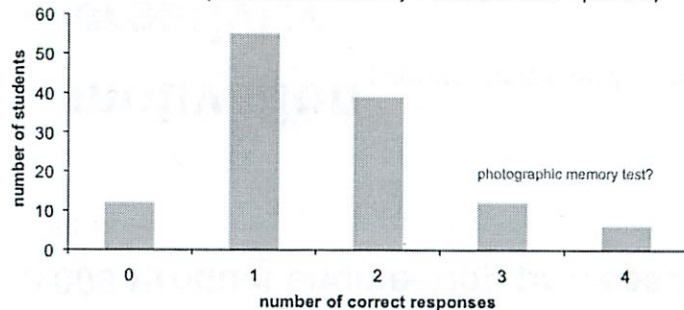
informed craft

process

Building an innovation team
Friday mini-quiz, checking retention

innovation receipe?

Cindy Oh MIT CHEER

in + ova + ti + on = CHEER

(motivation + creativity + informed craft + process)

photographic memory test?

number of students

number of correct responses

Building an innovation team
Friday mini-quiz, checking retention

innovation receipe?

Cindy Oh MIT CHEER

in + ova + ti + on = CHEER

(motivation + creativity + informed craft + process)

number of students

Motivation   Creativity   Informed Craft   Process

Included in Respose

Mini quiz!
2 minutes

Write your name on the top of your index card

list 4 individual creativity strategies

---
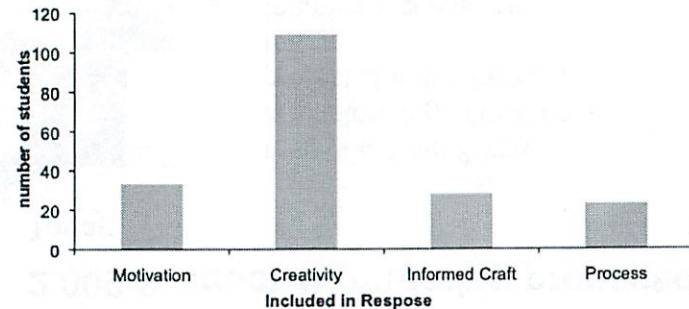
strategy #1
look for the next right answer

strategy #2
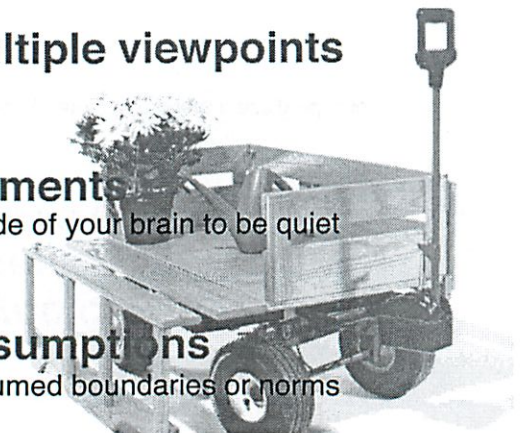# look from multiple viewpoints

strategy #3
defer all judgments
tell the left side of your brain to be quiet

strategy #4
challenge assumptions
question assumed boundaries or norms

Number of ideas in 5 minutes

improvement after instruction (Lincoln labs)
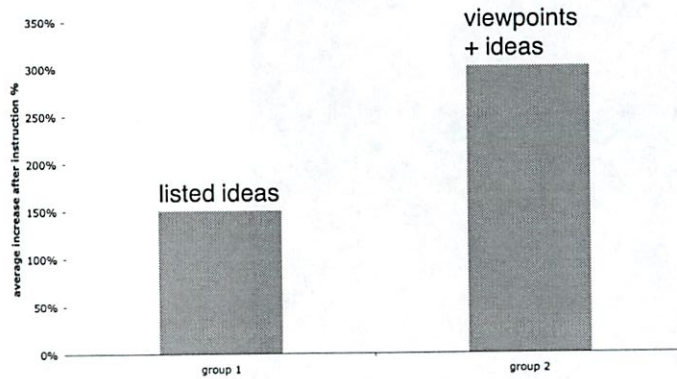
Brainstorming deliverable

for lab this week

at least 20 project ideas in notebook
you might be pleasantly surprised if you have many more

top 5 sketched on separate sheets
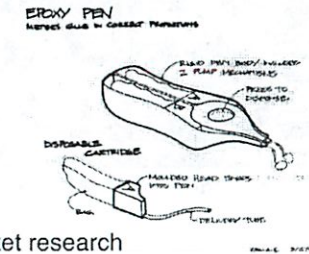
feasible, preliminary market research

Rigor in breadth

the importance of exploration

Project idea fair

7 PM (sharp) to 8 PM tonight

See *ideas fair session* link on homepage

Project idea fair

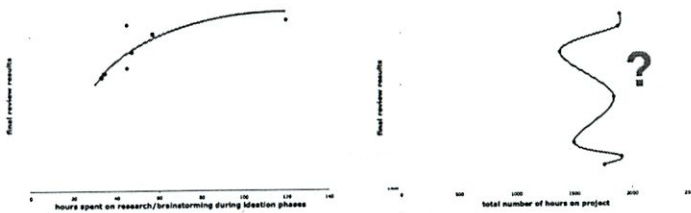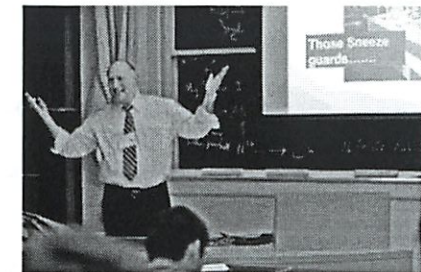### 7 PM (sharp) to 8 PM tonight

conference with parallel sessions

Schedule for the red team

	7:05-7:30 PM	7:35-8:00 PM
	Outdoor Sports	**Search and rescue**
Anne Warren	room 2-131	room 2-132
Monica Isava	*NEMO Equipment*	*Central Massachusetts Search and Rescue*
Gabe Blanchet		*Team*
Rachel Fraunhoffer		
Dan Bloch		
	High performance bicycle for triatheletes	**Small-scale farm productivity**
Vanessa Trevino	room 2-136	room 2-139
Xenia Antipova	*Fast Spins*	*The Farm School*
Julia Titarelli		
Sebastian Denault		
	Tree-care product opportunities	**Distribution of artificial snow**
Brigitte Morales	room 2-142	room 2-143
Shannon Yang	*Bartlett Tree Experts*	*HDK Snowmakers*
Missy Showers		
Sean Fannin		
Michael Buchman		
	Aquatic plant harvesting	**Afforable river transportation in Ecuador**
Ernesto Reza	room 2-146	room 2-147
Shaun Salzberg	*Aquatic Control Technology, Inc.*	*Fundación Pachamama*
Oscar Viquez Rojas		
Piaz Plasmeier		

interpret
information
carefully!

Project idea fair

7 PM (sharp) to 8 PM tonight

one video session at 8 PM

Youth and outdoor consumer products
8:05-8:35 PM room 2-151
The North Face

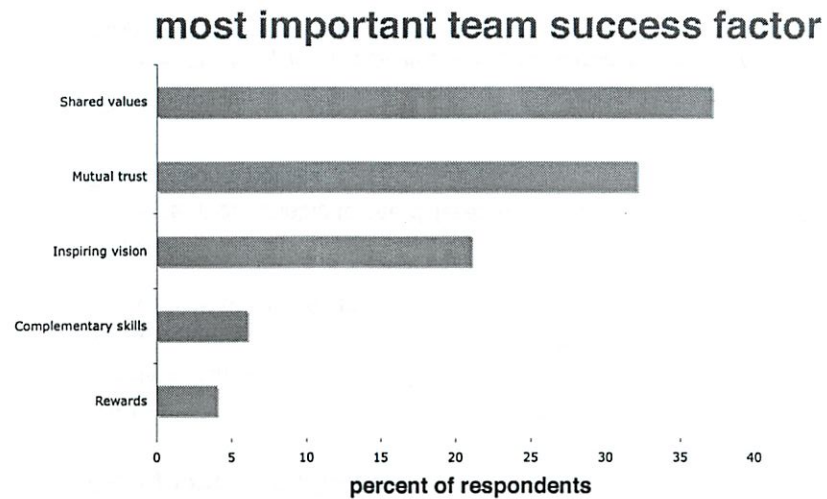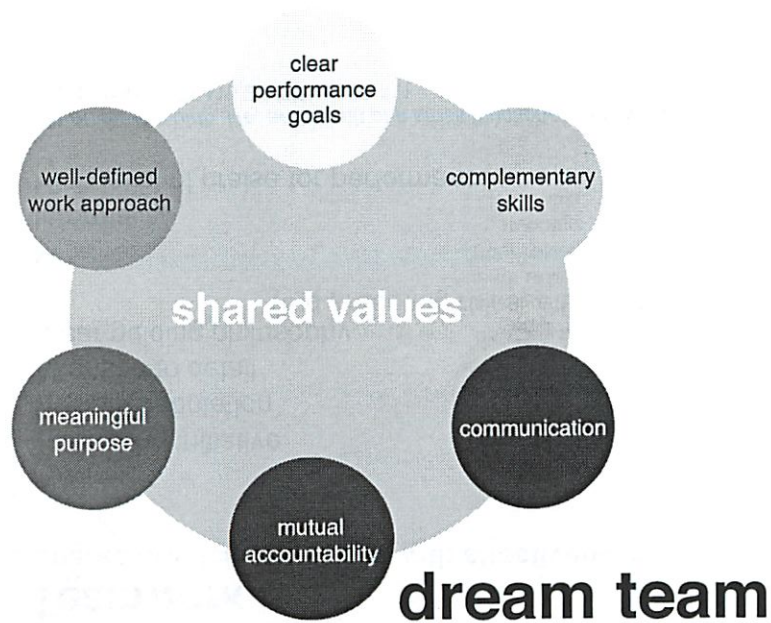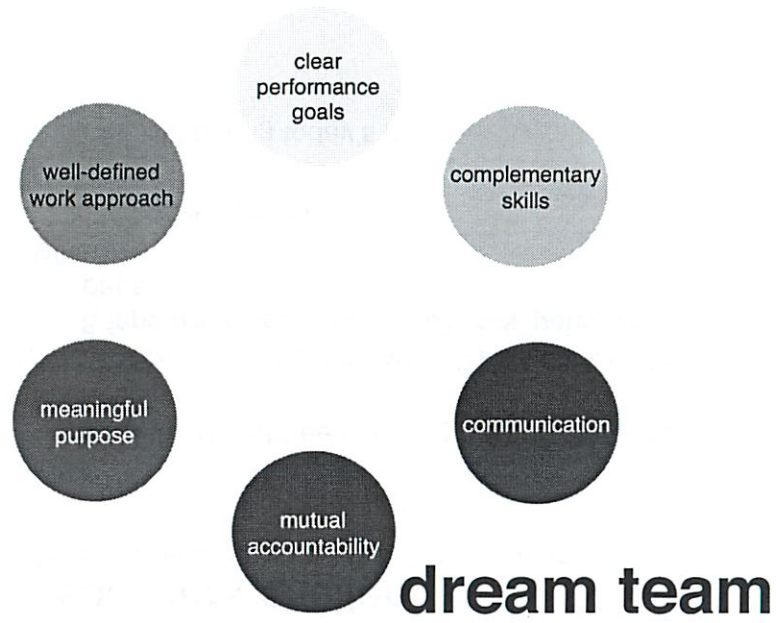team mailing lists are up-to-date

a team is...?
more than a group

a group that is interdependent for
overall performance
team!

why?
the need for teamwork grows with the challenge

none of us is as good as all of us
a good team!

dream team

- clear performance goals
- meaningful purpose
- communication
  - mailing lists
  - team wiki
  - notebooks
  - peer reviews
  - team reviews
  - communication instructors

dream team

- clear performance goals
- well-defined work approach
- complementary skills
- meaningful purpose
- mutual accountability
- communication

dream team

- clear performance goals
- well-defined work approach
- complementary skills
- **shared values**
- meaningful purpose
- communication
- mutual accountability

most important team success factor

Team success factor	percent of respondents
Shared values	37
Mutual trust	32
Inspiring vision	21
Complementary skills	6
Rewards	4

Ten3 global internet polls

Teamwork
Characteristics correlated with effectiveness

Positive:
Taking the initiative
Results orientation
Attention to detail
Clear guiding philosophy
          (e.g., meeting rules, ethics code)

Negative:
Informality
High level of praise for performance

Hitt *et. al. The birth, life, and death of a cross functional new product design team*, HF5415.2.M37 no. 96-111

Teamwork
Design success factors

Positive:
Effective communication
Management support (system integrators, lab instructors)
Involvement of all relevant parties (e.g., customer)

Negative:
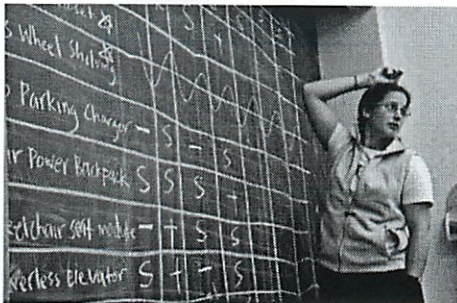Team members unable to see different viewpoints (strong mental set)
Organizational politics

Hitt *et. al. The birth, life, and death of a cross functional new product design team*, HF5415.2.M37 no. 96-111

Meetings
more on Wednesday

meeting ≠ chillaxin in a room around a big table

resources/running meetings

Teamwork challenge
Team role-playing and problem solving

Task
    Build the tallest free standing balloon structure
Materials
    144 balloons (in team color), 3 rolls packing tape,
    3 tape dispensers, 3 pair scissors, pens and
    paper
Where
    outside, Killian court
Deadline
    1:50 PM during today's class

Teamwork challenge
Roles and rules

Assemble your 2.009 team around the materials box

Make sure you are with the right team

Select at team manager

Pick roles from envelope—keep confidential

All but team manager play assigned roles

Do not tie balloons together

Only use the materials provided

Do not use chairs, ladders or climb objects to assemble structure

Teamwork challenge
Reflection

At 1:50 PM

Judging

Discuss your roles and how they impacted team performance

Discuss ways that the team manager was effective

Cleanup

You have always been highly regarded for building the highest towers. You enjoy a challenge and love to complete to win. You want to have the last word on everything.

You like to blend in and not make waves. You will go along with whatever the rest of the team decides and do your best to get the job done.

You see no value in building a tower. You are participating to have some fun.

Your contributions to a team never seem to be valued. You try, but are loosing your motivation to contribute.

You want to avoid risks. You want to work on the first obvious solution that comes to mind. You tend to be negative about different ideas.

You are very concerned about every detail. You want a lot of clarifications before proceeding on a task. You work slowly but what you do is done well.

You think that your ideas are the best. You have little patience for others. The best way to get something done is to do it your self.

You are very, very tired.

Running a meeting
Plan before

What is the purpose of the meeting?

What are the desired outcomes/milestones?

Is a meeting necessary?

Who should attend the meeting?

What is the meeting agenda and timeline?

What preparatory work is needed?

Running a meeting
Guidelines

Set the ground rules
(meeting ≠ chillaxin in a room with a big table)

Start on time, stop on time

Review agenda

Appoint roles: facilitator, visible scribe, timekeeper

All participate

Challenge ideas, not individuals

One conversation at a time

Running a meeting
Guidelines

Clear resolution plan for problem behaviors

Late arrivers (don't update)

Side conversations (must relay discussion to team)

Dominators (assign them to be the scribe)

Non participating members (solicit input)

Rambling (focus on agenda, document for later discussion)

Negativity (ask the team if they agree/disagree)

Running a meeting
Guidelines

Encourage constructive behaviors

Proposing (how about ...)

Info seeking (please describe ...)

Providing information (our task force found that ...)

Opinion giving (in my opinion ...)

Disagreeing (this may be a problem because ...)

Consensus testing (how many agree?)

Standard setting (we need to decide by ...)

Tension relieving (why did the chicken cross the road?)

Running a meeting
Guidelines

Meeting breakouts/task forces (groups of ~6 or more)

Explain why they are needed

Have a clear process for forming breakout groups

Provide clear instructions

Provide clear deliverables and timeline

Use the results

Running a meeting
Guidelines

Extraneous ideas

Document in a visible area

Discuss later under a different agenda

Allow a few minutes of informal discussion at the meeting's start

Running a meeting
Reflection

Seek closure

What actions are needed and who is responsible

What decisions were made

What issues still need to be resolved

When is the next meeting and what is the agenda

Action plan for extraneous ideas

Document and disseminate (minutes, team notes)

9/10

2.009

Home > Project ideas fair
Project Ideas Fair

The ideas fair is intended to provide you with additional project opportunities and introduce potential clients representing under-served groups.

There will be a number of parallel sessions at which clients identify projects and needs. We will divide your section so that all presentations will be covered by at least one person from your section. You will need to take notes so that you can report to your section in your first lab meeting.

Ideas from the idea fair may be combined with the list of ideas selected from your brainstorming deliverable. You may use ideas generated by your section and/or from the idea fair in the 3-ideas presentation. The HelmentHub (gallery) and Kinkajou projector are examples of 2.009 project that arose from a client at an idea fair.

The idea fair is scheduled in the evening so that a number of potential customers and experts can attend to propose project ideas.

Please follow the **detailed schedule** carefully and review **the summary of projects** that will be presented at the ideas fair.

2.009

Home > Project idea fair > Logistics

Ideas Fair Logistics

At the project ideas fair you will meet clients for a number of potential projects.

The fair will run from 7:00 PM sharp (not 7:05) to no later than 8:15 PM.

You will be assigned to attend at two sessions. Please remember that you will need to take notes so that you can report about the projects described by the clients to your team during lab (see the lab instructions).

At least two members of your team will be assigned to each session, so you can cover for each other if there are schedule conflicts. However, if no team members that are assigned to your session can attend, please make arrangements with your teammates to ensure that someone on the team covers every session.

The detailed schedule will be available shortly after the lab and team assignments have been made.

7:05 – 7:30 | **7:35 – 8** | **9/10**

Aquatic plant harvesting

Ernesto Reza
Shaun Salzberg
Oscar Viquez Rojas
Plaz Plasmeier

room 2-146
Aquatic Control Technology, Inc.

Afforable river transportation in Ecuador

room 2-147
Fundación Pachamama

Optional:

Youth and outdoor consumer products

Special video session at 8:05-8:35 PM
room 2-151
The North Face

2009

Equidor Public Transit Boats

(2 min late)

little Johs
    except go

Oil drilling
Some untaxed

(reading off #s made
    me think of consulting)

A chuar

Canoes

Shallow

More gas boats now
    but more expensive

Ministry of Foriengn Afairs Finland

$2 85,600

Sustainable
    Some charge
    Tribes also run

Split ride model
More people + goal

Solar mandatory for Finland

(I'm more on the network then vehicle side)

Some cloudy days

Solar data

↑ Use generator

fiberglass + aluminum

rocks + sticks so many electric motors fragile

Ocean Engineering Prof + Students involved

Eaviditor doing same as well in Galipagos

Lots of stakeholders

Figuring out what types of motors to use

Pivot

Stuck

Battery — what use + how to recharge

150 km

8000 people living

ne work on networks dynamics

(I like this big open ended thinking
very consulting mind set
its not a boat project — its a network/ biz
model project)

Nothing really on market for electric boats

(It's the wide range of experiences that are valuable
@ MIT)

North Face
2009

VP Product Marketing

~~X~~ Get people outside

1968

Gear for outdoors

Vanity Fair bought 2000

    Cash to grow

    .200M → 2B in sales

    Marketing + Product

→ Inspire global movement of outdoor exploration

~~Which~~

1. Getting kids outside
2. More active

Traditional like
or electronics
Web apps

China: ripe to get more people outside
less of a culture

Same in Brazil

Current segments: Very active in US
Newer: "Hardcore archivers" - getting involved

Up to 250 sessions /year

Can grow there 0 in US

Potential: Developing countries
where people getting into stuff

But also stay authentic to roots

Next generation
         – as people age at

Q: ~~What~~ Cheaper/more value?

       Enevitable that more affordable

       But not a low-end line

Q: Biggest obstacle to getting outdoors

     time
        └ school
        Sports (organized)
        want time w/ friends
            Video games
     transportation
     Cultural
       China: danger

(4)

Q Family
    lot step
    but mostly hard core achiver side

Q kids
    have a line
    parents

    intro packages
        EMS
        REI

    electronics - solar

    Nike's Fuel Band
    mostly sell to active parents
    good quality

Q Urban Outdoors
    High Line NYC

Overall Schedule

6:00 – 6:45	Dinner in 3-434 for Idea Fair presenters and 2.009 staff
6:45 - 7:00	Setup presentations
7:05 - 7:30	Session 1 presentations
7:35 - 8:00	Session 2 presentations
8:00 – 8:30	Dessert and debrief for Idea Fair presentations and 2.009 staff

Roles and responsibilities

• Danny Braunstein will be primary host for the dinner, David Wallace will be primary host for the desert and debrief

• TAs Josh, Lauren, and Jeff will be available to help, will circulate in case there are AV issues, and provide computer support if needed

• Name placecards will be at the table, placing you beside presenter you will host, take to the presentation room, help setup, and introduce

• During dinner, obtain information to introduce presenter, help with computer setup if needed. We will have computers if needed

• You will need to make sure that your session stays on time

• Please make sure that one of the TAs has their presentation slides on a memory stick before your presenter leaves

• Chevalley will stay in 3-434 during the fair in case there are stragglers

• TAs will show up to take pictures at some point during the presentations

Staff member	at 6 PM sit for dinner with…	at 6:45 escort to….	7:00 - 8:00 PM	at 8 PM
Rich Wiesman	Nate Phipps Nemo red placecard	2-131	remain in room … introduce guest and facilitate as needed. Sessions are 7:05-7:30 and 7:35-8	escort back to 3-434 make sure TAs thave slides
David Meeker	Scott Harris Central Mass Search and R yellow place card	2-132	remain in room … introduce guest and facilitate as needed. Sessions are 7:05-7:30 and 7:35-8	escort back to 3-434 make sure TAs thave slides
Sangbae Kim	Dave Nerrow Fast splits blue placecard	2-136	remain in room … introduce guest and facilitate as needed. Sessions are 7:05-7:30 and 7:35-8	escort back to 3-434 make sure TAs thave slides
Amos Winter	Tyson Neukirch, Stephen Corrigan The farm school	2-139	remain in room … introduce guest and facilitate as needed. Sessions are 7:05-7:30 and 7:35-8	escort back to 3-434 make sure TAs thave slides
Matt Duplessie	Jack Kelly Bartlett tree experts pink placecard	2-142	remain in room … introduce guest and facilitate as needed. Sessions are 7:05-7:30 and 7:35-8	escort back to 3-434 make sure TAs thave slides
Peter Nielsen	Charles Santry HDK Snowmakers orange placecard	2-143	remain in room … introduce guest and facilitate as needed. Sessions are 7:05-7:30 and 7:35-8	escort back to 3-434 make sure TAs thave slides
Warren Seering Jane Connor	Dominic Meringolo Aquatic control technology purple placecard	2-146	remain in room … introduce guest and facilitate as needed. Sessions are 7:05-7:30 and 7:35-9	escort back to 3-434 make sure TAs thave slides
Jane Kokernak	Oliver Utne Fundación Pachamama silver placecard	2-147	remain in room … introduce guest and facilitate as needed. Sessions are 7:05-7:30 and 7:35-8 ·	escort back to 3-434 make sure TAs thave slides
Danny Braunstein	at appropriate time welcome and explain the process. Talk to Kyle Penner (Coleman)	have coleman folks tag with other sessions at your discretion. Perhaps have him switch session at break	float amoungst the rooms in case there are probems. Be ready to help lost students figure out where they should be.	at 7:50 head to 2-151 to setup for North Face video call. Session should ... 8.05-8.30

David Wallace	Charles Santry HDK Snowmakers orange placecard	head to Pappalardo lab for new mentor orientation session	new mentor orientation session	debrief idea fair presenters in 3-434
Josh Ramos	float and help with computers	check all presentation rooms to make sure everything is OK	pictures and troubleshooting	collect presentations
Lauren Hermley	float and help with computers	check all presentation rooms to make sure everything is OK	pictures and troubleshooting	collect presentations
Jeff Mekler	float and help with computers	check all presentation rooms to make sure everything is OK	pictures and troubleshooting	collect presentations

2.009

Lab #1: Week of September 10: Electing officers and ideation

lab objectives, expectations for all labs, preparation, what's due, lab activities, other notes
section officer information form

Lab objectives
The main goals of the lab are to develop your team's organizational structure, elect team
officers, and continue the process of product idea exploration, working towards the 3-ideas
milestone in two weeks.

Do not change your lab section without making arrangements with the course instructor. Ad-hoc
changes will create problems for keeping team sizes the same and maintaining mail lists. Also,
since the project starts quickly, you do not have much time to adjust section assignments. Only
hard constraints are an acceptable reason for a change.

Expectations for all labs
Lab sections are to begin promptly, 5 minutes after their nominal starting time. Punctuality is
an important aspect of teamwork so showing up on time is essential. This applies to both
students and instructors. If you are late and people are waiting, you are wasting their time.

Students and instructors must attend all of their lab sessions. If you will be missing a lab
session, please make advanced arrangements so that your teammates can make adjustments.
Let your instructor know that you will be away.

In a typical lab, roughly 1/2 of the time will be spent giving progress updates and planning next
steps, and at least 1/2 of the lab time will be spent working on project tasks.

Preparation before lab #1
Please review the course website well enough to recall the project workflow and milestones.

Review the topics under the team manual menu carefully, especially the team officer roles—
electing officers is an important part of the first lab. Think about roles that you would like to
assume.

You may want somebody on your team to prepare a team-member information spreadsheet, or
be prepared to build the table directly in your team's wiki (see instructions below in the *as a
complete team* section). A template for this table has been provided on the wiki. Password
information needed to log into your team wiki will be provided by email on Monday evening
before the first lab.

Read the primer on how to run meetings.

Be sure to have prepared your brainstorming deliverable.

Review the tutorial on group idea generation so that you are familiar with the process. If there
is time, you will do additional idea generation during lab.

Be prepared to give a short summary presentation about the project opportunities that you saw
at the project ideas fair (~5 minutes per project).

Remember that you need to keep track of your time using the project timesheet.

What's due
Bring your completed brainstorming deliverable (prepared for submission) and your design
notebook to the lab read for the start of lab

Officer election results must be submitted using the **officer information form** by your
section's acting system integrator, right after the lab meeting (please include officer email
addresses).

Recommended lab #1 activities
It is recommended that you begin the lab with the two sections together for team-wide introductions and brief summaries of what you saw at the project ideas fair. Then, divide into individual sections for the officer nomination process and review of ideas from you individual brainstorming.

As a complete team (both sections together)
Distribute the student and staff name cards. Ideally the instructors will distribute these around the table before everyone arrives for lab. The name cards will be on a shelf in the conference room. At the end of each lab meeting, the name cards should be collected and put back on the shelf.

Introductions around the table should be made.

While the introductions are taking place, a student should fill in a spreadsheet or use the table in the team's wiki, recording the following information: team member name, their interests, whether they have transportation, how heavy their course load is during the term, IM name, and cell number as available. It will be useful to make two charts: one for the A section, and one for the B section. Be sure to project the chart so that all can see it as it is completed (there is a built-in projector in your meeting room).

The lab instructors should also briefly say what they do and describe their interests.

Students should present the short summaries they prepared for each of the projects they were assigned to at the ideas fair.

Close the meeting room divider and continue the lab with the two sections working separately.

As individual sections
You may want to use the projector in the conference room to display the lab instructions to help structure your process. For the team that is not on the side of the room with the ceiling mounted projector, you may also pick up a table top projector (certs required).

Identify persons in your section that are interested in the system integrator position. Allow each person to briefly say why they want to be an integrator. Develop a schedule for the candidate system integrators to rotate through during the first few weeks of the course. Each candidate should have at least one week to tryout at the position. When the tryout rotation is complete, the team can vote on a permanent system integrator. Ideally this would be no later in the term than a week before the sketch model review.

Now, the first system integrator in the rotation should take on the responsibility for running the rest of the lab meeting, as well as ensuring that minutes for today's lab meeting are taken and distributed via the team's wiki. The minutes for today's lab should include the table constructed during team introductions and all decisions from the remainder of the lab. This will include choices for team officers, results from an idea clustering exercise, and task forces assigned to meet deliverables for next week's lab. Files should be uploaded to the team wiki. (Your team also has an Athena locker named 2.009_yourTeamColor that can be used to share files. Instructions for connecting to Athena are available).

Elect one person in your section for each of the team officer positions: financial officer, safety officer, information officer, and tool officer. Please use a democratic election process that has been agreed upon by the section. Each officer needs to understand their responsibilities in detail. It may be helpful to project the role description for each officer under consideration.

You will also need to chose a wiki master. This person will be responsible for overseeing the team wiki and will be the only person with permissions to delete or rename pages.

Once you have selected officers, please submit this information using the online form.

Note: financial officers will need to attend a credit card orientation session and a rfp training session. Information officers will need to attend a session with the librarians. System integrators will attend a communications workshop.

Spend about 1/2 hour of the lab looking at the ideas you prepared for the individual brainstorming deliverable. Each student should pin up and briefly describe their ideas (push pins will be in the lab). Then, go through the exercise of working en-mass to classify the ideas into a small sets of similar ideas and giving descriptive names to the clusters.

Tip: At this stage the goal is not to eliminate/select specific ideas...we do not know enough about the ideas. The goal is to identify sets of general product categories/opportunities for further investigation. Ideas should be clustered based upon the need/issue, not the embodiment envisioned in the sketches.
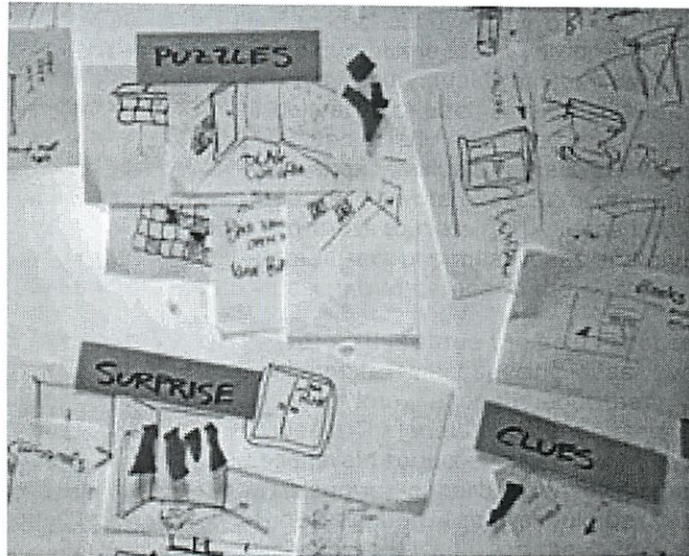
labeled clusters of sorted ideas (theme: toys)

Once you have the clusters named, you will want to decide which idea areas are of the most interest for additional exploration. You might give each team member three stickies and allow them to vote for the their top three. This should provide guidance on the areas that are most interesting to the team.

If there is enough time, conduct a group brainstorming session to generate additional ideas within your three chosen areas.

Talk about what needs to happen during lab next week. The main goal will be to gather information in preparation for the 3-ideas presentation. Before next week the team will need to do background work for its three chosen idea areas (possible customers and their key needs, relevant existing products, market potential, more product ideas, and some technical feasibility analysis). Of course, if something new and interesting comes up in the process of your research, that new direction can be explored as well. Keep in mind that at least one product idea loosely related to, or inspired by, the idea fair should be presented at the 3-ideas presentation.

Remember: The research and idea generation during this phase of the project is **very important** because it will determine your team's direction for the entire term.

Divide the team into task forces as needed, following the guidelines for creating task forces. Clarify what the different groups are to deliver and how the system integrator will facilitate coordination between the different task forces.

Submit a copy of your brainstorming assignment to your instructor before leaving lab. Your team may also want to photocopy a complete set of all brainstorming sketches for each section member. There is a copy machine in the 2.009 Pappalardo lab computer area.

Other notes about the lab:
A TA will show up during your lab section to take your picture. These pictures will be put on your team web-page.
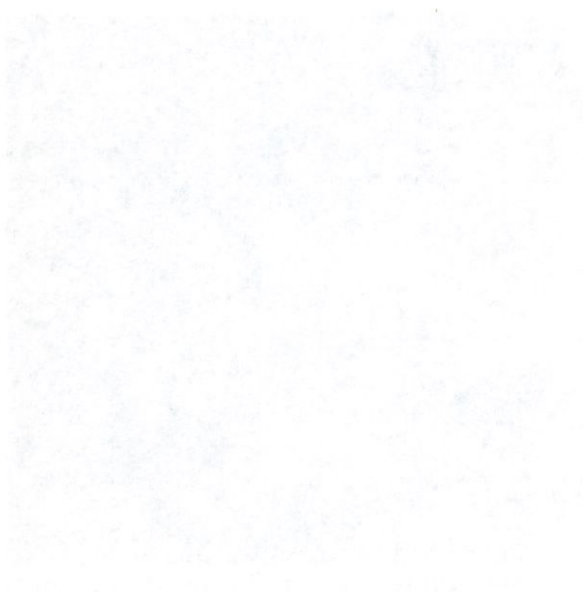
Last day ~~in this class~~
         On the tem

              Lectures w/o class?
                   —think still valuable
                   —for now
                   —swap for time if needed

Gabe Blachet — interested in how teams work

CVT for bike

Low-end farm equipment

Snow equipment
      flaten out
      rotate auto
      make littel ones more efficeenty

Thermal imaging

Have a system integrator

Jobs

Tools

Info

Financial

Saftey

Systems Integrator
Project Manager
and more tech intgration
lots of time

Dan working today as PM

No tech lead
Often competing roles
Can add positions though

Idea Pin-Ups

Charge mobile devices when biking

Stride counter

backpack → tent
Self assembling tents

kiack/surfboard
   silly to do both
   esp in sporting equipment
   Windsurf/kiack

Solo cup dispenser
   - who would buy it?
Me: auto bartend
   - make any drink

Angled umbrella
Smart Stop watch

Landing board plan to car

beach drill

doorbell to cell phone
table auto-leveler
detect robbers

Anklet that gives you the beat of the song
∟ DDR score

light painting

heated ear muffs

bike vending machine / zip car style

Portable wind turbine

3pt hammock

(5)

Which sketches stand out?

Grp: Cool + new mech e   or   pratical?

Talk about skills start of next meeting

9/10

2.009

Home > 3-Ideas presentation

3-Ideas Presentation

background, requirements, presentation setup logistics, grading, presentation tips, results

Background

The 3-ideas presentation is a critical step in the process of choosing a direction for your team's project. The milestone take place during lecture time, as indicated in the syllabus.

This milestone is also intended to help you learn how to prepare a 'clean' poster and describe a product idea in a very short amount of time—roughly the amount of time you might have to pitch a new idea to an executive when you see her while riding in a elevator. Hence, this type of presentation is called an "elevator pitch". If you are not completely at ease in this type of presentation, it is a great chance to practice.

During the presentation you will also be able to see other ideas that classmates are considering.

Requirements

Your section will prepare 3 posters illustrating your section's three best ideas for a project. These should include both ideas derived from your own brainstorming and inspired by the idea fair.

6 sheets of foamcore will be made available in your team's work area (3 sheets for each section). Use the foamcore that we provide so all posters are the same size. Each idea must be represented on a different sheet. Please **lay the posters out in tall format** since fitting all the posters in the classroom is tight and the mounting system is designed for portrait orientation. Also, be sure to identify your team and section on the poster.

Each idea poster should include a simple sketch and key talking points, such as potential customers, market, and technical feasibility assessment— all readable from 50-80 feet away. At a glance, a viewer should 'get the idea.'

A few examples from a previous year are provided on the right. You can also view posters from other years in the gallery (select a project and click on the ideas tab).

Remember that clean simple posters work well. Since the ideas are quite unformed at this time, using gestural sketch-like representations is more appropriate that realistic renderings or models. You can prepare the final poster by hand or using software. There is an illustrator tutorial with tips on preparing a 2.009 poster.

In your presentation, you must also identify at least one person/expert that is representative of your potential customer and be confident that they can serve as a resource during the term.

Logistics

Your section will present the ideas during class.
Please review the **detailed presentation setup logistics** carefully.

Grading

This presentation counts for a portion of your section-specific grade.

After class, the posters will be collected and all lab instructors will meet to discuss the 6 ideas presented by your entire team (three from each section).

Recyclo-Sink
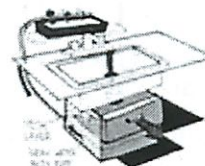
Features	Market
• Composting	$187 billion
• Greywater	dollar industry
• Herb Bed	

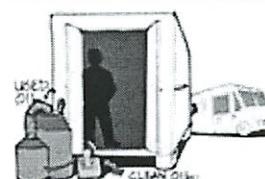| Consumers	Feasibility
DIY and green-minded urban dwellers	< 8 W water pump

Clover Seating
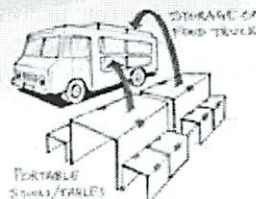
FEATURES Compact & Communal

MARKET $155 Billion Industry

CONSUMERS Fast-paced Foodies

FEASIBILITY Folding Mechanism, Specialized Attachments

Waste Oil Converter

Features	Market
Removes water and food particles	3 billion gallons of oil wasted per year

Consumers	Feasibility
Food trucks and at-home cooks	Optimizes technology for home scale

Based upon your work, the instructors will choose a product idea area and this will become the entire team's focus for the rest of the term. When making the selection instructors will consider: technical and educational interest; customer needs; project scope; and the product portfolio formed by all 8 teams in the class.

The posters will be photographed and your presentation will be video taped. The materials will be put on the course website, with a review form, and you will receive presentation feedback from instructors over night after the presentations (before your next lab).

Presentation tips
Pointers have been prepared (.pdf) by the communication instructors, while some additional guidelines are provided below.

- Look at the audience, not your poster.
- Don't block your poster.
- Don't read the poster! Viewers will already see everything on the poster... augment the visual information with speech. Lots of text on a poster is not a good recipe.
- Avoid cue cards... practice in advance.
- Think of the presentation as a short story. Telling the story through the viewpoint of the customer can be effective.
- Do not emulate a 'used-car salesperson' or TV infomercial... this is not appropriate for our professional context. Be honest and informative.
- Humor is great. However, humor can unintentionally become disrespectful or in bad taste. Just be careful!

Results of the 3 ideas presentation.

RunRunRevolution

Mobile motion-based game
$15M market
Smartphone/Arduino platform

yellow a
Fire Extinguishing Pod

$9 Billion Market

Pressurized Retardant

Release Mechanism

A-Team

2.009

Project Timesheet

background, use in 2.009, preparation and submission

In professional design practice we are typically required to track and bill our time to the different projects on which we are working. Different types of activities are often billed at different rates, so the type of activity is also recorded.

We are using an online timesheet tool to make the process as convenient as possible. The categories of the timesheet are fairly detailed, so please make entries into your timesheet on a regular, daily basis when you are working on 2.009 project... when your memory is fresh.

Use in 2.009
From a learning viewpoint, the structure of the timesheets provide a reminder of the types of things one is likely to be doing in a product development process, and reflecting upon your effort will help to improve skills in estimating how long different types of tasks will take.

Your **lab instructors**, who are responsible for grading, **will not see the timesheets**. The course instructor will use the information in the timesheets (after the class is over) to improve the 2.009 product development process through a detailed understanding of the resources needed during different phases of the project. Please bill your time as correctly as possible since the goal is to obtain accurate information. In professional practice, systematic over billing is fraud and at times can be a criminal offense!

The link to your timesheet will be available after class on Monday, September 10. Descriptions of the categories are available for reference.

Please see the instructions on **how to prepare and submit your timesheet.**

2.009

Home > Treasure hunt

Information Treasure Hunt

The information treasure hunt is an important activity early in the course schedule. You will work with your section mates for the first time, finding information similar to what will be needed to research your new product ideas (in preparation for the 3-ideas presentation). It should help you get started in finding information relevant to the project theme.

The learning goal is to familiarize yourself with different information resources and search techniques. It will help you to develop your secondary research skills and it will give you practice organizing your team quickly... in particular task delegation and coordination.

The treasure hunt is time constrained. This will help your team learn how to mobilize quickly when problems arise, and to delegate strategically considering both the skills needed for the task and different schedule constraints faced by team members.

Like most treasure hunts, prizes will be awarded.

Please review the **detailed instructions** carefully.
See **results** from the information treasure hunt.
Read the questions and information sources.

Meeting + Finding Info
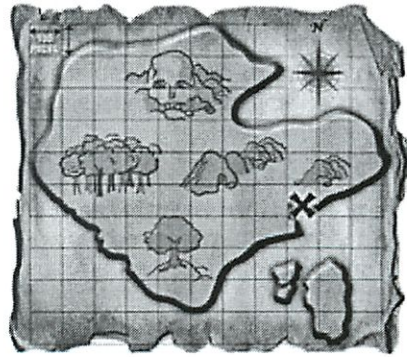
Formulation of problem is far more essential than Sol

idea fair

lot mtgs

time - sheet

    be accurate

Creativity strategies

      look for next right ans

       multiple viewpts

       defer judgement

       Challenge assumptions

(These qu are very exact - content memorization based)

Meetings

      Use time efficiently

      get on same pg

      Make decisions

      assign responsibility

~25% of your job is meetings

being good at meetings allows you more sucessful

be ceults-oriented

Expensive

his calc - $75/hr/person

        plus mentors + space

Sucess

  plan + prepare

  ground rules

  plan for problem behaviors

    ⌐ have dominators take notes

    (I don't agree)

  encourage constructive behavior

    even better than leader are top performers

Summarize + seek closure
(very important)

Mon : 3 ideas pitch
idea, feasibility, cost, market, expectations

informed ideas
⟋ So Treasure Hunt

mobilize quickly
delegate strategically

Need good info
market, industry info

Information is expensive
These dbs ⌗

(1)

Where find info?
  libraries.mit.edu/2.00*

might need to go to physical lib

Create 1 ans sheet in MS Word
  Cite
  Nicely, unified format

Due tmo at noon

2.009 Information Treasure Hunt – Red Team B

Problem Statement:

To choose and develop an interesting, useful, and marketable product, you need to be able to find good information quickly. Getting information on outdoor products or devices, the communities represented, and available technologies will inform your project selection and give you ideas for new innovations. Market information will be essential in choosing a project and for building your business plan later in the semester.

A lot of information (including most scholarly research) is in the "hidden web" – not available via Google, so you need to learn where to find that information. By finding the answers in this assignment, you will explore different types of information resources and be ready to find information as the need arises throughout the semester.

Where will we find the answers?

The Libraries' 2.009 course page will tell you where to easily find this information: **http://libraries.mit.edu/2.009**. Surfing the web will take much longer for many of these questions and may provide less reliable results. **Teams using recommended library resources will rank higher than those who use other resources.**

How should we submit the answers?

Your answers must come from reliable trusted sources and you must cite them so that you (or others) can go back and find the information again easily. Each answer on this assignment **must include a good citation** to your source **otherwise it will be dismissed as unreliable information**. See the accompanying handout or the Libraries' 2.009 course page for hints on how to cite properly.

When is this due?

Thursday (Sept. 13) at 12noon. One representative of your group should compile the answers into a single document using Microsoft Word (please include both the question and answer) and email the answers to Angie (locknar@mit.edu) by 12noon on Thursday. Only one email should be sent from each team. Don't forget to include your team section name on your document!

Who can I ask for help?

Librarians will be available until **5pm** today at the libraries – most libraries are open later, but you may only be able to get limited help. Feel free to also contact Angie directly. She will be in the Barker Library all afternoon:

Angie Locknar – locknar@mit.edu, Barker Library (10-500)

See other options for help (phone, email, etc.) through the "Ask us!" page:
http://libraries.mit.edu/ask

2.009 Information Treasure Hunt – Red Team B

For each question, please provide a citation for where you found the answer. If you used library materials, provide the call number and library in which it is located. If you used a database, indicate which database was used.

1. You are investigating a human powered generator and need to find some facts. (Hint: use handbooks, encyclopedias or reports to answer these types of factual questions)

   - What is the amount of useful horsepower (t in min) that an average 60 year old male can produce?

2. You are trying to estimate the size of the market for your revolutionary new product, which is a very quiet, low decibel riding lawn mower.
   Note: to cite this answer, provide the name and URL of the resource you used.

   A. In 2011, sales of riding lawn mowers represented what percent of total value sales of lawn mowers in the U.S?
   B. What is the post-2008 trend for lawn mower sales in the US?

3. You need to find a partner to help develop and commercialize (hopefully) your new product idea. An industry expert has suggested to you that Kirby Corporation, an inland barge operator and a publicly-owned company, might be a potential partner. Before contacting them, learn more about Kirby Corporation.
   Note: to cite this answer, provide the name and URL of the resource you used.

   A. Uncover the following facts about the company's operations:
      a) The year when the company was founded (or changed ownership)
      b) The address of their US headquarters
      c) Total number of employees worldwide
      d) Latest revenue (sales) figures
      e) Were they profitable last fiscal year? How much was their profit or loss? (Hint: Look for "Net Income" or "Total Net Income")
      f) The North American Industrial Classification code (NAICS) for their primary industry

   B. Find a news article about the company published in the past year. Provide a good citation for the article and include the name of the bibliographic database where you found the article.

4. You would like to learn more about backpacking or hiking, and you know that the right book can provide a good summary on this topic.

   A. Find a book on backpacking or hiking, available in the MIT Libraries.
      - Provide a good citation for the book, including the library call # at the end of the citation and which library has the item (Dewey, Rotch, Barker etc.). Also include if this book is available on the shelf (according to Barton) and the day/time this was checked. You do NOT need to physically get the book, use Barton to answer the questions. Electronic books are allowed. If you select an electronic book, provide the Online Ed. URL and the service provider (Books24x7, netlibrary, GPO access, etc.).
         - Example: Gavin, D. and Conran, T., 2007, *Outdoors: the garden design book for the twenty-first century*, Monacelli Press, New York.
            Rotch Library SB473.G39 2007– checked out (due 10/5/2012) as of 11:18am 9/7/12

B. To find more specific information, you want to read a scholarly article on the narrower topic of backpack load and its effect on gait.
   - Search for an English language journal article on this topic published in 2002-2012. Provide a good citation for the article, and include the bibliographic database you used to find the citation.
   - Does MIT have a print subscription to this journal for the year that the article was published? If yes, in which library is it held? Does MIT have access to an electronic version of this article? If yes, what are the years of access?

5. You want to make sure your design or project idea is unique before you take it to a company or customer for production. Check the patent literature, and find one granted (not an application) United States technical patent for a teepee.

   A. What is the patent title?
   B. What is the patent number?
      (Tip: numbers starting with D, e.g. D593812, are design patents, not technical patents. Numbers starting with the year, e.g. US20060201950, are applications, not granted patents)
   C. Who is the assignee? The inventor?
   D. Provide at least one classification code assigned to this patent (number and name, e.g. 446/486: Amusement Devices: Toys/ Resilient toy or actuator)

Citation Help and Suggestions

Below are suggested citation formats for various types of information sources. Use this citation style (ASME).

For more help and examples: See the Library guide for 2.009 (http://libraries.mit.edu/2.009)

Websites	A citation to a **website** should provide: • Author's name(if available) • Title of document • URL • Date of access, in parentheses Example: Omega Engineering, Inc., Positioning Strain Gages to Monitor Bending, Axial, Shear, and Torsional Loads, http://www.omega.com/faq/pressure/pdf/positioning.pdf (Accessed 8/18/2010) **Note:** If URL is exceptionally long, provide the base URL and provide the browse/search path used.

Journal or Newspaper Articles	A citation to an **article** should include: • last name of each author followed by their initials • year of publication • full title of the cited article in quotes, title capitalization • full name of the publication in which it appears • volume number (if any) in boldface (Do not include the abbreviation, "Vol.") • issue number (if any) in parentheses (Do not include the abbreviation, "No.") • inclusive page numbers of the cited article (include "pp.") • Name of bibliographic database the article was found in (normally this is not required in a citation, but it is for your Treasure Hunt assignment). Example: Ning, X., and Lovell, M. R., 2002, "On the Sliding Friction Characteristics of Unidirectional Continuous FRP Composites," ASME J. Tribol., **124**(1), pp. 5-13. Found in Compendex.
Press releases and newswire reports	A citation to a **press release or newswire report** should include: • Author(s) of press release • Title of press release • Title of news service • Date of release • Name of bibliographic database the article was found in (normally this is not required in a citation, but it is for your Treasure Hunt assignment). Example: Fonte, Diwata. "Diamond Walnut Growers to Go Public Friday as Diamond Foods, Inc." *Knight-Ridder Tribune Business News*, (2 July 2005). Found in LexisNexis.
Books and book chapters	A citation to a **book** should include: • last name of each author followed by their initials • year of publication • full title of the publication in italics • publisher • city of publication Example: Ulrich, K.T. and Eppinger, S.D., 2000, *Product design and development*, Irwin/McGraw-Hill, Boston MA. A citation to a **book chapter** should include: • last name of each author followed by their initials • year of publication • full title of the publication in italics • publisher • city of publication • inclusive page numbers of the work being cited (include "pp.") • chapter number (if any) at the end of the citation following the abbreviation, "Chap." Example: Jones, J., 2000, *Contact Mechanics*, Cambridge University Press, Cambridge, UK, Chap. 6.
Patents	A citation to a **patent** should include: • Inventor(s) name • Year • Patent name/title in quotes • Country where patent is registered • Patent number Example: Colledge, A. L., and Johnson, H. I., 1989, "Portable Multi-Purpose Exercise Device," U.S. Patent No. 4,856,775.

2.009 Product Engineering Processes

the mere formulation of a problem is far more often essential than its solution

Albert Einstein
1879-1955, Nobel prize in physics
a *relatively* smart person
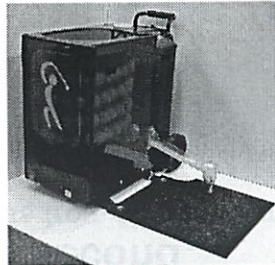
automatic golf teeing machine

idea fair?

but first...

Project timesheets... see homepage

In professional design practice we track and bill our time

Different types of activities are often billed at different rates, so the type of activity is also recorded

In 2.009 you must track and bill your time using a special timesheet

A time sheet is to be submitted every two weeks along with your digital design notebook submissions

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2.009 Product engineering processes

Today
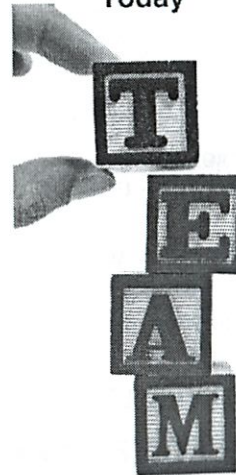
meetings
effective and efficient

finding information
informed ideation, teamwork

but first...
Project timesheets

Edit 2.009 Timesheet Entry for David Wallace

Date: 09-14

Activities	time alone		time w/others		short description of details (e.g., topic, accomplishment, conclusion)
Designing	hr	min	hr	min	
identifying design problems	1				secondary research on web
generating design concepts		30			listing ideas in notebook
selecting design concepts or details			1	30	pinup and organizations of ideas with team
sketching ideas	3				preparing annotated sketches
CAD modeling					
writing about your project					
analyzing or calculating					

Log in and start using the form
Spreadsheet for offline note keeping
Separate entry for each day

L4 Meetings + Finding Info

9/12

but first...
Project timesheets... why in 2.009?

Representative of real practice

Reflection on where/how
you are spending your time

Data for your business model

Improve the 2.009 product
development process

OK, but put it in
hey, what's up?
the timesheet

uh...

Do not overbill or under-bill

Be accurate and complete

Fastest to make entries every day that you work on the class

Your lab instructors (who are responsible for grading) will not see
the timesheets and I use scripts to process the data

and second...
results from Monday's mini quiz

list 4 individual creativity strategies Jeffery Lin dirty sketching—not like that, you perv

- look for the next right answer
- look from multiple viewpoints
- defer all judgments
- challenge assumptions
- others, sensible / categorize / brainstorm
- less sensible / think out of the box
- shower?
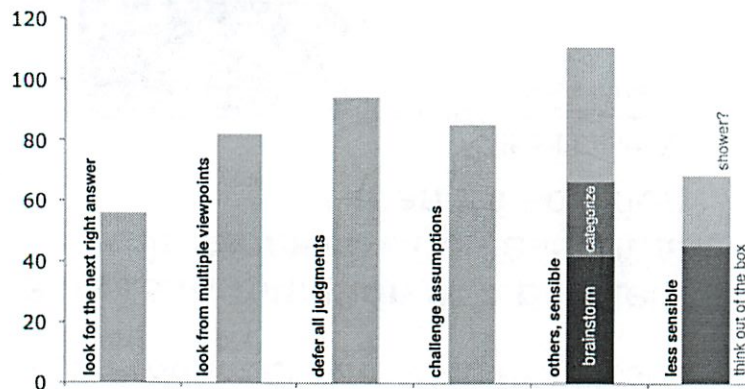
2.009 Product Engineering Processes
Mini-quiz

Put your name on the top of an index card

i) List a mental attitude/thought that *blocks* creativity?

ii) List two factors the correlate with *unsuccessful* product
development teams.
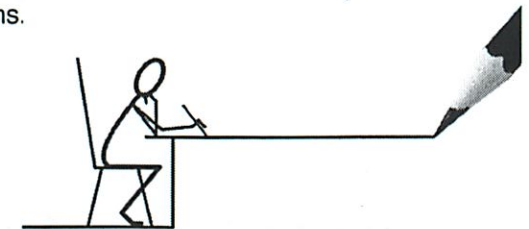
at last! Meetings (lab time +)
Why be good at them?

roughly 25% of your professional life will be spent in meetings

meetings will have a big influence on your level of success

Meetings
Why be good *and efficient*?

correlates with good performance

they are very expensive!

$40,000/year tuition at MIT
$50,000/year in opportunity costs
100 units/year, 12 unit course, 12 weeks gives ~$75/hour/person

team meeting costs ~$1500/hour (your time only)

~$8000/lab
including staff, mentors, facilities, etc.   be on time!
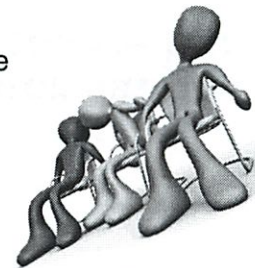
Running a meeting
resources/running meetings

Ted finds himself in a situation which he is grossly unprepared for

plan and prepare
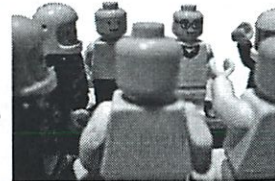
clear roles, challenge ideas not individuals
set ground rules

plan for problem behaviors
   dominators (assign them to be the scribe)

Running a meeting
resources/running meetings
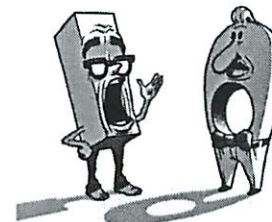
encourage constructive behaviors
opinion giving
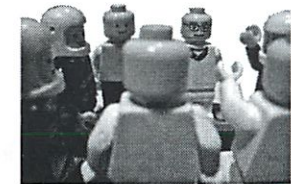
summarize and seek closure
review the plan and disseminate (minutes, team wiki)

coming up! 3-ideas milestone

During class, Monday September 24

See 3-*ideas presentation* link under the *Project* menu

3 ideas proposed by your *section*
idea, feasibility, customer, market, expert/client

1 of team's 6 idea areas chosen by panel of instructors and mentors
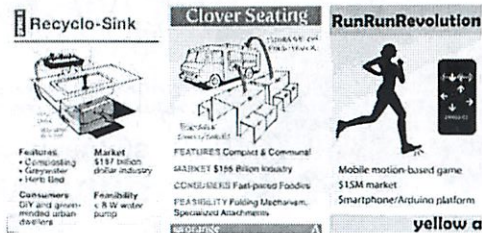
Finding information

3-ideas, September 24

your section proposes 3 feasible, viable ideas and identify contact resources

informed ideas

2.009 Information Treasure Hunt
informed ideas

Become more familiar with different information resources and search techniques

Find types of background information relevant to the project and early ideation

Obtain initial practice in task delegation and coordination

Help team learn how to mobilize quickly and to delegate strategically (considering skills and different schedule constraints)

instructions are linked on course home page

information treasure hunt

problem statement

where will we find the answers?

how should we submit the answers?

when is this due?

who can I ask for help?
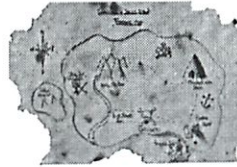
problem statement

You need good information to identify, choose and develop your product.

information on *outdoor* products or devices

market information (trends, competition, customers, etc.)

But a lot of important information is in the "hidden" web, not available via Google.

Information is expensive!

ASME journal
and conference proceedings
$15,000/ year

2013 Lexus RX Hybrid

IMechE journals $33,700/ year

Information is expensive!

Web of Science®

$138,000/ year

2BR/2 bath ski condo
Killington VT

where will we find the answers?

2.009 library course page:
(also under resources/finding information on course website

http://libraries.mit.edu/2.009

You can use other resources, but teams using the library-recommended resources will score higher.

You will probably need to visit

when is this due?

Thursday (Sept. 13) at 12 noon

how should we submit the answers?

create one answer sheet per section in MS word

include your section name on the answer sheet

answer the question

citations are required, including the source of answers
guidelines are in your instruction packet, and are linked to the home page

email answers to Angie
(locknar@mit.edu or 2009library@mit.edu)

who can I ask for help?

librarians in class today

Ask us! (librarians via email) http://libraries.mit.edu/ask

staff at any MIT Library

Angie Locknar
locknar@mit.edu, x3-9320, Barker Library

angie

1234
56

2.009 Treasure Hunt
Getting started

Make sure you are with your lab section

Distribute instruction packets
All instructions are also on the course website, except the questions

Read the instructions

Delegate tasks and decide how you will coordinate
Mailing lists are active: see information/mailing lists

Take advantage of available help!

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

2.009 Product engineering processes
A few reminders about lab

be on time
be prepared

officer information needed today:
yellow b

A product opportunity

idea + user + market + feasibility

3-ideas presentation

Identifying opportunities
idea + user + market + feasibility

Processes:
individual creativity strategies

Jeffery Lin

182

---

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 + market + feasibility

Processes:
individual creativity strategies
brainstorming

1. DEFER JUDGMENT
2. ENCOURAGE WILD IDEAS
3. GO FOR QUANTITY
4. BUILD ON THE IDEAS OF OTHERS
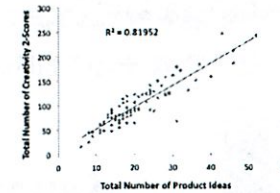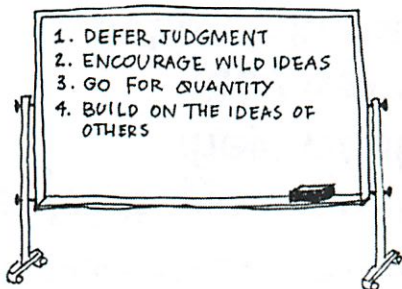
Identifying opportunities
idea + user + market + feasibility

Processes:
individual creativity strategies
brainstorming
one-on-one/few discussions
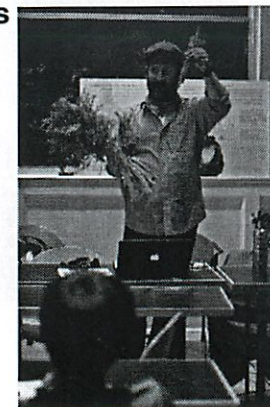
Identifying opportunities
idea + user + market + feasibility

Processes:

individual creativity strategies

brainstorming

ask, one-on-one/few discussions (idea fair)

secondary research (treasure hunt)

Treasure hunt
Feedback

first to complete: red b, 6:24 PM Wednesday
best formatted for the client: orange a

top sections:
incorporated the question into their response
provided all of the requested information
provided correct, consistent citations
provided a nicely formatted, easy to read document
found more than one source to verify their answers

lower scoring sections:
provided incorrect information
did not provide complete/consistent citations, or were missing citations
did not always utilize the 2.009 library "finding information" guide

---

Treasure hunt
Results

Accounts of the voyage of the Ship Green A and all her crew,

to discover the whereabouts of the treasure we most crave...

Knowledge

Housing of the outdoor grill

Density of Limestone ranges from 2.3 to 2.7 g/cm³, depending on the type of limestone.

Young's Modulus of slate ranges from 6 to 9 dynes/cm², again depending on the type of slate.
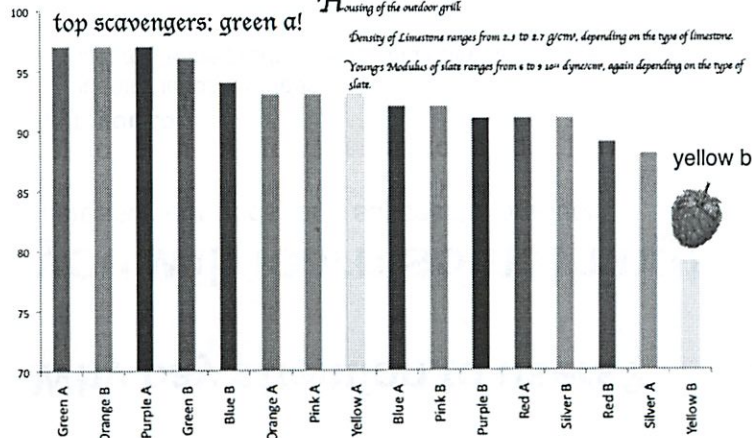
top scavengers: green a!

yellow b

(bar chart, y-axis 70–100, categories: Green A, Orange B, Purple A, Green B, Blue B, Orange A, Pink A, Yellow A, Blue A, Pink B, Purple B, Red A, Silver B, Red B, Silver A, Yellow B)

Identifying opportunities
idea + user + market + feasibility

Processes:

individual creativity strategies

brainstorming

ask, one-on-one/few discussions (idea fair)

secondary research (treasure hunt)

in-context observation of users

Why pay attention to users?

you will learn something!

increase your odds for a successful product

help you to...

identify leads for ideas
clearly define product goals and refine/test ideas

Identifying opportunities
in-context observation

every user compensation
or adaptation is a potential
product opportunity

learning to observe
key to being a designer/innovator

Observation exercise
The opportunity-finding process has just begun!

each person in your section will sign up to observe at
one of several 'places'

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

organize as section and complete 'places' signup
form at the end of class
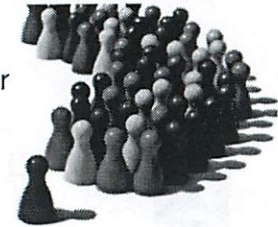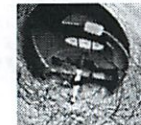
Special tutorial
Observing users

today, 4 PM in 1-150, 50 minutes long

Jeremy VanHill: Cambridge Consultants

information on course website

Identifying opportunities
idea + user + market + **feasibility**

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

Identifying opportunities
idea + user + market + **feasibility**

Engineering estimation
Order of magnitude calculations, *back of the envelope*

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

Estimation exercise
Some practice!

Estimate the usable energy in a D size battery
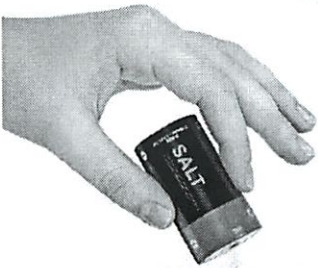
4 minutes
blank sheet of paper
name and section on top of page
no computers or mobile devices
hand in to center isle

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

$2E = 5$ J/s $\times 10800$ s
$E = {\sim}3 \times 10^4$ J

Feasibility estimation
General approach

1) what is the idea?

2) what are the critical questions?

3) develop/ideate models

4) apply quantities, checking units

5) decide if answer seems believable

Estimation
typical critical feasibility questions

is it possible?
is it difficult?
        how efficient?

how much?

        how big?

how expensive?

An idea!
Battery powered, hand-held foam cutter
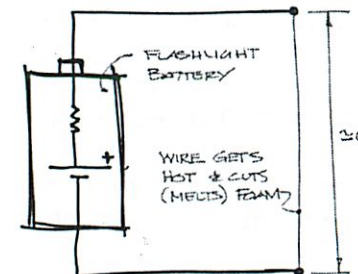
is it feasible?

key questions
develop a model
some numbers

name on paper
4 minutes
no computers or mobile

An idea!
Battery powered, hand-held foam cutter

FLASHLIGHT BATTERY

WIRE GETS HOT & CUTS (MELTS) FOAM?

≃6"

light bulb 100 W
sphere dia. ~4 cm
area ~ 50 cm²
need ~2 W/cm²

wire dia. 0.1 cm
wire length 15 cm
wire area ~5 cm²

power: 2 W/cm² x 5 cm²
~10 W
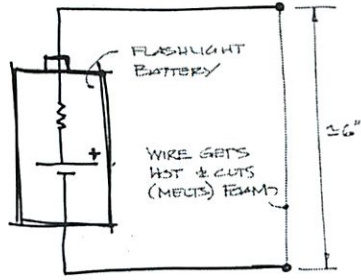
key question?
power?

reasonable?

An idea!
Battery powered, hand-held foam cutter

FLASHLIGHT BATTERY

WIRE GETS HOT & CUTS (MELTS) FOAM?

≃6"
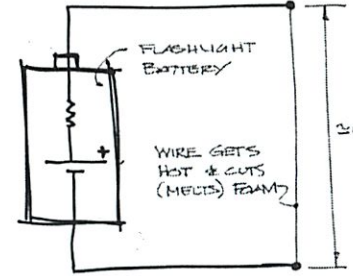
what next?
feasibility test
(sketch model)

power ~10 W

reasonable: yes

A sketch model!
Battery powered, hand-held foam cutter

PAPER SWITCH

D CELLS

WELDING ROD

NiCr WIRE

ELASTIC TENSIONER

FOAM CORE HOLDER
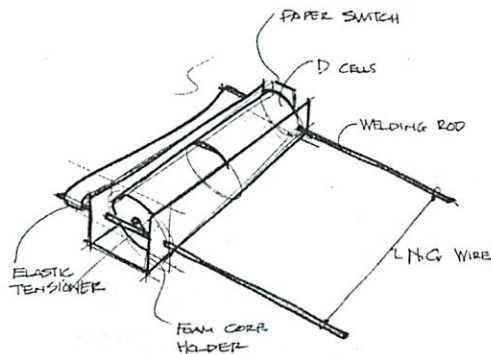
what next?
sketch model

---

and last...
some logistics

observing users: 4 PM today in 1-150

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

special workshop Monday:
   designing with sourced components

and last...
Some logistics

now:

organize for observation exercise

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

scored treasure hunt submissions will be emailed

9/14

2.009

Observation Exercise

This exercise is scheduled to help your idea generation process. Each person in your team will need sign up to observe a place. A list of places will be provided before the exercise is assigned.

You will practice your customer observation skills and also help you to develop a broader range of ideas for the project. Simply watching potential customer behaviors is an excellent way to identify product opportunities. The Friday afternoon observation tutorial session may also help you develop a strategy for observing.

Please review the submission instructions.

2.009

Home > Observation exercise

Observation Exercise

This exercise will help you practice your customer observation skills and also help you to develop a broader range of ideas for the project. Simply watching potential customer behaviors (unobtrusively) and talking to them is an excellent way to identify product opportunities. This exercise is scheduled to help your 2.009 project idea generation.

There is also a special seminar on Friday, September 14 at 4 PM in 1-150 to help you develop skills for observing and learning from potential users.

One member of your lab section should complete the web form below and submit it for your entire section. After picking your section in the combination box, **assign each section member to one "place or person" to go and observe**. Since there are more options that section members, all places will not be assigned. After all section members have been assigned, submit the form. Your section and the course instructor will receive an email with the 'place' assignments.

Details of how to complete your observation task are with the observation submission instructions.

Lab section: ---

'Place or person'	Section member
harvard square	select section first for member list
a bus stop or train platform	--
a park	--
a construction site	--
a busy street corner/crossing	--
an outdoor sporting event	--
Newbury street	--
a campground or hiking area	--
the beach	--
an amusement park	--
a zoo	--
an outdoor university commons	--
an outdoor dining venue	--
a marina or dock	--
a bike path	--

☐ I have completed the form and I am ready to
submit the observation exercise assignments form

(**Note:** You will be redirected to the course home page after submission is complete.)
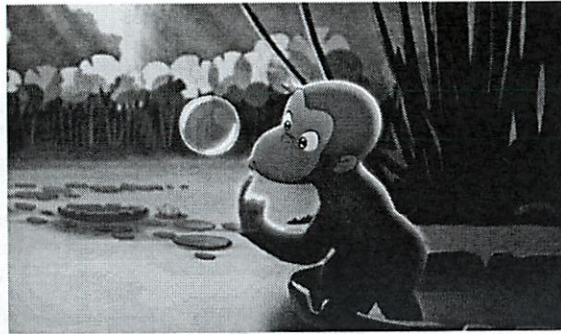
Curiosity
is as much a parent of attention
as attention is of memory

Richard Whately (logician, 1787-1863)

2.009 Product Engineering Processes

ideas presentation
estimation from Friday
more estimation

Mini-quiz from Wednesday
Question i)

What is an important mental attitude for *blocking* creativity?
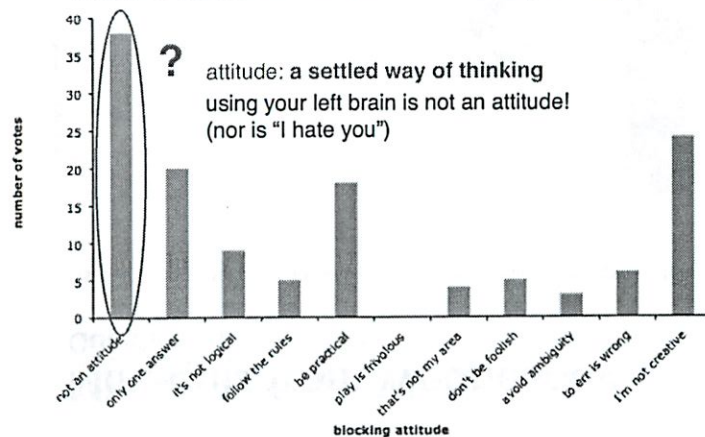
? attitude: a settled way of thinking
using your left brain is not an attitude!
(nor is "I hate you")

number of votes

blocking attitude: not an attitude, only one answer, it's not logical, follow the rules, be practical, play is frivolous, that's not my area, don't be foolish, avoid ambiguity, to err is wrong, I'm not creative

Mini-quiz from Wednesday
Question ii)

List two factors that correlate with *unsuccessful* product development teams

Correlate: **have a mutual relationship or connection**
vs. opinions (laziness, disorganization, dominators)
truisms (bad teamwork, weak group)
negative of a positive (poor communication)

number of students

number of correct answers: zero, one, two, two +
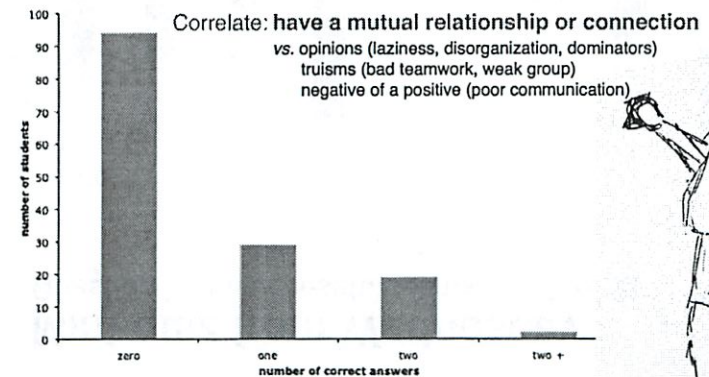
Michelle Deng

Mini-quiz from Wednesday
Question ii)

List two factors that correlate with *unsuccessful* product development teams
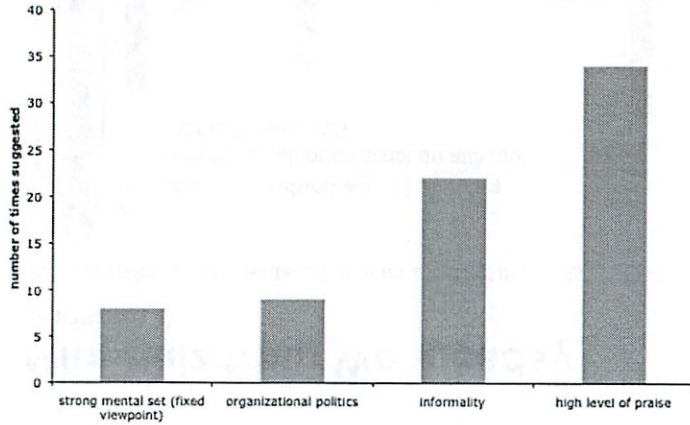
Mini-quiz from Wednesday
Question ii) unsuccessful teams, 2010 *vs.* 2012
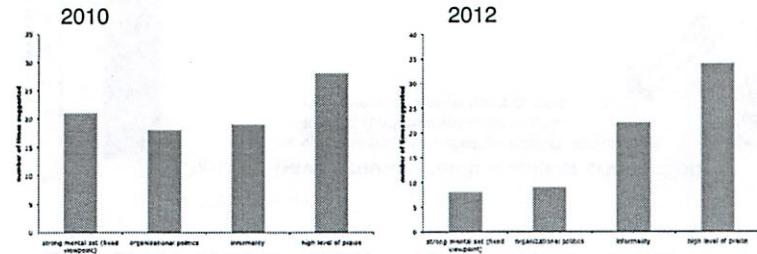
Class Monday

3-ideas presentation
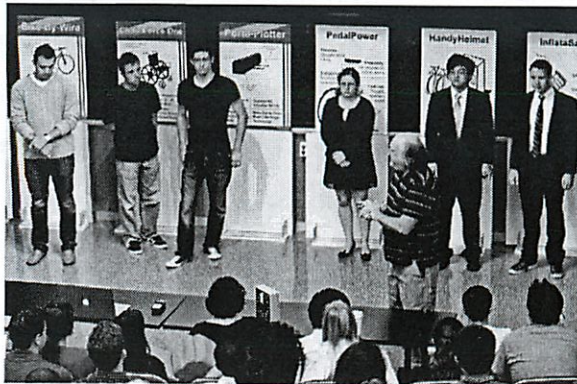
A product opportunity

idea + customer + market + feasibility

3-ideas presentation
Monday

one team

Section A
1 lab instructor
8-10 students

Section B
1 lab instructor
8-10 students

4-6 mentors

3 ideas

3 ideas

1 area

three ideas presentation

3-ideas presentation
Tips and overview

Review structure

each section presents
2 minutes to present 3 product ideas
equal amounts of time on each idea

scenario?
strictly held to two minutes

3-ideas presentation
Tips and overview

use descriptive sketches
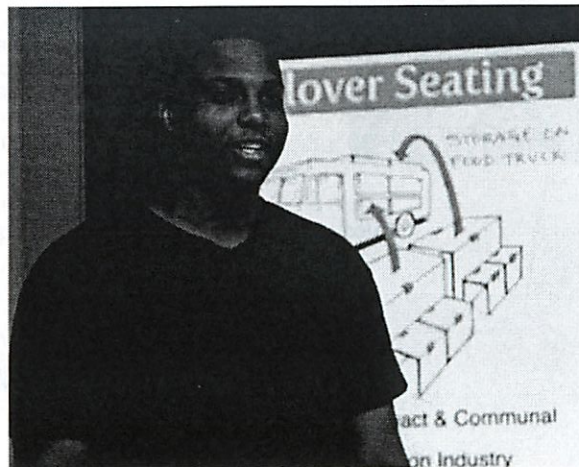
3-ideas presentation
Tips and overview

visuals

sketch

not solid model

Fire
Extinguishing
Pod

$9 Billion Market

Pressurized Retardant
Release Mechanism
A-Team

hand done

scan and plot

RoLL-A-RooF

MARKET: all flat roofs
CUSTOMER: retail, apt.
FEASIBILITY: high but <1%

not clip art

original

3-ideas presentation
Tips and overview

Poster format

each idea should be prepared on a piece of foam core,
laid out in vertical orientation
foam core is in your team's area in lab (24x36)
the poster should convey
  your section name and the idea name
  the idea's embodiment/purpose
  the targeted customer
  the anticipated market
  its feasibility: (e.g., power requirements)
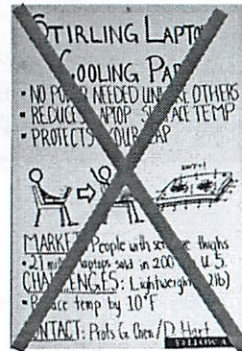
readable from 50-80 feet **= clean and flows**
Friday/Sunday plotter schedule will be on website

3-ideas presentation
Tips and overview

setup

Make sure your posters and presenters arrive no later than 12:55 PM

Posters will be placed at the front of the classroom

Presentations will commence at 1:05 PM

3-ideas presentation
Tips and overview

presentation tips

Do not read the poster! Augment the visual information
and look at the audience
A story is more memorable than a list

Do not read cue cards... practice in advance
Do not emulate a 'used-car salesperson'
or TV infomercial
Be honest and informative
Humor is great!   ... but be careful

More tips from communication instructors online

3-ideas presentation
Tips and overview

feedback logistics

Team idea area for your team posted 5 PM Monday

Instructors (from other teams) will provide poster feedback
over night (before Tuesday lab)

Feedback from your own
team instructors during lab

2.009 Product engineering processes
today in class

idea presentation

estimation from Friday

more estimation

Friday
Usable energy in a D cell

42% offered no answer, or did not have units of energy

about right

number of students

answer in Joules

3

Battery powered, hand foam cutter
Estimation exercise

power?   2 W/cm²
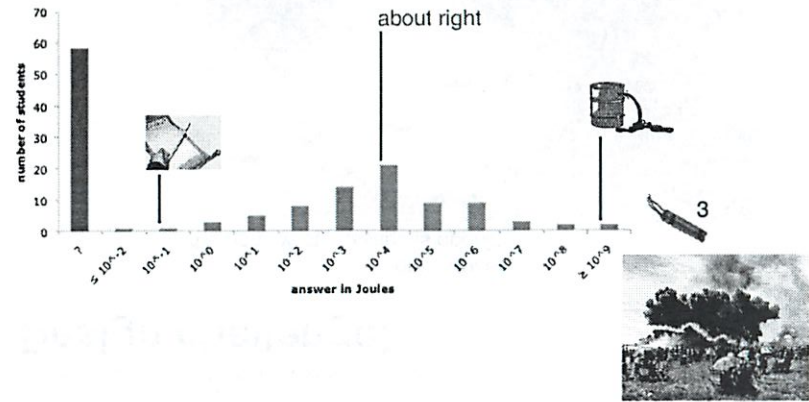
how am I supposed to know that?

do you have an experience to draw upon?

look for the next right answer!

Battery powered, hand foam cutter
Estimation exercise

power?

~2 W/cm²

~1.5-2 W/cm²

~2-3 W/cm²
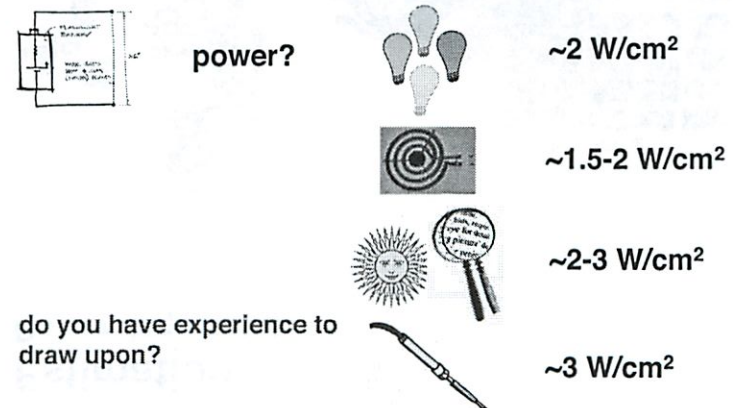
do you have experience to draw upon?

~3 W/cm²

Battery powered, hand foam cutter
Results

numbers (1W to 1 MW)
model (13 %)
power? (78 %)

~2-4 W/cm²

none | first principles | flashlight | light bulb | other wire/ knife cutters | toaster/range | car battery
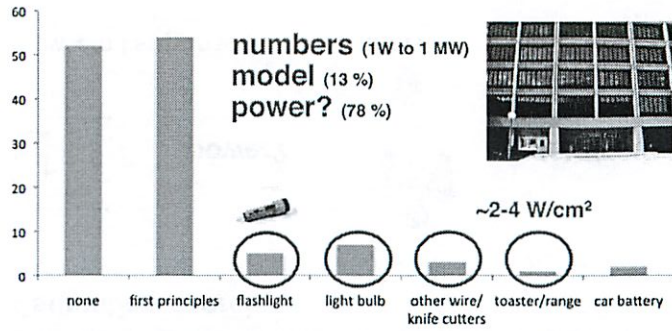
Estimation
Power requirements

MIT Building 39

I W | 100W | I KW | 10 KW | 100 KW | I MW | 10 MW
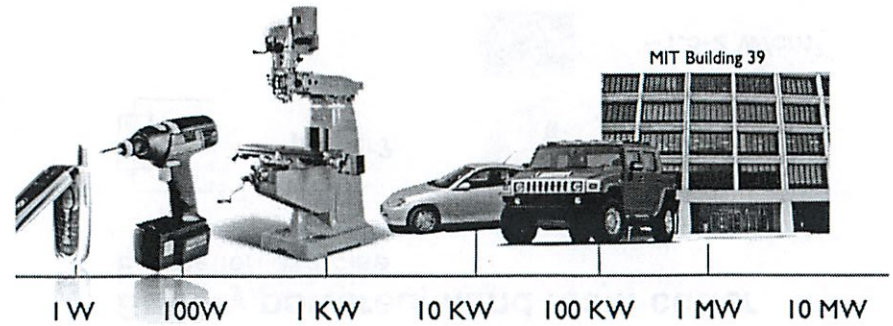
name *and section*, no computers or mobile
Design challenge!

global warming is upon us

name *and section*, no computers or mobile
Design challenge!

once frozen,
the northwest passage is opening

ATHROPOLIS Arctic Maps

ASIA | EUROPE
ARCTIC OCEAN
NORTH POLE | ARCTIC CIRCLE
Iceland
Alaska (USA) | Greenland
NORTH PACIFIC OCEAN | CANADA | Northwest Passage | NORTH ATLANTIC OCEAN
NORTH AMERICA | Hudson Bay
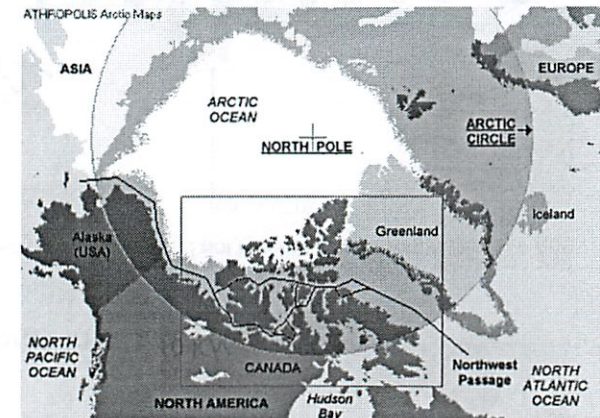
Design challenge!

and the pole...
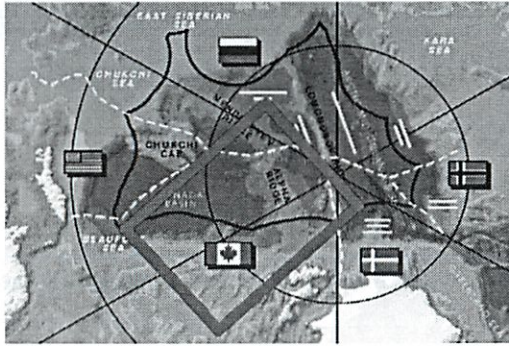
it's up for grabs!

Design challenge!

it is a race between nations

Design challenge!

2.009
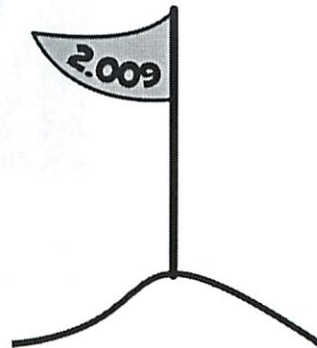
and a lead group has placed your flag

doh!

forgot to unfurl it

but in the polar darkness
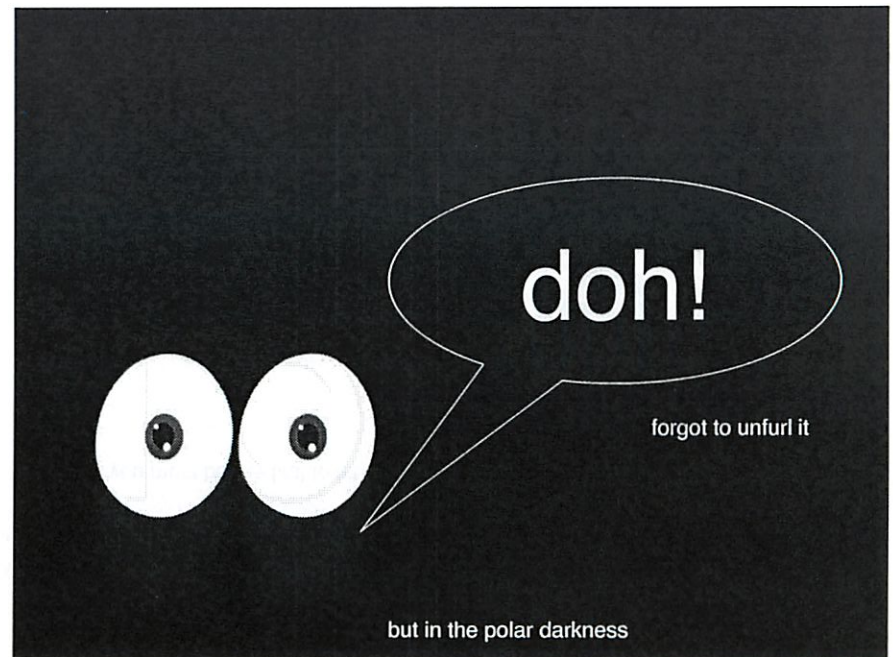
Design challenge!

your team has been sent to complete the job

you are within 30 meters
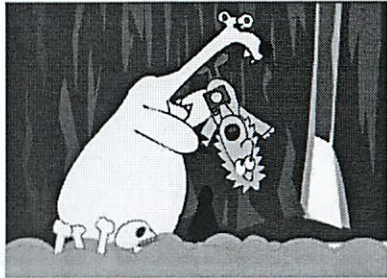
but it is too dangerous to go closer

Design challenge!

you must be the first to hit a target
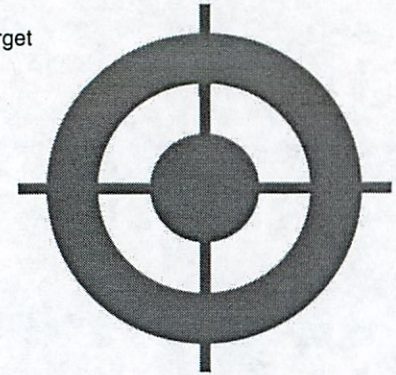
that releases your flag

Design challenge!

but all you have is a pile

of "snowballs"
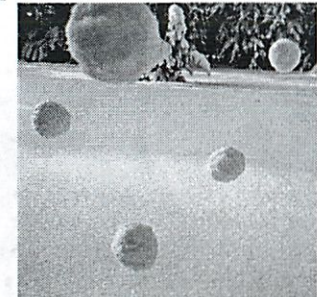
Design challenge!

Your challenge is to design a mechanical ball shooting device

But there's a catch... it must be human powered

You can't shoot with your hands

10 minutes

Estimation challenge!
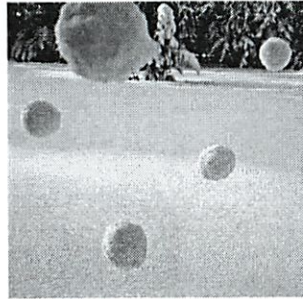
What is the most critical aspect or key risk in your design?

How well will your design work?

estimate and rationale

5 minutes

And finally...

reminders/coming up

Be prepared for your lab

Will send email with plotter signup/schedule

Foam core in lab but you need to obtain other materials

Financial officer training this Thursday, 4 PM

Design portfolio tips: Thursday 7:15-8 PM

9/18

Skipped

2.009

Home > Course schedule > Lab #2

Lab #2: Week of September 17: Exploring ideas and preparing for the 3 ideas presentation

objective, preparation, what's due, activities, other notes

Main lab objective
Each section must decide which ideas they will pursue for the 3-ideas presentation that is during class next Monday (24th). You will need to plan how the posters for the presentation will be prepared and presented. You may also want to spend part of the lab period doing additional research.

Friday is a student holiday, but the Pappalardo lab will be open and you will be able to schedule times to have help with the plotter on both Friday and Sunday.

Preparation before lab #2
Make sure that you understand the requirements for the 3-ideas presentation. You may also want to review the sketching tutorials and/or practice sketching. There is also a 2.009 illustrator tutorial.

Be prepared to give short a very summary of your new idea from the observation exercise. Slides are not required, but you should have a sketch to pinup.

Be prepared to give a short summary of background work for the idea areas that you may have been assigned to in lab #1 (e.g., possible customers and their key needs, relevant existing products, market potential, and some technical feasibility analysis).

The system integrators should prepare an agenda for the lab and make sure that the name cards are setup on the table before the start of lab. If you have not done so already, review the "running a meeting" primer.

If you think that you will need AV equipment (in addition to the projectors installed in the room) set this up in advance as well.

Before lab (or sometime during the lab) the tool officers should obtain the combination for the team's tool box from Steve Haberek and provide this information to the team.

What's due
There are no graded deliverables due in lab this week. The focus is on preparing for the ideas presentation.

Recommended lab #2 activities
It is recommended that you begin the lab with the two sections together to hear summaries of the ideas from the observation exercise.

As a complete team (both sections together)
Each group of students should present sketches of their new idea that is based upon the observation exercise. This should take no more than 30-40 minutes for the entire team. Be sure that the idea sketches are pinned up.

After discussing the ideas, close the meeting room divider and continue the lab with the two sections working separately.

As individual sections
Your system integrator should present an agenda and estimated timeline for the meeting. Adjust the agenda accordingly, based upon feedback from section members or the section instructor.

The system integrator should obtain a volunteer to take minutes for the meeting (unless your team has chosen a permanent scribe). The person taking minutes needs to post (on the section's wiki) a relevant summary shortly after the lab. It may be expedient to record the notes into the wiki directly during lab.

Have the section members/task forces responsible for additional background work related to ideas that were identified during lab last week present their findings. If new ideas were developed over the week they should be discussed as well.

Decide on the 3 ideas that will be presented by your section at the 3-ideas presentation. The two sections that comprise your team should not coordinate on this decision. This means that, for the most part, the two sections of your team will present different options in the 3-ideas

presentation. Your final list of 3 ideas *should include at least one idea that is somehow inspired by a presenter at the idea fair.*

A suggested process for selecting you top 3 ideas is below.

- develop a short list of up to 8 ideas, drawing from the most promising projects identified by your section.
- develop a small number of key assessment criteria (~6). Things to consider might include importance and clarity of customer need, market potential, aspects of feasibility, technical interest/excitement, ability to test, and appropriateness of scope. You **must** be able to identify at least one person or "client" who represents your customer. This person needs to easy to contact for advice throughout the term.
- **Do not** just hold a vote asking 'which do you like' to select ideas. Use a rational process (such as the Pugh method) to select 3 ideas. Your lab instructor may need to remind you how this method works. An example Pugh chart is at the bottom of the page. Choosing an appropriate datum (reference idea) is important... one that everyone on the team clearly understands, and is neither the strongest or weakest concept. Remember that at least one of the final three ideas should derive from a project suggested at the idea fair.

Organize task forces to prepare the posters for the 3-ideas presentation. Decide who will be presenting and who will be helping with setup. Be sure to note on the team wiki which ideas were chosen for the 3-ideas presentation, and who is responsible for preparing posters and helping with setup.

Work!

	NAIL	RING SHANK	STAPLE	SCREW
RATE	S	S	+	−
COST	S	−	+	−
HOLDING	S	+	−	++
EFFORT	S	S	+	−

Example Pugh chart for comparing fastener concepts. "S" means same, or O.

Other notes:
Your team's communication instructor can help you with preparation for you 3-ideas elevator speeches.

If you would like to have a team locker in the Pappalardo lab, you can arrange this with Steve Haberek. There is also a lockable space under your team's table.

There is a credit card training session for all financial officers at 4 PM Thursday. All financial officers must attend.

ideas must be put to the test.
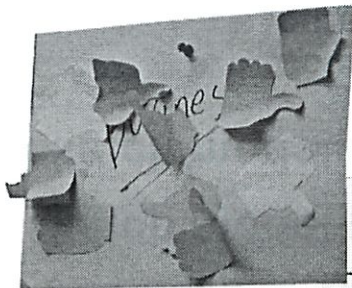that's why we make things,
otherwise they would be
no more than ideas.
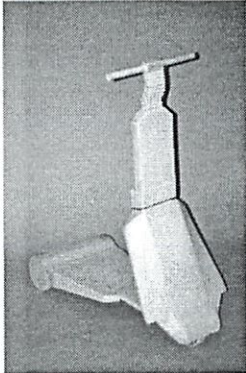
Andy Goldsworthy, 1956-
English sculptor and photographer

usability sketch model **2.009 Product Engineering Processes**

idea selection
lab this week

	NAIL	RING SHANK	STAPLE	SCREW
RATE	S	S	+	—
COST	S	—	+	—
HOLDING	S	+	—	++
EFFORT	S	S	+	—

and now
a mini quiz! More estimation

name on index card, 4 minutes

i) what is energy and what are its units?

ii) what power is needed for a small bird to fly?

iii) define mechanical horsepower.

iv) how much power can you output continuously for 30 minutes?

2.009 Product engineering processes
Today

sketch model review broaden and deepen

sketch models test ideas

Effort
Modeling at different levels of ambiguity/certainty

CROSS SECTION PROPORTIONAL TO EFFORT ≈ CONSTANT OVER PHASES

(axes: DEPTH, BREADTH; ECONOMIC MODELING, PHYSICAL MODELING, ANALYTICAL MODELING; IDEA, CONCEPT, DETAIL)
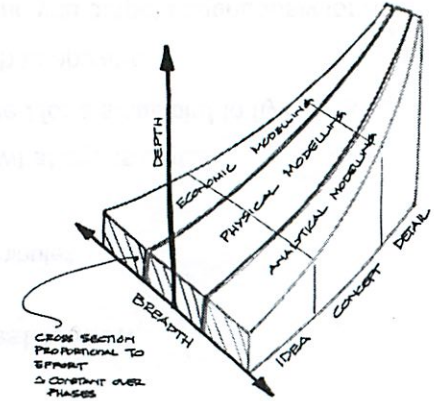
Sketch model review
10 days after ideas presentation!

one team

Section A — 3 ideas
Section B — 3 ideas
1 idea

Section A → 2 sketch models → 1 concept mockup
Section B → 2 sketch models → 1 concept mockup
→ Team → 1 team concept → 1 alpha prototype

three ideas presentation

sketch model review (evening, October 4)
mockup review
final selection
assembly drawing
technical review
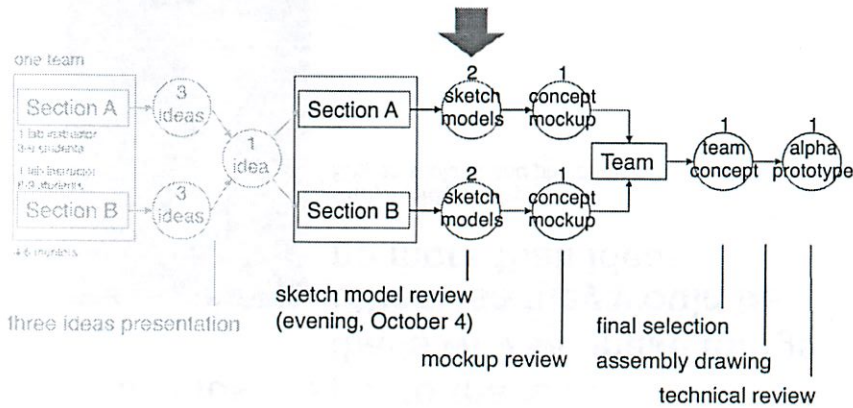
Sketch Model Review
Means… development of ideas into concepts

first order energy feasibility

more idea generation

more research:
customer needs/benchmarking
(Information officer session Monday before review)

sketch models/testing

feasibility estimates

And what is a sketch model?
definition

Simple *physical* models made of soft, low cost, easy-to-work materials

3D analog to sketching

Made to learn and test
articulate an idea
understand product scale
explore user interaction issues
assess operational issues
establish common shared view
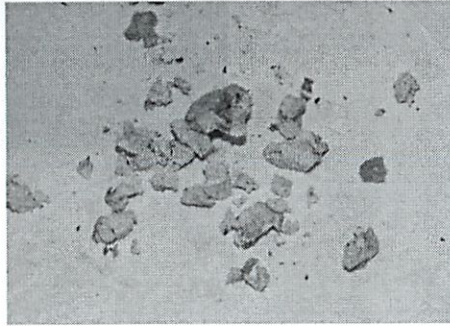
What is *NOT* a sketch model?
Anti-definition

Simple *physical* models **that have no purpose** and are made of soft, low cost, easy-to-work materials
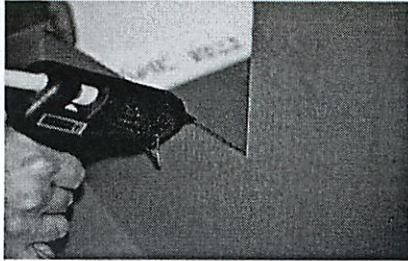

TREE BARROW
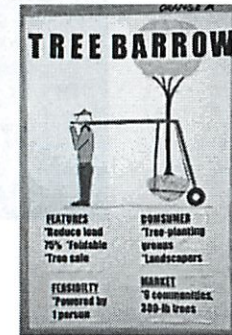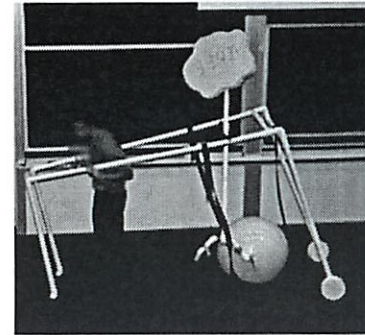
Sketch modeling techniques
Cardboard

Cardboard
Bending sharp corners
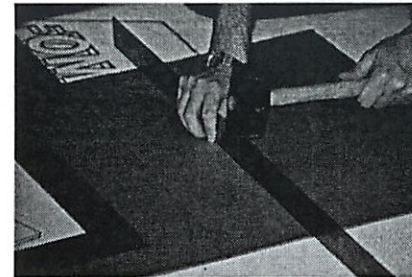
Cardboard
Fastening (when you cannot bend)

Cardboard
Bending allowance
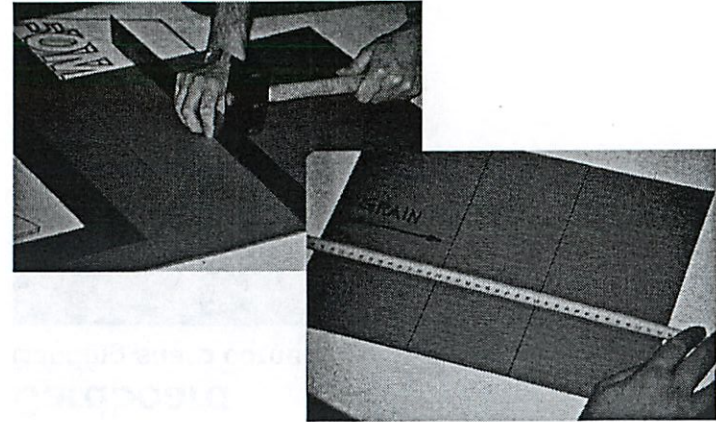
Cardboard
Making large radii
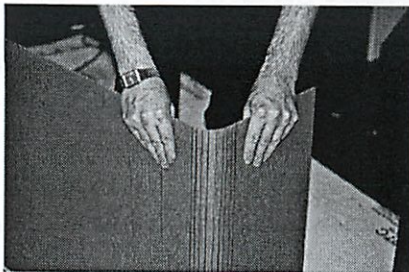
Cardboard
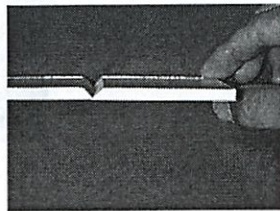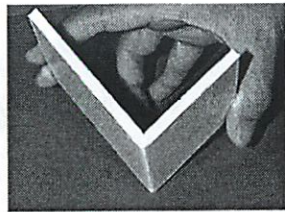Holes
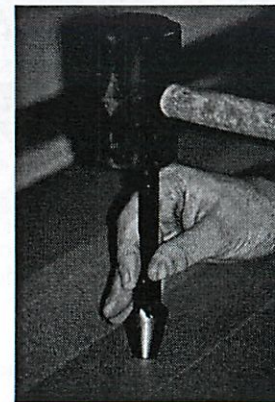
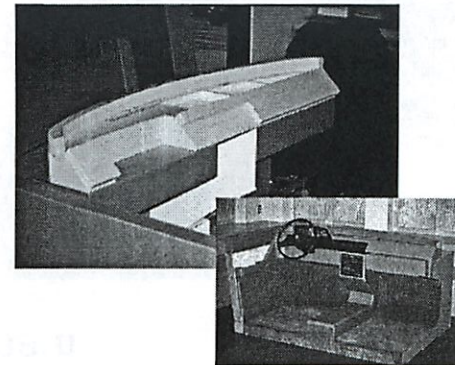# Sketch modeling techniques
Foam core
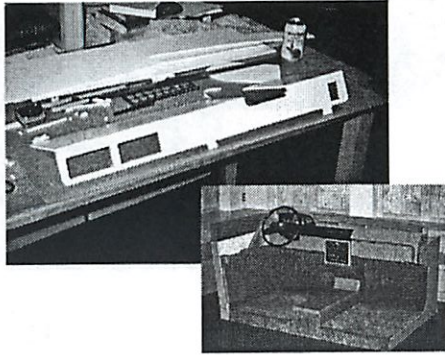
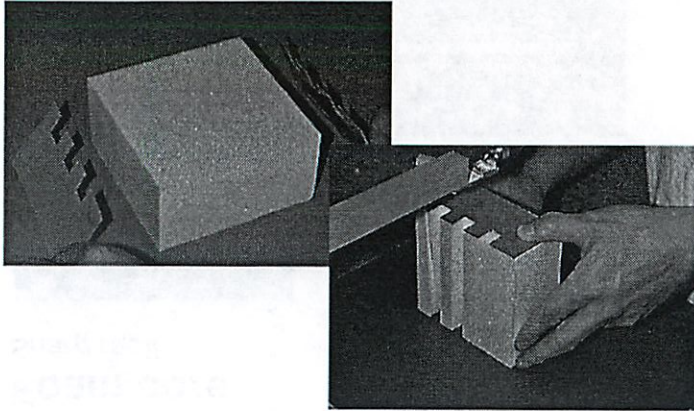# Foam core
Cutting
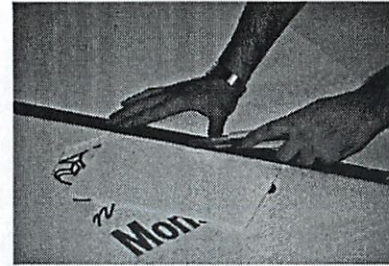
Foam core
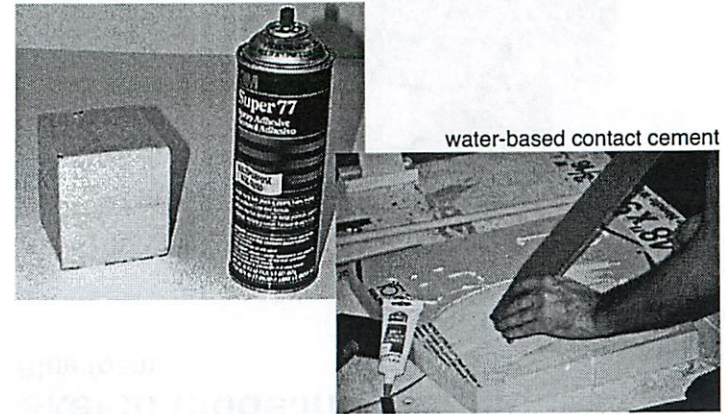Sharp radii

Sketch modeling techniques
Blue foam

Blue foam
Cutting straights, circles and other shapes
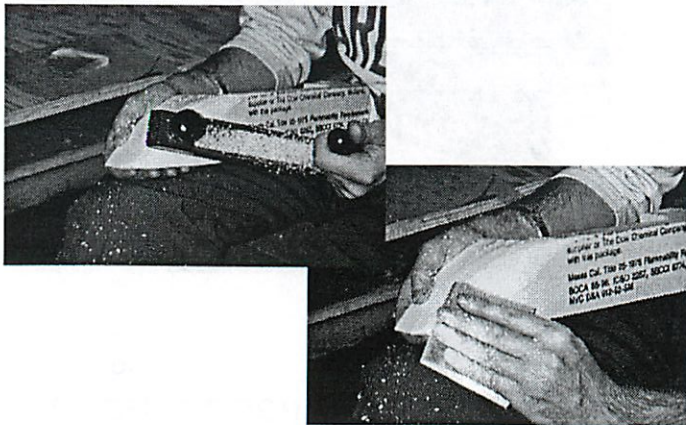

Blue Foam
Joining

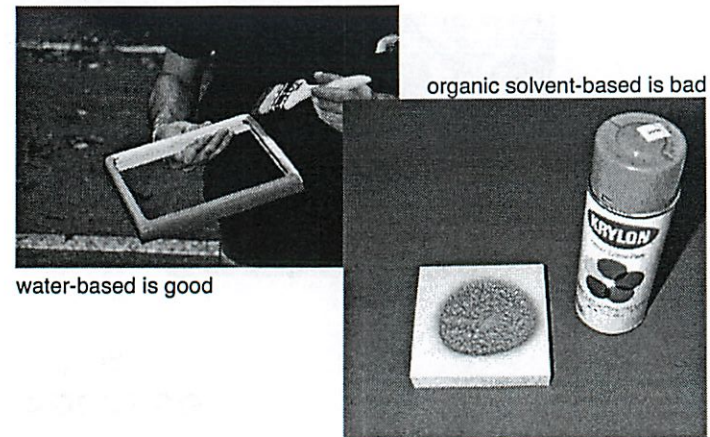water-based contact cement

Blue foam
Shaping

Blue foam
Painting

organic solvent-based is bad

water-based is good

Wrap up
Miscellaneous items

sketch modeling tutorials on website (/resources)

portfolio tutorial Thursday evening 7:15 in 3-370

credit card training Thursday 4 PM in 3-434

plotting and poster mounting schedule online
presentation practice schedule online

Design Using Sourced Parts
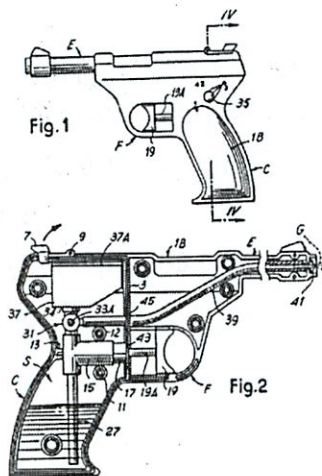**Part 1**

...AND I HAVE FOUND THIS ONE WORKS A LOT BETTER.
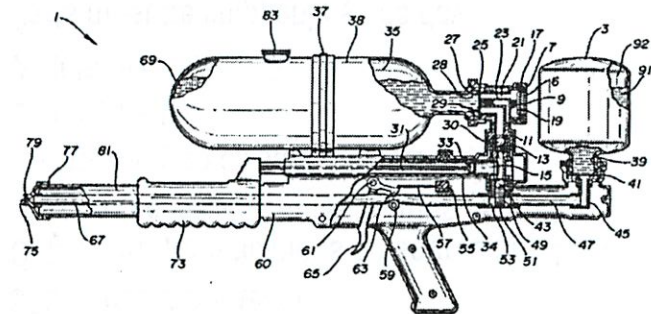
Eric Sugalski
sugalski@mit.edu

Your Assignment

Design and build a custom awesome water gun using only sourced parts.

Hydraulic Pressure

Fig.1

Fig.2

Pneumatic Pressure

Steps

1. Name your team
2. 15-Minute brainstorm
3. Sketch your idea (including the parts)
4. Divide parts & source
5. Document all parts on order forms
6. Staple your sketch and order forms together – give to instructor when complete

Rules

1. $200 Budget per team
2. Only minor modifications on sourced parts are allowed (i.e. drilling holes, cutting length)
3. No attaching to existing faucets / hoses
4. Batteries = OK
5. Wall Power = Not OK
6. Parts must be shippable same day
   - Preferred Sources – McMaster, Amazon (Direct), Grainger, Cole Parmer

Awards

1. Longest Squirt
2. Most Accurate Squirt
3. Most Creative Squirt

Order Form

Team Name		Contact		Email	
Supplier	P/N (or ASIN)	Description	Qty	Cost	Notes

(missed 4 min)

LED tracking ● Screws for trees
    Search + rescue fine

Sunshade
    degree + tilt
        Simple + org design
        ("electronic")

Patio Title w/ wifi booster

IT Grills
    tells you when ready
        Propane low
        North Face
    Lazy Bartender
        Automated dispense
    Transit Live
        MBTA bus stations

(Team right on time)

Bike +
    GPS for bike
    Vibrates so don't need to look

Follow Bot
    follows you

Inflatable Bridge
    (in audible)

Home 2.0
    displaced homes

Clean All Drinking
    UV light cleans them

Scavenger Hunt
    Tree Seen
    Geocaching
    Social media

Gyro Bike
    had to remain stable at low speeds

Surfboard Collapsable fin
    less injuries

Collapsuble Cloth table

Saftey Sicba
    pressure senors to not go back too far

    add on

Poobnbu
    Dog poop robot

Portable Generator

Gathering Greens

Caffeto Canteen
        (stumbled)

E cycle
    Store Bike energy

Transport Me
    Workers toss tools
    Collapsable shoot to stop item

Green Harvester
    Harvesting salad
    Cheaper
    Based on area mower

Carry On stroller

Snap + Save
    markers for trees

Stream Charger
    Charge battery while canoing

Hardy Planter

Hydro Seal
    $ Bring water
    ¿ Filter ¿

Sensitive Audio
        Some headphones

Cleaning Sheath
            Clean knives outdoors

Davin Seal Thinner

Pothole Filer
            easy to fix it

Package dropoff
        lockbox
        (amazon has this)
        (but why assign package now)
            ∟ so inefficient

(4)

Roll out stove
     (how watt that work)

Green harvester for small farms

Bike blind spot

Patible plastic sheater

Sky Beacon

Steared scroller
     through your hip location

Auto leveling table

Field liner
     Laser
         chalk + pain
         300 m? - really
Handle Heater
         ring that loads

(7)

Window-matic

Open + close window automatic

FREE MONEY TO CHANGE YOUR LIFE
ONLY $59.95 PLUS S&H
REG $37.95

to be persuasive, we must be believable;
to be believable, we must be credible;
to be credible, we must be truthful.

Edward R. Murrow, 1908-1965, television news pioneer
producer of news reports leading to the censure of Joseph McCarthy

2.009 3-ideas presentation

Wrap up
Miscellaneous items

idea area for your team will be posted by 5 PM
presentations/review forms on website at ~9 PM
emailed feedback from 3 instructors by noon Tuesday
all feedback summarized on website by Tuesday evening

notebooks in lab this week
notebook images and timesheets 10 PM Thursday

sketch modeling tutorials on website (/resources)

L8 3-ideas
Presentation

9/24

9/25

2.009

Skipped

Lab #3: Week of September 24: From an opportunity area to concepts

objective, preparation, what's due, activities, other notes

Main Lab Objective

Now that the 3-ideas presentation is over, each section will focus on preparation for the upcoming sketch model review. Your section should work towards identifying two promising concept direction or variations within the team's assigned idea area.

You should also look ahead to lab #4 since the sketch model review is on Thursday evening next week!

Preparation before Lab #3

Make sure that you understand the goals of the sketch model review.

Review the feedback received from the 3-ideas presentation and compile it into a distilled form that will allow you to effectively review and discuss issues raised, being careful to not overlook potentially valuable suggestions. Since all written feedback from instructors will have been received by noon on Tuesday, red team will need to do this right before lab.

Having the feedback distilled onto a page or two and printed for use in the lab can help the discussion. Compiled feedback for every team is also linked on the 3-ideas results page by Tuesday evening after the review.

Each lab section member should develop at least two concept variations within the team's assigned idea area. While the timing is tight for the Tuesday teams, it is really important to get the exploration process restarted before your team meeting. Prepare the concept variations on individual sheets of paper so that they can be pinned up, as was done in the brainstorming assignment, but the ideas should be more complete, focused, and researched (at least similar to the 3-ideas posters). Make sure that you have done enough research to be confident that the ideas have a degree of novelty and competitive advantage, and that there is a real, tangible need motivating the concepts.

For teams meeting on Wednesday or later, organize your section into appropriate task forces and begin gathering additional information relevant to the idea area selected for your team. This might include benchmarking, customer needs, market data, and observation. Be prepared to present a short summary to the team at the beginning of your lab. Tuesday teams will probably need to do this as part of their lab time.

The system integrators should prepare an agenda for the lab and make sure that the name cards are setup on the table before the start of lab. If you think that you will need AV equipment set this up *before* your scheduled lab period.

What's due

Your physical design notebook is reviewed during lab. Digital notebook submissions and timesheet submissions are due no later than 10 PM Thursday.

Recommended lab #3 activities

As a complete team (both sections together)

It is recommended that you begin with the two sections together and reflect upon your effort in the 3-ideas presentation, its outcome, and the team's idea area. This should be a brief discussion.

Teams meeting on Wednesday or Thursday should each task force that was assigned to gather additional information (see lab preparation above) take roughly 5 minutes to summarize their findings. It will be beneficial for the two sections to hear each other's background research. Teams meeting on Tuesday will probably not have had time to prepare this.

Close the meeting room divider and continue the lab with the two sections working separately.

As individual sections

Give your design notebook to your instructor so he/she can review it during lab.

Begin with the standard meeting startup.

Pin up the concept variants that you developed when you prepared for this lab. Discuss each other's ideas. If you feel that the variants from the pinup are not adequate, spend additional time brainstorming as a group.

Establish relevant selection criteria and pick two concept variants for further development, using a method such as a Pugh chart.

Divide your section into task forces to work on the two concept variations in preparation for the sketch model review, which is next week. You will need to further develop the idea, prepare informative sketch models, conduct simple tests, and refine customer needs, benchmarking, and market data. Ideas need to be researched so that you have clear needs connected with real users, and so that you understand what competitive products may exist. You may also want to refer to the online sketch modeling resources.

Use the remaining time to work. Remember to pickup your design notebook before you leave the lab.

Other notes:
The RPF training session at 4:00 PM, Friday the 28th. All financial officers are required to attend.

There is also a communications session next week—Monday October 1, 7-8:30 PM for system integrators, who are required to participate.

There is a required information officer session with the course librarians net week on Monday October 1, 7-8:30 PM.
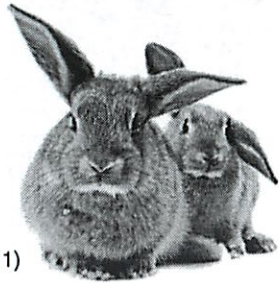
Karl Albrecht, 1920 - present:
10th wealthiest person in the world (2011)

if you are not serving the customer...
you'd better be serving someone who is

2.009 Product engineering processes
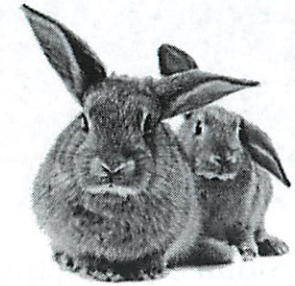
who is the customer?

there are many "customers"

why the bunny rabbit?

(skipped)
4 IP/Patents

Sketch model review
Next Thursday!

one team

| Section A |
| 1 lab instructor 6-9 students |
| 1 lab instructor 6-9 students |
| Section B |

3 ideas → 1 idea ← 3 ideas

Section A → 2 sketch models → 1 concept mockup

Section B → 2 sketch models → 1 concept mockup

Team → 1 team concept → 1 alpha prototype

three ideas presentation

sketch model review
(evening, October 4)

mockup review

final selection
assembly drawing
technical review

926

Sketch model review
a formal presentation

Each section presents 2 well-prepared design concept alternatives. Relevant technical, market/benchmarking, and customer needs information.

Each section will have 6 minutes for their presentation and 2 minutes of questions. Each section has a single set of slides.
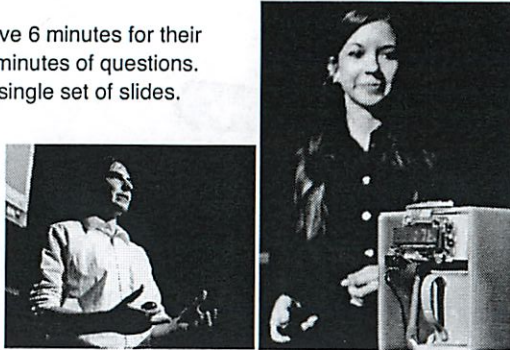
Sketch model review
next Thursday!

important review aspects:
appropriateness of the sketches, sketch models, CAD models, calculations
clarity and quality of the design alternatives/design exploration
quality of technical, market/benchmarking, and customer data

hunch → **real data**

Why?
Seating doesn't provide place for food

Foldable furniture is not appropriate

Competitors

e-pill: Manufacturer and distributor of electronic medication reminders

Automatic Pill Dispenser Organizer

$289.95

MedCenter Systems: Manufacturer of monthly planners and organizers

31 day monthly pill organizer

$69.95

Information officer session
next Monday at 7 PM

come with questions about...
secondary research: technical, market/benchmarking, and customer data

Why?
Seating doesn't provide place for food

Foldable furniture is not appropriate

Competitors

e-pill: Manufacturer and distributor of electronic medication reminders

Automatic Pill Dispenser Organizer

$289.95

MedCenter Systems: Manufacturer of monthly planners and organizers

31 day monthly pill organizer

$69.95

3-ideas presentation
Discussion

went well? **yes!**
could every one of the presentations be improved? yes!

how to improve?
"practice is the best of all instructors"
Publilius Syrus, Author, 1 B.C.

3-ideas presentation
Tips

how to improve?

practice is the best of all instructors
Publilius Syrus, Author, 1 B.C.

scenario?

artifacts?
40s

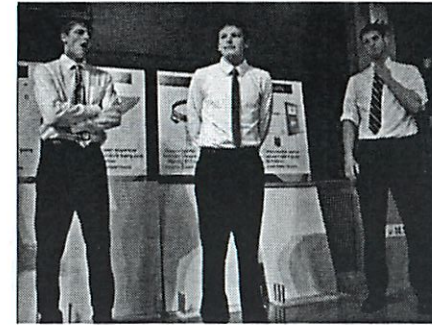**idea up front**
a story is good but…

talking points
but not a rote script

3-ideas presentation
Tips

how to improve?
practice is the best of all instructors
Publilius Syrus, Author, 1 B.C.

speak slowly

interact with poster
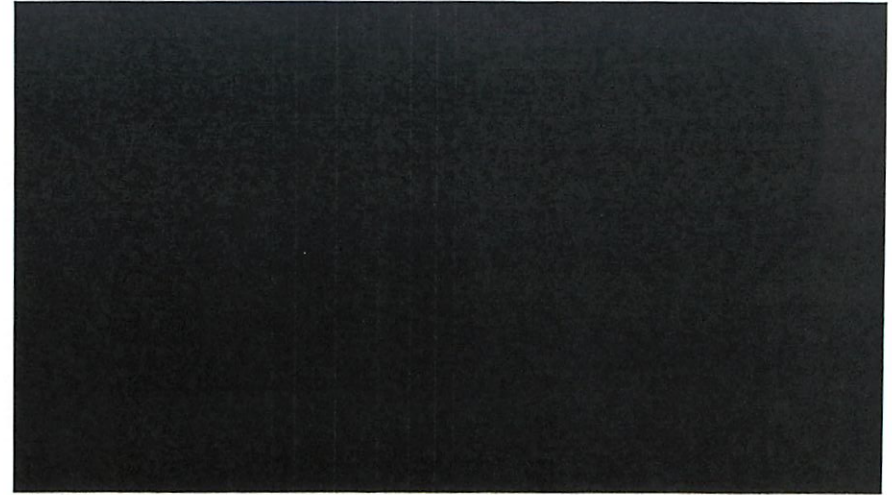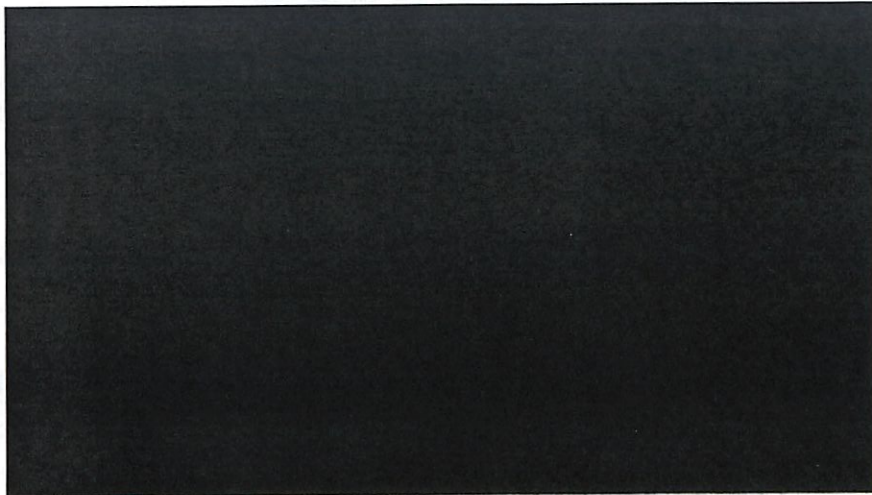and look at audience!
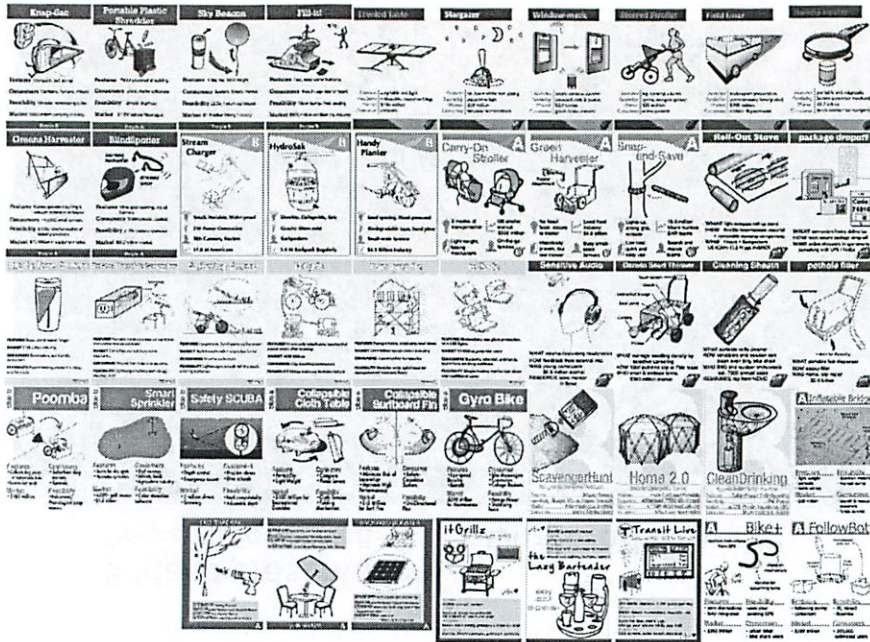
be energetic!
and be natural

body language matters

3-ideas presentation
Presentation revisit   what worked well?

3-ideas presentation
Presentation revisit   what worked well?

responding to instructor feedback
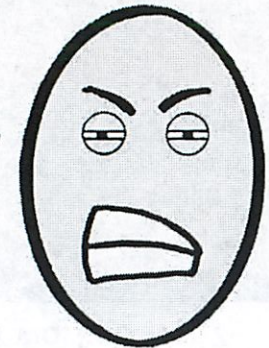
the least useful comment is "good job"

we received comments that were unfair

we received conflicting advice

informed decisions
vs. emotions
vs. organizational politics

3-ideas presentation
sub-themes

we picked a sub-theme, not an idea

why?
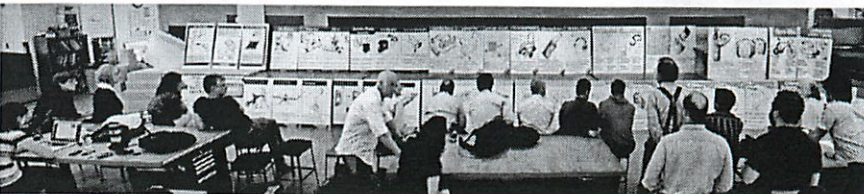
More idea exploration?
Why waste time?

"just tell us what the design problem is and we will do the detailed engineering."

the mere formulation of a problem is far more often essential than its solution
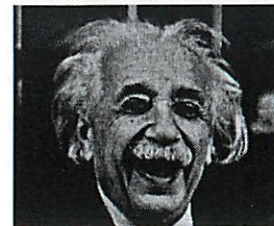
Albert Einstein
1879-1955, Nobel prize in physics
a relatively smart person

there are many smart, well educated people in the world

2.009 Product engineering processes

The rest of today

intellectual property thinking about patents

Patents & Patenting Basics

what every 2.009 student should know about patents

Elaine Yang
2.009 September 26, 2012

Warm-up Question

Do you want your name on a patent?

A) Yes, I do.

B) No, I do not.

C) Maybe, or don't really care.

Understanding patents

What rights are granted by a patent on an invention?

A) The right to practice the invention.

→ B) The right to exclude others from practicing the invention.

C) Both A & B

Practicing the invention includes making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States.

Note that patent rights are territorial!

Why doesn't a patent owner get a right to practice the invention?

Other laws or rights may apply to the situation.

Importing the invention:

> The government might not approve authorization for the import (e.g., prohibited weapons in the National Firearms Act).

Offering for sale the invention:

> The FDA has not yet approved the sale of the item to U.S. consumers.

Making the invention:

> Third-party patent blocks the patent owner.
> Patent A: chair = seat and four legs
> Patent B: rocking chair = seat and four legs and two rockers

Understanding patents
Can your team legally use an idea if there is a patent on the same idea?
A) Yes.
B) No.
→ C) Maybe, it depends.

Maybe the patent is expired.

> The subject matter of the patent becomes public domain after the term of the patent.

Maybe the high-level idea is the same, but your implementation is different.

> Look at the claims of the patent to see what the patent protects (i.e., permits the patent owner to exclude you from doing).

Maybe you can work around the patent.

Maybe you can license the right to use the invention from the patent owner.

How to read a patent
When will this mousetrap patent expire?

A) 20 years from date of application (Mar. 4, 1997) ←—— current general rule
B) 17 years from date of grant (Sep. 7, 1999) ←—— general rule before 6/8/95
→ C) Can't tell from face of patent

United States Patent [19]
Johnson et al.

[11] Patent Number: 5,949,636
[45] Date of Patent: Sep. 7, 1999

[54] PORTABLE PEST ELECTROCUTION DEVICE WITH RESISTIVE SWITCH TRIGGER

[75] Inventors: William L. Johnson, Somis; Robert Noe, Ojai; William R. Luther, Santa Paula, all of Calif.

Affect patent term

[73] Assignee: Agrizap, Inc., Ventura, Calif.

[*] Notice: This patent is subject to a terminal disclaimer.

[21] Appl. No.: 08/810,030
[22] Filed: Mar. 4, 1997

Related U.S. Application Data

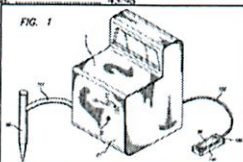[63] Continuation of application No. 08/255,328, Jun. 7, 1994, abandoned.

3,468,054	9/1969	Levine .
3,792,547	2/1974	Day .
3,827,176	8/1974	Stirewalt .
4,048,746	9/1977	Dye 43/98
4,074,456	2/1978	Tidwell .
4,200,809	4/1980	Madsen 256/10
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5,269,091	12/1993	Johnson et al. 43/98

FOREIGN PATENT D...

2650385	11/1976	Germany .
443772	2/1968	Switzerland
8700727	2/1987	WIPO .

FIG. 1

Primary Examiner—Fritz Fleming
Attorney, Agent, or Firm—Koppel

[57] ABSTRAC...

The present invention is a meth...

Check USPTO maintenance fee status
https://ramps.uspto.gov/eram/patentMaintFees.do

Return To:
USPTO Home Page
Finance Online Shopping Page

United States Patent and Trademark Office

Patent Maintenance Fees

Please enter both a patent number and its corresponding application number to do the following:

- Click on 'Retrieve Fees to Pay' to pay a maintenance fee.
- Click on 'Get Bibliographic Data' to obtain patent bibliographic data.
- Click on 'View Payment Windows' to determine when maintenance fees are due.
- Select the applicable year (4, 8 or 12) from the drop-down list box next to 'Payment Window' and click 'View Statement' to print a statement showing receipt of a maintenance fee payment.

Patent Number (exclude special characters; e.g. commas): `5949636`

Application Number (must be 8 numeric digits - see NOTE below): `08810030`

(Retrieve Fees to Pay)
(Get Bibliographic Data) ←
(View Payment Windows)
(View Statement) for Payment Window: [04]

The Privacy Act of 1974 - as it relates to Maintenance Fees
The Paperwork Reduction Act of 1995 - as it relates to Maintenance Fees

Check USPTO maintenance fee status

https://ramps.uspto.gov/eram/patentMaintFees.do

Patent Bibliographic Data			09/30/2011 10:25 AM	
Patent Number:	5949636	Application Number:	08810030	
Issue Date:	09/07/1999	Filing Date:	03/04/1997	
Title:	PORTABLE PEST ELECTROCUTION DEVICE WITH RESISTIVE SWITCH TRIGGER			
Status:	Expired, No 12th year fee paid by: 09/07/2011		Entity:	Small
Window Opens:	09/07/2010	Surcharge Date:	03/08/2011	Expiration:	N/A
Fee Amt Due:	$0.00	Surchg Amt Due:	$0.00	Total Amt Due:	$0.00
Fee Code:				
Surcharge Fee Code:				

Most recent events (up to 7):	04/11/2011	Maintenance Fee Reminder Mailed.
	05/01/2007	Payment of Maintenance Fee, 8th Yr, Small Entity.
	05/01/2007	7.5 yr surcharge - late pmt w/in 6 mo, Small Entity.
	03/28/2007	Maintenance Fee Reminder Mailed.
	03/04/2003	Payment of Maintenance Fee, 4th Yr, Small Entity.
		— End of Maintenance History —
Address for fee purposes:	WILLIAM L. JOHNSON KOPPEL AND JACOBS 555 ST. CHARLES DRIVE SUITE 107 THOUSAND OAKS CA 91360	

NOTE: All USPTO fees are subject to change. If you are making a payment by mail or fax, please visit this link or contact the Maintenance Fee Branch (571-272-6500) to confirm the amount due on the date payment is to be made. A maintenance fee payment can be timely made using the certificate of mailing or transmission procedure set forth in 37 CFR 1.8.

(Run Another Query)

Why didn't Agrizap pay their maintenance fee?

Patent found invalid due to obviousness by the US Court of Appeals for the Federal Circuit in 2007.

Not enforceable.

How to read a patent

Patent Claims

Claims define the scope of the patent owner's rights.

Description and figures help one to understand the claims, but do not define patent rights.

An item infringes a claim of a patent if it includes each and every element in the claim.

Understanding patent claims

How many elements are in the following claim?

A) 1
B) 2
C) 3
D) 4

Preamble may impose additional limitations.

How to work around?
• no body
• not ceiling-mountable
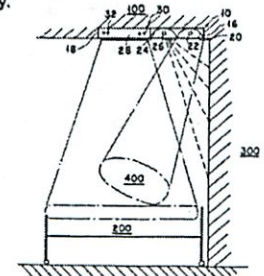
→ 1. A medical lighting system comprising:
→ a body;
→ means for ceiling-mounting said body;
→ a first light fixture within said body oriented to direct light downwardly to a selected reading area under said body;
→ a second light fixture within said body oriented to direct light downwardly and outwardly to a vertical wall surface outwardly adjacent from said body whereby light is reflected back to a broad area under said body.

Understanding patent claims
How many elements are in claim 2?

A) 1
B) 2
C) 4
D) 5

Independent claims (e.g. claim 1) stand on their own.

Dependent claims (e.g. claim 2) add to the claim it depends on.

- May add new elements
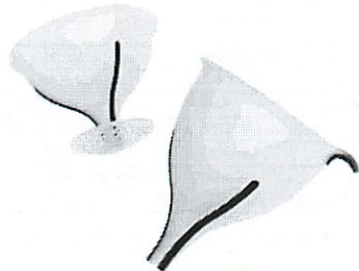- May add limitations to existing elements

---

1. A medical lighting system comprising:
 a body;
 means for ceiling-mounting said body;
 a first light fixture within said body oriented to direct light downwardly to a selected reading area under said body;
 a second light fixture within said body oriented to direct light downwardly and outwardly to a vertical wall surface outwardly adjacent from said body whereby light is reflected back to a broad area under said body.

2. The medical lighting system of claim 1 wherein said first light fixture includes a first reflector and a first fluorescent bulb therewithin; and said second light fixture includes a second reflector and a second fluorescent bulb therewithin.

Understanding patent claims
Why do we have dependent claims?

Form a "web of protection" around the invention.

- If an independent claim fails in court, a dependent claim may be upheld.

Assist in understanding the scope of the patent claims:

- Each claim must have a different scope.
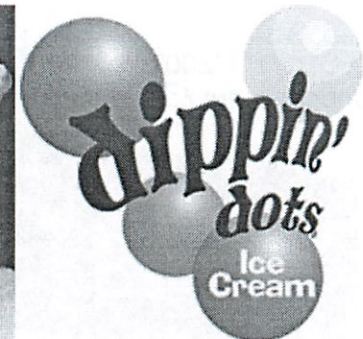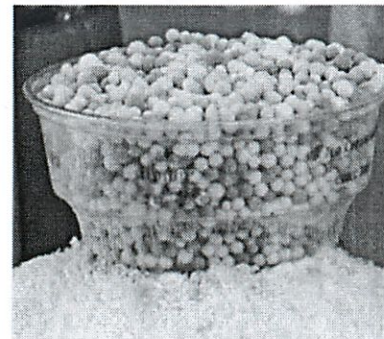- Dependent claims are narrower than the independent claims from which they depend.

---

1. A medical lighting system comprising:
 a body;
 means for ceiling-mounting said body;
 a first light fixture within said body oriented to direct light downwardly to a selected reading area under said body;
 a second light fixture within said body oriented to direct light downwardly and outwardly to a vertical wall surface outwardly adjacent from said body whereby light is reflected back to a broad area under said body.

2. The medical lighting system of claim 1 wherein said first light fixture includes a first reflector and a first fluorescent bulb therewithin; and said second light fixture includes a second reflector and a second fluorescent bulb therewithin.

3. The medical lighting system of claim 2 wherein said first fluorescent bulb is a "biax"-type bulb.

Understanding patent claims
How many longitudinally extending elastomeric strips can our funnel have on its exterior?

A) None
B) 1
C) 2
D) More than 2

Plurality = two or more

---

1. A funnel comprising:
 an elongated rigid hollow body with an exterior and an interior and having a wide end defining a wide inlet opening and a narrow end defining a narrow outlet opening, and
 a plurality of longitudinally extending strips disposed on the exterior of the body and projecting laterally outwardly therefrom at spaced locations,
 each strip being formed of an elastomeric material.

US Patent No. 6,739,363

What is it?

US Patent 5,126,156

Understanding patent claims
What is the shape of a bead?

A) Round/spherical
B) Cylindrical
C) Popcorn-shaped
→ D) Any shape

Ordinary meaning
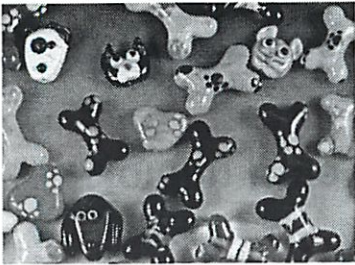
1. A method of preparing and storing a free-flowing, frozen alimentary dairy product, comprising the steps of:

preparing an alimentary composition for freezing;
dripping said alimentary composition into a freezing chamber;
freezing said dripping alimentary composition into beads;
storing said beads at a temperature at least as low as −20° F. so as to maintain said beads free-flowing for an extended period of time;
bringing said beads to a temperature between substantially −10° F. and −20° F. prior to serving; and
serving said beads for consumption at a temperature between substantially −10° F. and −20° F. so that said beads are free flowing when served.
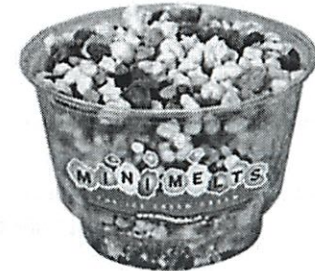
Understanding patent claims
What is the shape of a bead?

→ A) Round/spherical
B) Cylindrical
C) Popcorn-shaped
D) Any shape

Ordinary meaning,
unless defined differently
in description.

The small beads B that are produced contain only relatively small ice crystals. The beads B have a smooth, spherical appearance.

Understanding inventorship
Who is an inventor?

A) Al – who came up with the need
B) Betty – who came up with the solution description
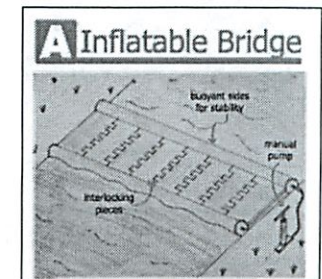C) Both Al and Betty
→ D) Neither Al nor Betty

No conception yet
- Conception requires one to have a definite and permanent idea of the operative invention, including every feature of the subject matter claimed.
- An idea is permanent and definite when only ordinary skill would be required to reduce the invention to practice.

Understanding inventorship
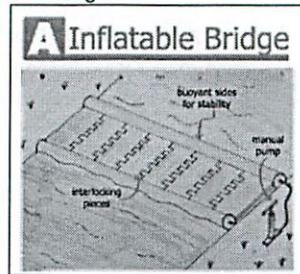### Who is an inventor?

→ A) Al – sketched out how to implement it
B) Betty – who built the prototype
C) Both Al and Betty
D) Neither Al nor Betty

A Inflatable Bridge

Understanding inventorship
Who is an inventor?
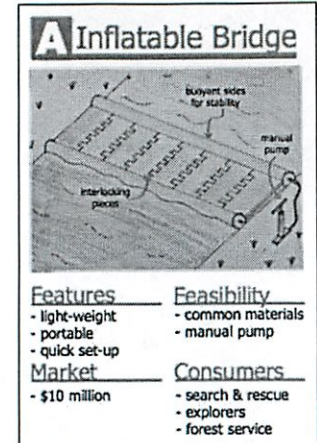
A) Al – sketched out how to implement it
B) Betty – who built the prototype and improved the design
C) Both Al and Betty
D) It depends

A Inflatable Bridge

Understanding inventorship
Can Company file for a patent on an inflatable bridge?

A) Yes.
B) No, because the company didn't invent it.
C) No, because Al and Betty invented it.
D) It depends.

A Inflatable Bridge

Features
- light-weight
- portable
- quick set-up

Feasibility
- common materials
- manual pump

Market
- $10 million

Consumers
- search & rescue
- explorers
- forest service

Golden Rule of Patenting

Document

Document

Document

How to document

What should you document:
- Ideas, rough & detailed designs, test results
- Copies of presentations, correspondence, meeting minutes
- Records of related patents and non-patent literature found
- Records of who and when the idea/prototypes were discussed/tested with third parties

How should you document:
- Design notebook
- Electronic files that are immutable (cannot be changed)
- Date everything

Standard of proof is often "clear and convincing"
- Do you have all the documentation you need to prove your point?
- Will your documentation survive an authenticity challenge?

Design Notebook Tips

Write down all ideas on the date you have them
- Date and sign your entries

Get a witness to date and sign every "eureka" moment
- Be sure the witness understands, at a high level, what they are witnessing

Document experiments/prototypes
- Why you did/made them
- What the results/functionality was

Write directly in the notebook. Avoid gluing things in if you can.
- For things added in, note where the material came from
- Good time to have the entry witnessed by another person

Make the notebook more tamper-proof:
- Do not write in pencil or other erasable writing utensils
- For added items (e.g., photos, computer-generated charts), permanently bond the item to the design notebook page (e.g., glue is better than tape)
- Do not erase anything - cross out instead
- Cross out large areas of white space

Make the entries legible and neat

Be consistent in your practices

Put your contact information clearly at the front of the notebook, so it can be easily returned to you

The patenting process
Can you get a patent for $125?

A) Yes, you can get a provisional patent.
B) No.
C) It depends.

No such thing as a provisional patent, only a provisional patent application.

The patenting process
Nonprovisional (i.e., regular) patent applications

- Strict deadlines for when one must file a patent application
- Allows you to mark your product as "Patent Pending"
- Application is usually published within 18 months of the filing date
- Application is examined
- May lead to the issuance of a utility, design, or plant patent

But what if you are:
- Not ready to file a patent application
- Not sure if you want to invest the time and money into filing a patent application
  - Only 1 "invention" per patent application

The patenting process
Provisional patent applications

- Placeholder to put something on file with the U.S.P.T.O.
  - Preserves patent rights while trying to sell or market the invention or while trying to raise funds to start a business around the invention.
  - Preserves patent rights in countries other than the U.S.
- Application is not published nor examined.
- Gives you one year from the filing date to file a nonprovisional patent application.
  - The nonprovisional patent application would "claim priority" to the provisional patent application.
- Allows you to mark your product as "Patent Pending"
- But, the provisional patent application filed must provide support for the claimed invention in the nonprovisional patent application
  - At least one named inventor must be the same
- No such thing as a provisional patent

The patenting process
When you are ready to start...

- Get the help of a professional (patent attorney or patent agent)
- You can do-it-yourself, but there are risks!
  - Not recommended if it is your first time and you want your eventual patent to be worth anything.
  - Patent application cannot be changed (with few exceptions) after it has been filed.

How to find relevant patents

- Look for patent numbers on products or websites
- Look for press releases about companies receiving patents
- Look for news about patent lawsuits
- Do a patent search
  - Search both patents and patent applications
  - MIT Libraries Patents Guide: http://libguides.mit.edu/patents
    - List of available databases
    - Videos on patent searching techniques

- But, don't just search for patents, search non-patent literature, too!
  - Article One Partners' resource list page:
    - http://www.articleonepartners.com/meet-our-community/resources-tools.php

Resources

MIT Library has a books and good web pages on patents/patent searching.
  MIT Libraries' Guide to Patents: http://libguides.mit.edu/patents
Resources for becoming patent literate:
  Patent Savvy for Managers: Spot & Protect Valuable Innovations in Your Company, by Kirk Teska (available in MIT library)
  Strategic Patenting online book:
    http://fishiplaw.com/home/strategic-patenting.html
USPTO website:
  http://www.uspto.gov
  Inventor resources: http://www.uspto.gov/inventors/index.jsp
People:
  Elaine Yang, elaine@mit.edu
  Ask a lawyer questions: http://www.avvo.com
  Ask a community questions: http://www.askpatents.com

and Finally
coming up!

notebooks in lab this week
notebook images and timesheets 10 PM Thursday

team activity Friday
don't wear open toe shoes
iPhone and android users: install HP ePrint Home & Biz
tool officers: know combination

Solidworks tutorial Thursday 5 PM
sourced parts workshop: build! 7 PM Thursday

Rec 2.00 l
L10 Product Teardown

Take compatable products + tear them down

Example: scanner
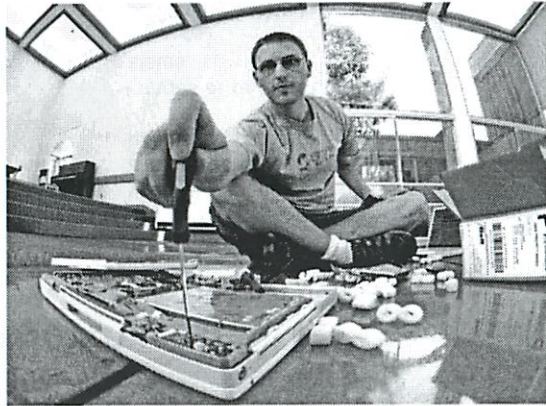
Flow of layout

Peg board

estimate costs

'information' sticker

Packaging

indicate confidence

W. Edwards Deming, 1900-1993
modern quality management
father of the Japanese post-war industrial revival
Perception: Japan produced cheap,
shoddy imitations of innovative quality products

learning is not compulsory...
neither is survival

2.009 Product Engineering Processes

2.009 Product engineering processes

Today

Product teardowns learn from the work of others

Friday
financial officer RFP training at 4 PM

Monday
information officer session, 7 PM
introduction to microcontrollers, 7 PM
SI communication workshop, 7 PM

online notebook pages and timesheets, 10 PM tonight

Product teardown
Part of a benchmarking process

teardown exercise

practice the process: relevant to sketch models

learn about products related to your idea area

observe design details

practice secondary research

organize information so others can understand it

practice organizing team to work quickly

Product teardown
Deliverable from each team at end of class
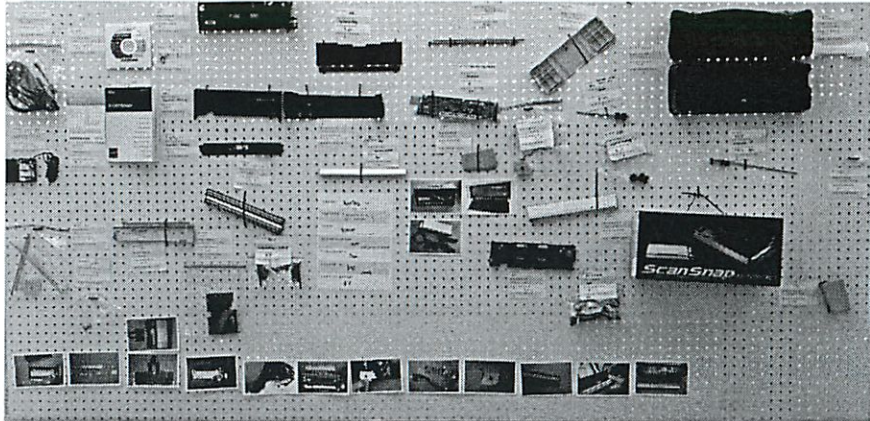
a white pegboard display that allows one to...

easily understand the product
easily see what parts are in the product
obtain specified information about the parts/product

Product teardown
Example: scanner

Product teardown
Resources for each team

resources

a product to teardown (on team table)
safety glasses (yours for the term and to keep)
white peg board mounted to team table
zip ties and foam mounting tape
baggies for small parts
guidelines for identifying plastics (also on website)
magnets and lighters for materials identification
scales for weighing parts
guidelines for estimating costs (also on website)
your smart phone cameras (email to 2009printer@mit.edu, pickup 4"x6" photo in 2009 area)
product and part information stickers

Product teardown
Product information sticker (2, one needed)

product name:

target customer:

retail cost:

estimated production volume:

location of manufacture:

estimated labor cost:

cost of the most expensive part:

you will want pictures of the assembled product (and in use as appropriate)

images at key disassembly states

packaging and the unpacking experience are part of the product

Product teardown
Part information sticker (100, as needed)

part material:

method of manufacture:

estimated manufacture cost:

number of times used in product:

for every answer indicate your confidence
guess
hunch
educated estimate
know/verified

Teardown exercise
Getting started

i) go to your team area in the lab
your product and materials are on team table

ii) put on your safety glasses

iii) develop a work and management strategy

iv) complete the deliverable

v) tool officers have your tool kit combination

and remember…

these products gave their lives for education…

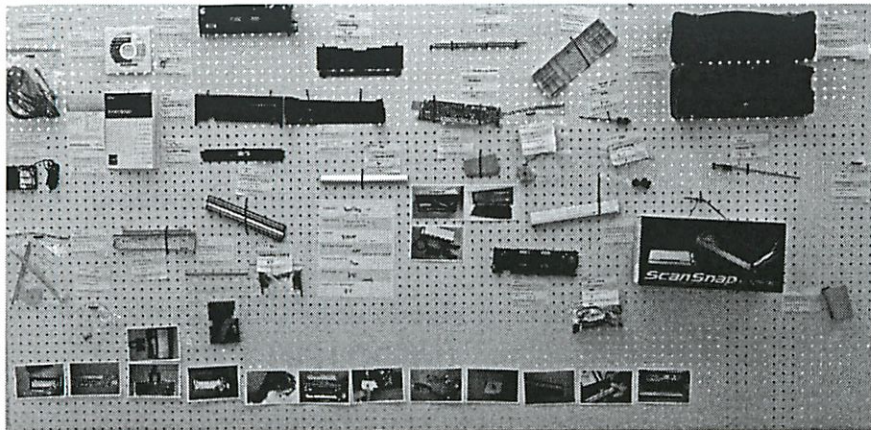so enjoy and learn from the displays!

Product teardown
Part of a benchmarking process

teardown exercise

practice the process: relevant to sketch models
learn about products related to your idea area
observe design details
practice secondary research
organize information so others can understand it
practice organizing team to work quickly

Product teardown
Deliverable from each team at end of class

a white pegboard display that allows one to...

easily understand the product
easily see what parts are in the product
obtain specified information about the parts/product

Product teardown
Example: scanner

Product teardown
Resources for each team

resources

a product to teardown (on team table)
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guidelines for identifying plastics (also on website)
magnets and lighters for materials identification
scales for weighing parts
guidelines for estimating costs (also on website)
your smart phone cameras (email to 2009printer@mit.edu, pickup 4"x6" photo in 2009 area)
product and part information stickers

Product teardown
Product information sticker (2, one needed)

product name:

target customer:

retail cost:

estimated production volume:

location of manufacture:

.

estimated labor cost:

cost of the most expensive part:

you will want pictures of the
assembled product (and in
use as appropriate)

images at key disassembly
states

packaging and the
unpacking experience are
part of the product

Product teardown
Part information sticker (100, as needed)

part material:

method of manufacture:

estimated manufacture cost:

number of times used in product:

for every answer indicate your confidence
guess
hunch
educated estimate
know/verified

Teardown exercise
Getting started

i) go to your team area in the lab
your product and materials are on team table

ii) put on your safety glasses

iii) develop a work and management strategy

iv) complete the deliverable

v) tool officers have your tool kit combination

and remember…

these products gave their lives for education…

so enjoy and learn from the displays!

2.009

Team Product Teardown Exercise

Product teardown is part of the benchmarking process and helps one learn about how different products are made.

In this practice exercise, teams had 45 minutes to take apart a product, and, using a large pegboard, create a display that allowed an observer to easily understand the product, see what parts are in the product, and obtain information about the product and its parts.

This exercise gave class members practice organizing and mobilizing their teams quickly, and required the effective organization of information. For their product, students were asked to indicate the product name, its target customer, retail cost, estimated production volume, manufacture location, estimated labor cost, and the cost of the most expensive part. For each part, students had to provide the part material, the method of manufacture, the estimated manufacturing cost, and the number of times it was used in the product.
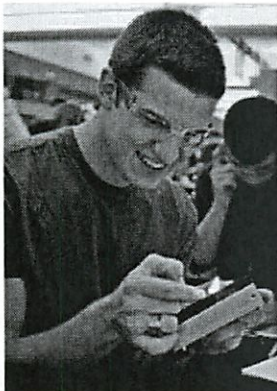
Students were supplied with mounting materials, product and part labels, guidelines for identifying plastics and estimating cost, and a digital camera and printer to use as they saw fit.

The more successful teardown displays disassembled the product into its most basic components, effectively made use of the entire pegboard space, had an organized and coherent layout and intuitive label placement, grouped related parts together, and featured logical use of photos to show sub-assemblies and the interaction of different parts.

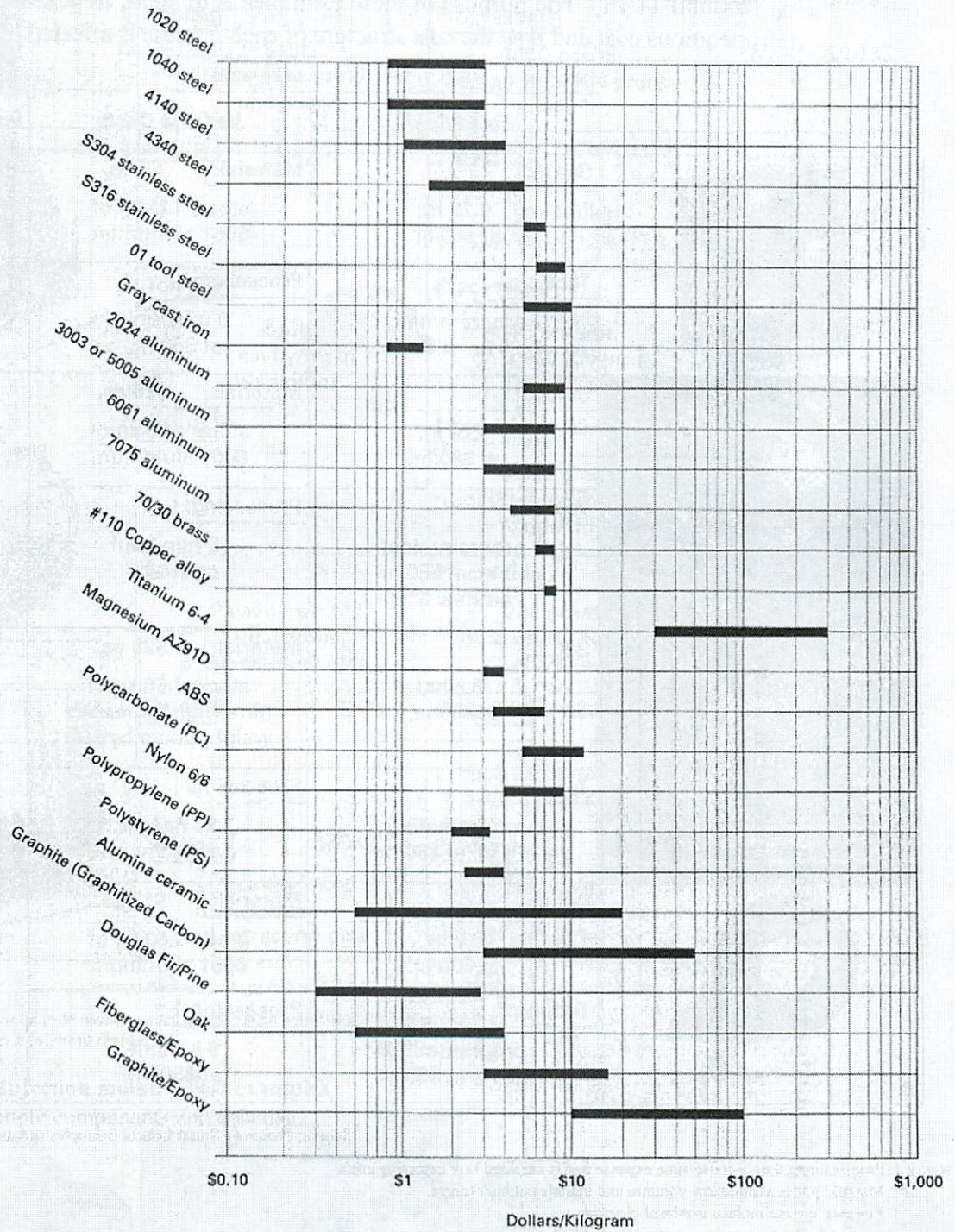See the results from the exercise and the compressed-time video (.mov, coming soon).

Appendix A

Materials Costs

EXHIBIT 11-17

Range of costs for common engineering materials. Price ranges shown correspond to various grades and forms of each material, purchased in bulk quantities (2007 prices).
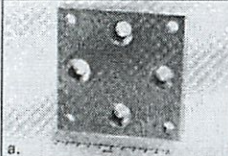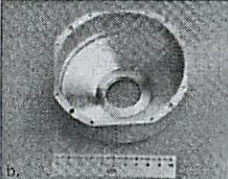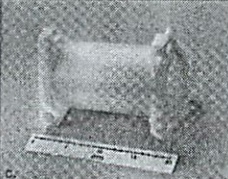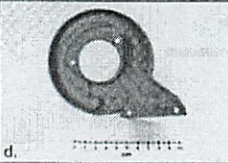
Source: Adapted from David G. Ullman, *The Mechanical Design Process,* third edition, McGraw-Hill, New York, 2003

Chart: Dollars/Kilogram ranges for materials: 1020 steel, 1040 steel, 4140 steel, 4340 steel, S304 stainless steel, S316 stainless steel, O1 tool steel, Gray cast iron, 2024 aluminum, 3003 or 5005 aluminum, 6061 aluminum, 7075 aluminum, 70/30 brass, #110 Copper alloy, Titanium 6-4, Magnesium AZ91D, ABS, Polycarbonate (PC), Nylon 6/6, Polypropylene (PP), Polystyrene (PS), Alumina ceramic, Graphite (Graphitized Carbon), Douglas Fir/Pine, Oak, Fiberglass/Epoxy, Graphite/Epoxy. X-axis: $0.10, $1, $10, $100, $1,000.

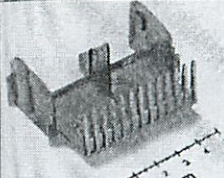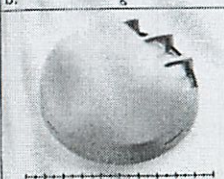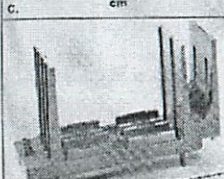# Appendix B

Component Manufacturing Costs

The exhibits in this appendix show example components and their cost data for computer-numerical control (CNC) machining (Exhibit 11-18), injection molding (Exhibit 11-19), progressive die stamping (Exhibit 11-20), and sand casting and investment casting (Exhibit 11-21). The purpose of these examples is to show, in general terms, what typical operations cost and how the cost structure of each process is affected by part complexity.

Fixed Costs	Variable Costs	Volume	Total Unit Cost
Setup: 0.75 hr. at $60/hr.	**Material:** $9 ea. stock: 1.11 kg of 6061 aluminum	1	$75.00
Tooling: programming: 0.25 hr. at $60/hr.	**Processing:** 6 min./unit at $60/hr.	10 / 100	$21.00 / $15.50
Setup: 1.75 hr. at $60/hr.	**Material:** $16 ea. stock: 1.96 kg of 6061 aluminum	1	$386.00
Tooling: programming: 1.0 hr. at $60/hr. Fixtures: $150	**Processing:** 55 min./unit at $60/hr.	10 / 100	$102.50 / $74.15
Setup: 5.5 hr. at $60/hr.	**Material:** $25 ea. stock: 4.60 kg of ultra-high molecular weight polyethylene	1	$646.00
Tooling: programming: 2.0 hr. at $60/hr.	**Processing:** 2.85 hr./unit at $60/hr.	10 / 100	$241.00 / $200.50
Setup: 2.0 hr. at $60/hr.	**Material:** $12 ea. stock: 1.50 kg of 6061 aluminum	1	$612.00
Tooling: programming: 2.0 hr. at $60/hr.	**Processing:** 6 hr./unit at $60/hr.	10 / 100	$396.00 / $374.40

Source: Photos by Stuart Cohen. Examples and data courtesy of Ramco, Inc.

Notes: 1. Programming time is a one-time expense and is included here in tooling costs.
2. Material prices assume low volumes and include cutting charges.
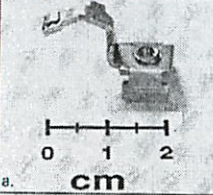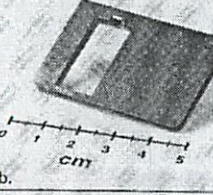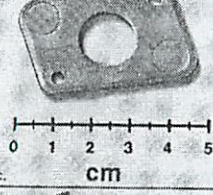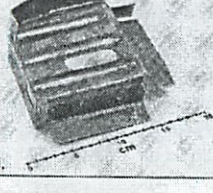3. Processing costs include overhead charges.

EXHIBIT 11-18 CNC machining cost examples
CNC machining example components and cost data.

Fixed Costs	Variable Costs	Volume	Total Unit Cost
Setup:	**Material:** $0.075 ea. 45 g of linear low density polyethylene (LLDPF)	10K / 100K	$1.915 / $0.295
Tooling: $18K 8 cavities/mold no actions	**Processing:** 1000 pcs/hr. on an 1800 KN press at $40/hr.	1M	$0.133
Setup:	**Material:** $0.244 ea. 10 g of steel-filled polycarbonate (PC)	10K / 100K	$1.507 / $0.607
Tooling: $10K 1 cavity/mold no actions	**Processing:** 160 pcs/hr. on a 900 KN press at $42/hr.	1M	$0.517
Setup:	**Material:** $0.15 ea. 22 g of modified polyphenylene oxide (PPO)	10K / 100K	$2.125 / $0.505
Tooling: $18K 2 cavities/mold no actions 3 retracting pins	**Processing:** 240 pcs/hr. on an 800 KN press at $42/hr.	1M	$0.343
Setup:	**Material:** $2.58 ea. 227 g of polycarbonate (PC) with 8 brass inserts	10K / 100K	$11.085 / $3.885
Tooling: $80K 1 cavity/mold 1 action 4 retracting pins	**Processing:** 95 pcs/hr. on a 2700 KN press at $48/hr.	1M	$3.165

Source: Photos by Stuart Cohen. Examples and data courtesy of Lee Plastics, Inc., and Digital Equipment Corporation

Notes: 1. Setup costs (only a few hours in each case) are negligible for high-volume injection molding.
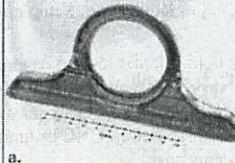2. Processing costs include overhead charges.

EXHIBIT 11-19 Injection molding cost examples
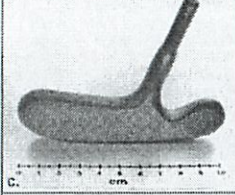Injection molding example components and cost data.

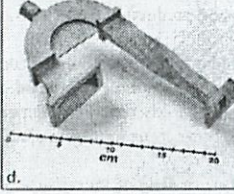|	Fixed Costs	Variable Costs	Volume	Total Unit Cost
a.	Setup:	Material: $0.040 ea. 2.2g 70/30 Brass	100K	$0.281
			1M	$0.083
	Tooling: $22K	Processing: 3000 pcs/hr. on a 550 KN press at $63/hr.	10M	$0.063
b.	Setup:	Material: $0.032 ea. 3.5 g 304 SST	100K	$0.775
			1M	$0.136
	Tooling: $71K	Processing: 4300 pcs/hr. on a 550 KN press at $140/hr.	10M	$0.072
c.	Setup:	Material: $0.128 ea. 19.2 g 102 copper	100K	$0.248
			1M	$0.149
	Tooling: $11K	Processing: 4800 pcs/hr. on a 650 KN press at $50/hr.	10M	$0.140
d.	Setup:	Material: $0.28 ea. 341 g galvanized steel	100K	$2.516
			1M	$0.761
	Tooling: $195K	Processing: 700 pcs/hr. on a 1000 KN press at $200/hr.	10M	$0.585

Source: Photos by Stuart Cohen. Examples and data courtesy of Brainin Advance Industries and other sources

Notes: 1. Setup costs (only a few hours in each case) are negligible for high-volume stamping.
2. Material weights represent the finished stampings. Material costs include scrap.
3. Hourly processing costs are not only driven by press size, but also can include ancillary processing equipment, such as in-die tapping.
4. Processing costs include overhead charges.

EXHIBIT 11-20 Stamping cost examples
Volume progressive die stamping example components and cost data.

	Fixed Costs	Variable Costs	Volume	Total Unit Cost
a.	Setup:	Material: $0.53 ea. 570 g of gray cast iron	10	$180.91
			100	$18.91
	Tooling: $1.8K 8 impressions/pattern no core	Processing: 120 pcs/hr. at $46/hr.	1000	$2.71
b.	Setup:	Material: $2.42 ea. 2,600 g of gray cast iron	10	$243.95
			100	$27.95
	Tooling: $2.4K 2 impressions/pattern 1 core	Processing: 30 pcs/hr. at $46/hr.	1000	$6.35

	Fixed Costs	Variable Costs	Volume	Total Unit Cost
c.	Setup:	Material: $0.713 ea. 260 g of yellow brass	10	$163.21
			100	$28.21
	Tooling: $1.5K no cores	Processing: 4 pcs/hr. at $50/hr.	1000	$14.71
d.	Setup:	Material: $0.395 ea. 180 g of 712 aluminum	10	$750.40
			100	$120.40
	Tooling: $7K 3 cores	Processing: 1 pc/hr. at $50/hr.	1000	$57.40

Source: Photos by Stuart Cohen. Examples and data courtesy of Cumberland Foundry Co., Inc. (sand casting), and Castronics, Inc. (investment casting)

Notes: 1. Setup is not generally charged in costing.
2. Processing costs include overhead charges.

EXHIBIT 11-21 Casting cost examples
Sand casting (top) and investment casting (bottom) example components and cost data.

Terminology

The following terminology applies to all of the tables in this appendix:

- *Setup* is the work required to prepare the equipment for a production run. Setup costs are charged for each run.
- *Tooling costs* are incurred in advance of the first production run, and tooling can usually be reused for later production runs. However, in very high-volume production runs, tooling wears out and therefore is a recurring expense. Tooling costs may be spread over the entire production volume or may be charged separately. CNC programming time is generally also a one-time expense, like a tooling cost.
- *Material types* are listed for each part. Material weights and costs include processing scrap and waste.
- *Processing costs* vary with the type of manufacturing equipment used and include charges for both machine time and labor.

While fixed costs (setup and tooling) are sometimes billed separately from material and processing costs, for these examples, fixed costs are spread over the production volume shown. Unit costs are calculated as

$$\text{Total unit cost} = \frac{\text{Setup costs} + \text{Tooling costs}}{\text{Volume}} + \text{Variable costs}$$

The cost rates given include overhead charges, so these data are representative of custom components purchased from suppliers.

Description of Processes

CNC machining includes computer-controlled milling and turning processes. CNC machines are highly flexible due to automatic tool-changing mechanisms, multiple work axes, and programmable computer control. To produce a particular part, a machinist must first program the cutting tool trajectories and tool selections into the machine's computer. Also, fixtures or other tooling may be utilized to produce multiple parts more efficiently. Once the program is written and fixtures are made, subsequent production runs can be set up much more quickly.

Injection molding is the process of forcing hot plastic under high pressure into a mold, where it cools and solidifies. When the part is sufficiently cool, the mold is opened, the part is ejected, the mold closes, and the cycle begins again. Mold complexity depends highly on the part geometry; undercuts (features that would prevent the part from ejecting out of the mold) are achieved using mold "actions" or "retracting pins."

Progressive die stamping is the process of passing a sheet or strip of metal through a set of dies to cut and/or form it to a desired size and shape. While some stampings require only cutting, formed stampings are made by bending and stretching the metal beyond its yield point, thereby causing permanent deformation.
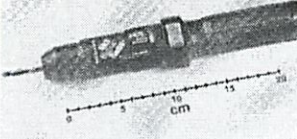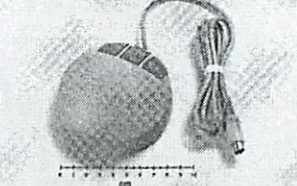
Sand castings are created by forming a sand mold from master patterns (tooling in the shape of the final part). Special binders are mixed with the sand to allow the sand to retain shape when packed around the pattern to create a single-use mold. Internal cavities in a casting can be created using additional sand cores inside the outer mold. Molten metal

is then poured into the mold where the metal cools and solidifies. Once cool, the sand is broken off to reveal the metal casting. Sand castings generally require subsequent machining operations to create finished components.

Investment castings are made by first creating a temporary wax pattern, using master tooling. The wax pattern is then dipped or immersed in plaster or ceramic slurry which is allowed to solidify. The form is then heated, melting out the wax, and leaving behind only the thin shell as a mold. Molten metal is then poured into the mold, where it cools and solidifies. When the metal is cool, the mold is broken off to reveal the metal part.

Detailed process descriptions for the above and numerous other processes, as well as more detailed cost estimating techniques, can be found in the reference books listed for this chapter.

Appendix C

Assembly Costs

Product	Part Data		Assembly Times (Seconds)	
	No. of Parts	Total		
	16	125.7		
	No. of Unique Parts	Slowest Part		
	12	9.7		
	No. of Fasteners	Fastest Part		
	0	2.9		
	No. of Parts	Total		
	34	186.5		
	No. of Unique Parts	Slowest Part		
	25	10.7		
	No. of Fasteners	Fastest Part		
	5	2.6		
	No. of Parts	Total		
	49	266.0		
	No. of Unique Parts	Slowest Part		
	43	14.0		
	No. of Fasteners	Fastest Part		
	5	3.5		
	No. of Parts	Total		
	56/17*	277.0/138.0*		
	No. of Unique Parts	Slowest Part		
	44/12*	8.0/8.0*		
	No. of Fasteners	Fastest Part		
	0/0*	0.75/3.0*		

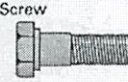Source: Photos by Stuart Cohen. Data obtained by using Boothroyd Dewhurst Inc. DFA software

*Data for the mouse are given as: total components (including electronic) mechanical components only.
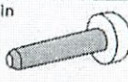Notes: 1. This table gives manual assembly times, which can be converted to assembly costs using applicable labor rates.
2. Assembly times shown include times for individual part handling and insertion, as well as other operations such as subassembly handling and insertion, reorientations, and heat riveting.

EXHIBIT 11-22 Assembly costs
Assembly data for common products. Obtained using Boothroyd Dewhurst Inc. DFA Software.

Component	Time (Seconds)			Component	Time (Seconds)		
	Min	Max	Avg		Min	Max	Avg
Screw	7.5	13.1	10.3	Pin	3.1	10.1	6.6
Snap-fit	3.5	8.0	5.9	Spring	2.6	14.0	8.3

Source: Manual assembly tables in Boothroyd and Dewhurst, 1989

EXHIBIT 11-23 Typical handling and insertion times for common components.

Appendix D

Cost Structures

Type of Firm	Cost Calculation
Electromechanical products manufacturer (Traditional cost structure)	Cost = (113%) × (Materials cost) + (360%) × (Direct labor cost)
Precision valve manufacturer (Activity-based cost structure)	Cost = (108%) × [(Direct labor cost) + (Setup labor cost) + (160%) × (Materials cost) + ($27.80) × (Machine hours) + ($2,000.00) × (Number of shipments)]
Heavy equipment component manufacturer (Activity-based cost structure)	Cost = (110%) × (Materials cost) + (109%) × [(211%) × (Direct labor cost) + ($16.71) × (Machine hours) + ($33.76) × (Setup hours) + ($114.27) × (Number of production orders) + ($19.42) × (Number of material handling loads) + ($487.00) × (Number of new parts added to the system)]

Sources, top to bottom: Unpublished company source; Harvard Business School cases; Destin Brass Products Co., 9-190-089, and John Deere Component Works, 9-187-107

Notes: 1. This table shows total costs per customer order.
2. Materials costs include costs of raw materials and purchased components.

EXHIBIT 11-24 Typical cost structures for manufacturing firms.

2.009

Home > Team product teardown exercise > Results

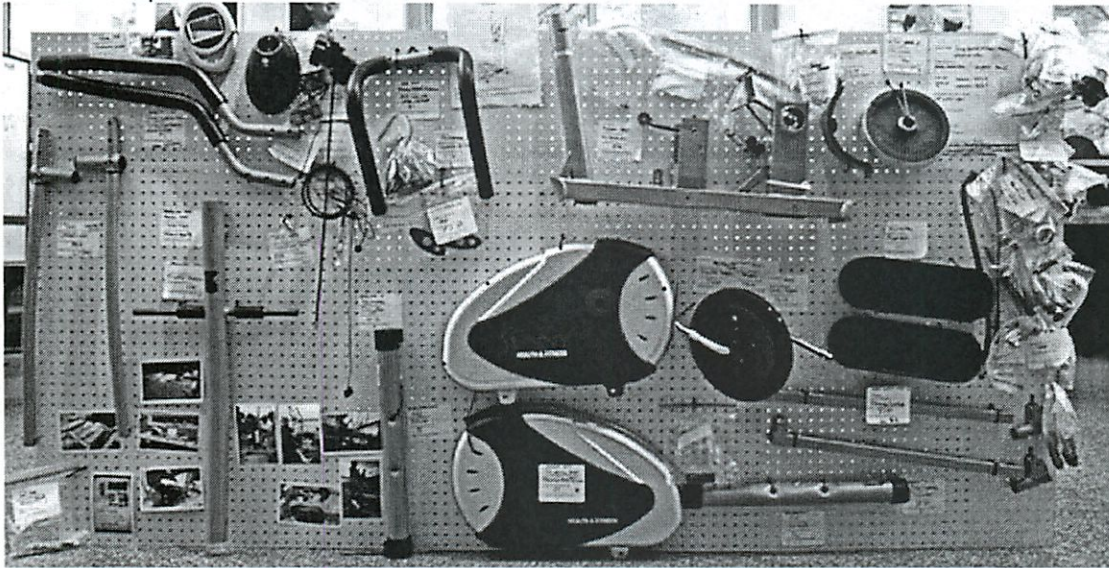# Teardown Results

Click on images to see a larger version.

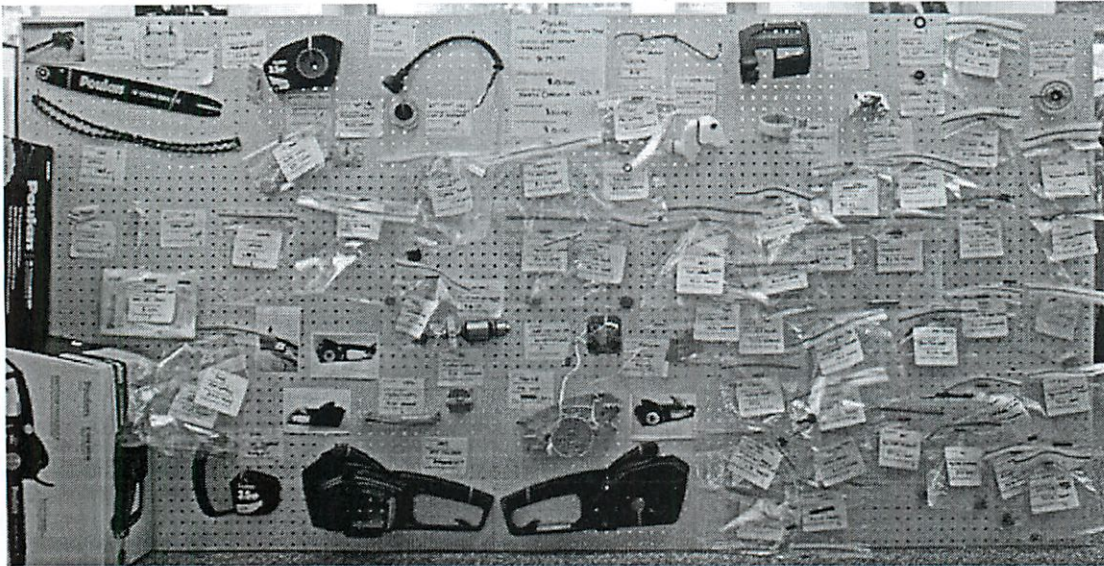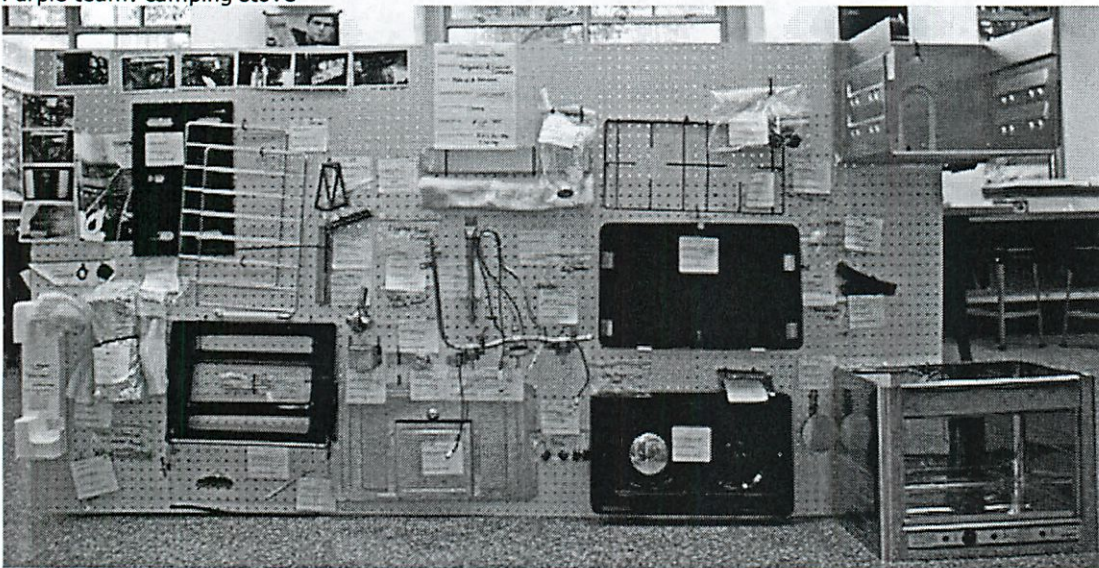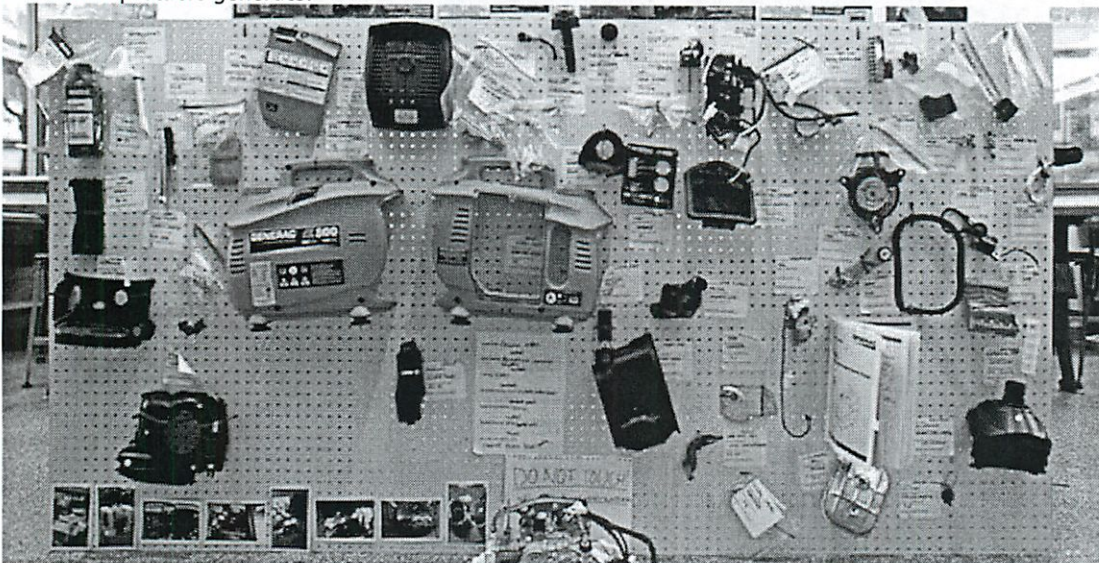|			
eliptical	ice maker	electric chain saw	camping stove
portable generator	roomba	electric roto-tiller	electric motor bike

Blue team: eliptical

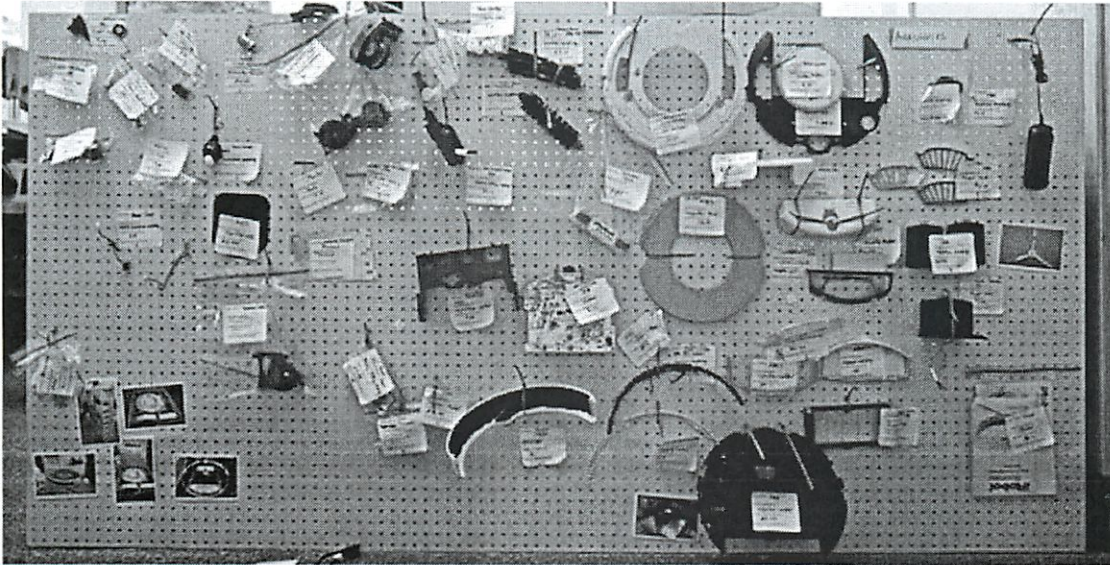Green team: ice maker

Orange team: electric chain saw
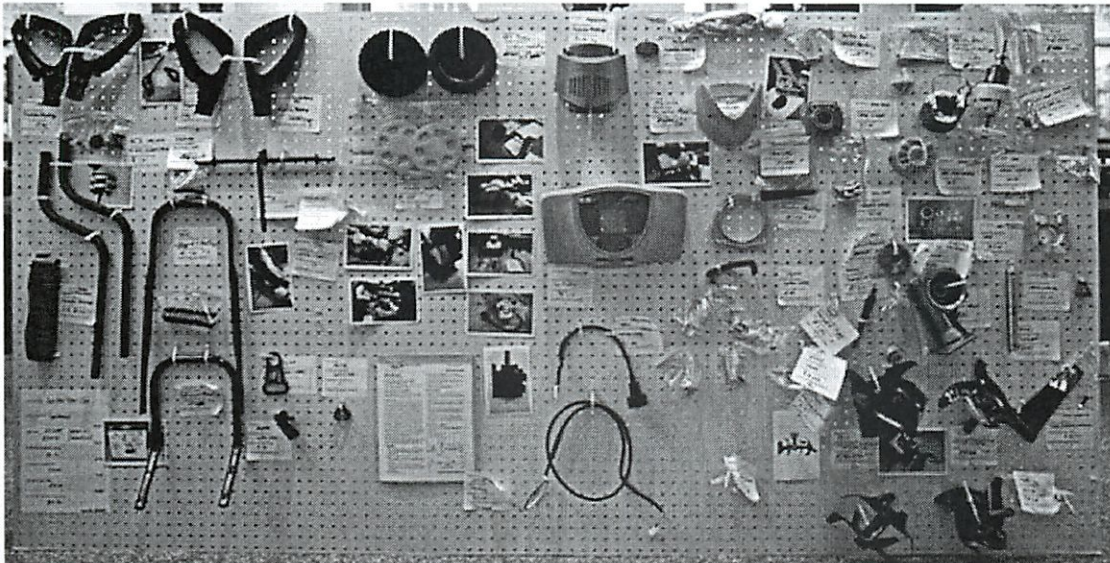
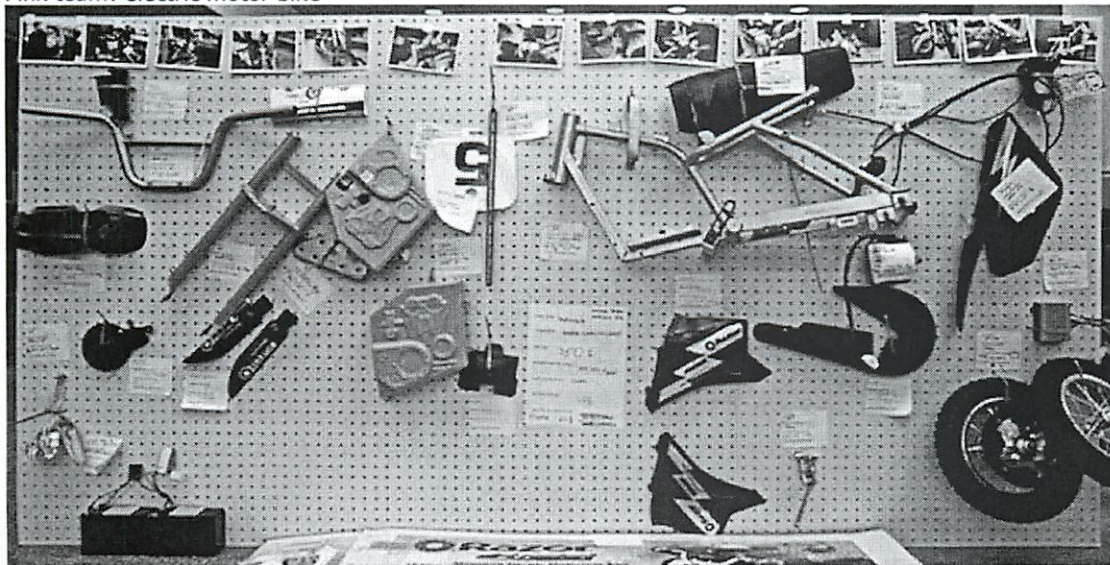Purple team: camping stove

Red team: protable generator

Silver team: roomba

Yellow team: electric roto-tiller

Pink team: electric motor bike

anyone who has never made a mistake
has never tried anything new

Albert Einstein, 1879-1955
theoretical physicist

2.009 Product engineering processes

Sketch model review
in 34-101

Shop is open 6-9 PM Tuesday and Wednesday

Load slides onto presentation computer 2:30-5:30 PM Thursday

Use scheduling tool to arrange upload time

Work in the shop will cease at the usual 4:45 PM, but you will be
able to have access to pickup materials until 6:30 PM

Presenters test in 34-101 between 5:30 and 6:30 PM

Sketch models/presentation props should be in foyer outside of
34-101 prior to starting at 7:00 PM

Presentation order and detailed logistics linked on home page
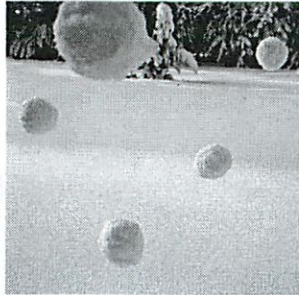
2.009 Product engineering processes
Friday

Benchmarking an important way to learn

mobilize as a team to teardown

2.009 Product engineering processes
Today

L11 Build/Logistics Challenge

Modeling challenge mobilize to build up

101

Design challenge

Your challenge was to design a snowball launcher

it must be human powered

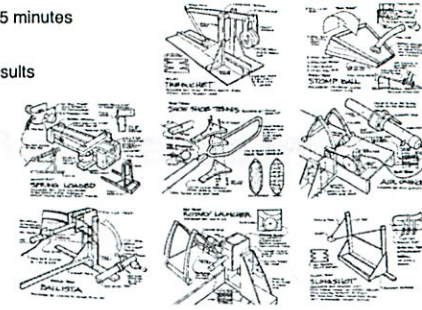# Build challenge
ball launchers

kits are in your team area, based on idea suggestions from team

team challenge:
assemble sketch model in 45 minutes
test:
Friday after sketch model results

tips
review plans, make a plan, delegate, work in parallel, ask, be careful

Build challenge!
a couple of pledges

I will work safely

I will not throw snowballs in the lab
(no testing)

w/ Mark - prefrosh

"Anyone who has never made a mistake has never
   tried anything new"

arguino - microcontroller 7pm

Sketch model review 34-101
Shop 6-9 Tue + Wed

Fri Benchmarking
     tear down

Today Modeling challenging
     Snowball launcher
     ball launchers
     knit w/ sketches

Tips review plans, make plans, delegate, work in parallel
          instructions

①

I will work safley
No testing today

10/2 ✓

Shipped

2.009

Lab #4: Week of October 1: Preparing for the sketch model review

objective, preparation, what's due, activities, other notes

Main Lab Objective
Each section will focus on preparation for the upcoming sketch model review. The presentation is this Thursday evening. Your section should be working on details for the two concepts that you have chosen within the team's assigned idea area.

This lab should be focused on running a very efficient meeting so there is time to work on sketch models and complete other tasks..

Advanced preparation for Lab #4

For the complete team
There are no overall team items to prepare.

For your individual section
Make sure that you understand the requirements for the sketch model review and logistics for the presentation.

Make sure that your task forces are organized to give yourself enough time to prepare the different types of materials needed to refine your ideas for the sketch model review. Be sure to allow several days for making sketch models and allocate time to practice your presentation. You may want to refer to the online sketch modeling resources.

Be prepared to give a status report on the items you are responsible for at the start of lab.

The system integrators should prepare an agenda for the lab. If you think that you will need AV equipment set this up in advance as well. Plan to have a meeting that allows a significant amount of time for working on tasks.

What's due
There are no formal deliverables for lab this week, other than focusing on preparation for the sketch model review on Thursday.

Recommended Lab #4 Activities
As a complete team
Your lab instructors may choose to discuss the peer reviews with the entire team together. They will lead a short discussion on the peer review process and its importance. The first peer review is assigned on Friday at the end of this week, to be completed for 5 PM Wednesday, October 12. Peer reviews are mandatory.

Close the meeting room divider. The two sections will typically work separately for the entire lab.

As individual sections
Begin with the standard meeting startup.

Each task force should give a brief status report to the section, indicating what you have completed, what needs to be done, issues that are of concern, and whether the assigned tasks are on-schedule. Using your work-in-progress (models) as props can facilitate this discussion.

Based on the reports, decide if resources need to be reallocated to different tasks or if new task forces need to be created.

Before your next lab you will likely need to decide which concept your section will pursue for the mockup review. You may end up selecting one of your two concepts, an idea from the other half of your team (if one section has the two strongest concepts), or even decide on new direction. However you must wait for the written feedback from instructors, and be sure to apply a rational process for making this decision. You may want to invite your instructor to participate in the process.

Work!

Other notes:
All section members that were auditioning for an officer position should have now served in the role, so the section should vote to select the final officers by no Later than 5 PM Friday, October 5. When the **officer positions are finalized** please email this information to the course instructor using the officer information form.

Tuesday lab sections only:
Since Tuesday (October 9) is a student holiday, your team will need to find a way to make up what needs to happen next week for your project. The Pappalardo lab wil be open on Tuesday, and instructors will be available if your team elects to meet at your normal time. Otherwise, you may be able to arrange a time with your instructors.