2.009 Product engineering processes

I am a great believer in luck, and I find the harder I work, the more I have of it.

Thomas Jefferson
2.009 Product engineering processes

“always remember that while it is wrong to use too few words, it is often far worse to use too many”

Milo: “I never knew words could be so confusing”

Tock: “only when you use a lot to say a little”

Norton Juster
the phantom toll booth
2.009 Product engineering processes today

logistics hours leading to final presentation

goals what where we trying to accomplish?

presenting data avoid misleading messages
Final presentation
suggested time allocation (not order)

- the product, where and how it is used, use experience
- who it is for and why should we care (value proposition)
- how it works, principle of operation
- market and preliminary business model
2.009 Product engineering processes
but first

~1600 people current in pool, first lottery was Friday (campus advertisements up today)

Name cards give access prior to 7:15 and guaranteed seat
We have an overflow venue (Little Theatre)
We will have standby ticket system, and displays in lobby
We will webcast from the course website

Business model consultation, Monday (tonight) in Pappalardo
Presentation drop in, Wednesday afternoon
When things go wrong tutorial, Wednesday in Pappalardo
Logistics
important web pages

Details are linked from 2.009 home page
final presentation logistics & detailed timeline
final presentation practice session logistics
course wrap up timeline

Read the details carefully. Ask questions if something is not clear
Please watch for emails this week
Logistics

critical timeline to presentation

Friday, 4:30-10 PM: presentation practice sessions
3-370
schedule will be linked from the home page (today)
no surrogate presenters
dress rehearsal, less the dress

Sunday 2-6: communication staff presentation practice sessions
scheduler will be posted

Sunday 5 PM: digital brochure due (pdf)

Sunday 5 PM: Sets start rolling to Kresge

Sunday 6:45: class video in front of Kresge banners

Sometime Sunday evening: testing with yellow, silver, red
Logistics

critical timeline to presentation

Monday: countdown to presentation
sets will be in basement, backstage

11:00-1:00 PM: presentation upload with TA, Pappalardo lab
2:00-4:35 PM**: final AV run-through, no changes
  presenters and projectionist’s assistants, Kresge
  15 min/team; come at scheduled time
5-6:00 PM: final foyer cleanup
(all coats, bags, supplies go in practice room, name cards will be in room)
6:00 PM: Pappalardo lab closes
7:00 PM: Discussion with yellow presenters, backstage
7:15 PM: You MUST all be seated in your team’s area
Logistics

Critical timeline to presentation

Monday: Final, 15 min AV run-through (do not be late!)
Team presenter’s & projectionist’s assistants, Kresge onstage

2:00-2:15 red team (note: red is out of order due to a conflict)
2:20-2:35 yellow team
2:40-2:55 blue team
3:00-3:15 purple team
3:15 red supporting AV and lighting cues
3:20-3:35 orange team
3:40-3:55 green team
4:00-4:15 pink team
4:20-4:35 silver team

We never go to the stage from the auditorium. Always enter backstage
Logistics
sets/booth setup

Sunday, 5:00 PM
  course staff moves sets to Kresge foyer

Monday
9 AM: sets available for practice in Kresge basement
mid-day: yellow set moved onstage, blue moved backstage, all other sets in basement by elevator (golf cart, water tanks backstage)
5:00-6:00 PM: final set organization
  complete setting up prototype and set materials
  pick up name tag in your team’s area (practice room)
  all coats and bags in practice room
6:00 PM: be ready to talk with guests (with your name tag)
6:15 PM: standby tickets
**Logistics**

**presentation logistics**

only presenters onstage during presentation
don’t introduce your presentation by team color
team members participating in Q&A wait backstage during presentation
when presentation is finished, presenters should stop and look at the Q&A moderator
  *do not ask* if there are any questions, no question slide. A strong landing image
Q&A moderator will lead the team members waiting backstage come onstage
Q&A moderator will moderate question session
always enter stage from the backstage
  *go from seating area to backstage using prescribed route*  *do not enter* from the audience area
Logistics
Kresge foyer – backstage route

**black**: route for moving to backstage
course staff will assist
teams in moving the sets
Logistics
Stage setup

confidence monitor
is at back of theatre

live video
slides (16:9)
live video or on-stage feed

reveal gate
reveal gate

entrance is behind set   stage exit
Logistics

Stage setup

confidence monitor is at back of theatre

live video

slides (16:9)

live video or on-stage feed

reveal gate

team set

reveal gate

entrance is behind set

stage exit
Logistics

When does your presentation start?

Your set will have been moved onstage in darkness
Your will enter behind the reveal gates
You hear your team color
Stage lights come on
Your slides come on
Reveal gates open
You’re on!
**Logistics**

**live presentation logistics (team viewpoint)**

<table>
<thead>
<tr>
<th>When Q&amp;A starts for</th>
<th>Team presenters, set up setup crew leave for move backstage*</th>
<th>Team Q&amp;A participants leave for backstage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>Purple</td>
<td>Blue</td>
</tr>
<tr>
<td>Blue</td>
<td>Red</td>
<td>Purple</td>
</tr>
<tr>
<td>Purple</td>
<td>Orange</td>
<td>Red</td>
</tr>
<tr>
<td>Red</td>
<td>Green</td>
<td>Orange</td>
</tr>
<tr>
<td>Orange</td>
<td>Pink</td>
<td>Green</td>
</tr>
<tr>
<td>Green</td>
<td>Silver</td>
<td>Pink</td>
</tr>
<tr>
<td>Pink</td>
<td></td>
<td>Silver</td>
</tr>
</tbody>
</table>

* at this time, the team projectionist’s assistant moves to sit near projectionist
Logistics

Yellow and blue-specific startup

7:00 PM: Yellow presenters meet me backstage to coordinate start
7:15 PM: Yellow presenters and Q&A participants backstage
7:15 PM: Yellow projectionist assistant sit with projectionist

7:15 PM: Blue presenters report backstage
7:20 PM: Blue projectionist assistants sit with projectionist

Hard to remember? Your team’s logistics will be on the back of your name card
Logistics
Seating

7:15 PM: all students seated in team area
only teams in team area!
Logistics

general considerations

Do not enter or leave Kresge seating area while another team is presenting
  watch on screen in lobby until team’s presentation is over, then return to your seats

Be very quiet when backstage
  backstage is separated from onstage only by a curtain

Be very quiet in Kresge foyer during the presentations
  doors to auditorium will be open

Start moving backstage on-time! Communicate with staff member (Billy)
  no elevator use or moving onto backstage during presentations
Logistics
after presentation timeline

Monday: after presentation

10:00 - 10:45 PM: eat, talk to guests at booth

~10:45PM: Return materials to Pappalardo lab
Logistics

critical timeline for course wrap up

Tuesday 9 AM: submit final presentation materials
(other than slides and brochures)

Wednesday
noon: final peer review, on-line class evaluation, due Saturday at noon
1-5 PM: feedback from guests available in lab
1 PM: submit physical design notebook in lab
1:00-3:30 PM: lab cleanup, tool checkout
3:00 PM: 2.009 lunch/dinner
midnight: final timesheets, online notebook submission
Last class...

how does the cost of building your alpha prototype relate to the product’s manufacturing cost?

Malik: alpha prototype=$7000, product cost=hopefully less
And now...

a final mini quiz!

Name on index card

to make a graphic/slide understandable, you need to ________

and, keep in mind that

less is ____________________________________________
2.009 Product engineering processes

class goals

develop an understanding of the engineering activities involved with designing a new product

develop an appreciation for the significance of societal contributions that can be made as a technological innovator. User centric/driven design

your projects are real
2.009 Product engineering processes

class goals

improve creative-thinking capability and ability to identify the most significant opportunities

improve expertise in constructing models for reasoning about design alternatives. (estimation, sketch models, geometric models, mockups and prototypes)

improve engineering expertise and proficiency in building product models and prototypes

learn about and experience methods for working in large teams

improve presentation skills using a wide variety of media
2.009 Class goals
a bit different, but why?

ME graduates
Warren Seering
I learned it at...

did not elsewhere

job

grad school

MIT ungd
underlying sciences
underlying mathematics
mechanics of solids
mechanical behavior of materials
systems dynamics and control
dynamics
fluid mechanics
thermodynamics
heat transfer
engineering design process
manufacturing
engineering reasoning and problem solving
experimentation and knowledge discovery
system thinking
personal skills and attributes
professional skills and attitudes
independent thinking
teamwork
communications
testing

designing

developing an idea

market context

business context

societal context
I learned it at...

ME core

professional skills

how and why

did not
elsewhere
job
grad school
MIT ungd
I use this knowledge…

proficiency that was expected of me…
learned at MIT how and why professional skills used pervasively

data consistent across gender and career paths (engineering, management, consulting, other)

2.009 goals aim at several of the gaps
Presenting data

key questions

how to?
- convert abstract information into a visual representation
- make meaning easily accessible
- preserve the underlying meaning
- provide new/desired insight

vision test
Which is clearer?

A
Which is clearer?

B
Which is clearer?

A

B
Which is clearer?
Which is clearer?
Which is clearer?

A

B

E
F
P
T
O
Z
E
F
P
T
O
Z
Which is clearer?
Which is clearer?

A

Hello
Which is clearer?

B

Hello
Which is clearer?

A

B

Hello

Hello
Color Wheel

Opposites sides are contrasting colors
Which is clearer?

A

hello
Which is clearer?
Which is clearer?

A

hello

B

hello
Readability

Fast Track Appetizers

Escargot
$7.50
Shrimp Cocktail
$8.00
Tempura
$6.00
Readability

B

Fast Track Entrees
Salmon Steak
$19.95
Stuffed Trout
$18.00
Filet Mignon
$21.95
Readability

**Fast Track Appetizers**
- Escargot $7.50
- Shrimp Cocktail $8.00
- Tempura $6.00

**Fast Track Entrees**
- Salmon Steak $19.95
- Stuffed Trout $18.00
- Filet Mignon $21.95
Traffic Deaths and Speeding
Traffic Deaths and Speeding
Traffic Deaths and Speeding
Traffic Deaths, Speeding and Trends

A

B

Before stricter enforcement

After stricter enforcement

1955 1956

325

300

275

1951 1953 1955 1957 1959
Variable relationships
Variable relationships

Death Rate Plotted against Age,
Prospective Study of Mortality in U.S. Veterans

Death Rate per 10,000 Man-Years

Smokers

Non-Smokers

Age (in Years)
Variable relationships

Death Rate (Log Scale) Plotted Against Age

Ln(Death Rate per 10,000 man-years)
Variable relationships

A

Death Rate Plotted against Age,
Prospective Study of Mortality in U.S. Veterans

Death Rate per 10,000 Man-Years

Age (in Years)

Smokers

Non-Smokers

B

Death Rate (Log Scale) Plotted Against Age

Ln(Death Rate per 10,000 man-years)

Age
Variable relationships

Death Rate Plotted against Age,
Prospective Study of Mortality in U.S. Veterans

Death Rate per 10,000 Man-Years

Age (in Years)

Smokers
Non-Smokers
Variable relationships

A

B

Smoking and Death Rates Shown By Age

- Non-Smokers
- Smokers

Death Rate (per 100,000 Man Years)
Variable relationships

A

Death Rate Plotted against Age,
Prospective Study of Mortality in U.S. Veterans

B

Smoking and Death Rates Shown By Age

-Non-Smokers
-Smokers
Variable relationships

Smoking and Death Rates Shown By Age

- Age (Years)
  - 77.5
  - 76
  - 75
  - 72.5
  - 67.5
  - 62.5
  - 60
  - 47.5
  - 42.5

- Death Rate (per 100,000 Man Years)
  - Non-Smokers
  - Smokers
Variable relationships

A

Surgeon General Reports
Aging is the Primary Cause of Death

Smoker
Non-Smoker

Ln(Death Rate for Non-Smokers)

Ln(Death Rate for Smokers)

Age

B

Smoking and Death Rates Shown By Age

Age (Years)

Death Rate (per 100,000 Man Years)

Non-Smokers
Smokers
Trends
Trends

SAT scores and funds for education rise together

- Per Pupil Expenditures
- SAT Score
Trends

SAT scores soar despite sluggish funding of education

- **Per Pupil Expenditures**
- **SAT Score**
Trends

A

SAT scores and funds for education rise together

B

SAT scores soar despite sluggish funding of education
Scale of effect
The purchasing power of the dollar declined most sharply during the Nixon administration.
Scale of effect
The purchasing power of the dollar declined most sharply during the Nixon administration.
Readability
Presenting data

Key questions

How to?
Convert abstract information into a visual representation
Preserve the underlying meaning
Provide new/desired insight

Make meaning easily accessible: direct representations

Tufte, envisioning information
(details in of-interest section)