Lecture 11
March 10, 2015

Preparation for Finals
Concluding Remarks
Course survey
What I wish I said (appended)
Final

• Thursday noon Poster and Prototype session
  – Poster and Prototype demonstration session open to the public. Invite friends!
  – Poster presents in capsule form your results. If you have more than one prototype show them all to demonstrate the progression in your thinking.
  – Reporters have been invited
  – Videos of elevator speeches, interviews and prototype demonstration
  – Poster stand availability
• Next Tuesday, March 17th, 2015
• Location: RLANRC
• Car Pool and wheelchair transport
• Be there by 11:00 AM
• 12:00-1:00pm Project Summaries
• 1:00 - 2:00pm Poster Sessions
  – 10 minute presentations plus poster session.
• Final Paper due
Final

• We will submit Final paper to RESNA for those who would like to attend Denver conference – you have to register

• Who would like to attend?
Final paper

FINAL PAPER Due March 17th
E/ME 105 Winter 2015

exec summary

1. Mission Statement Why are you doing this?
2. Problem statement What problem are you trying to solve?
3. Solution Briefly, What is your solution?
4. Design Approach What is your design?
5. Marketplace As specifically as you can make it, who are your customers and how many are there (primary and secondary)
6. Cultural Sensitivity What cultural concerns are embedded in your approach?
7. Low Cost How expensive is your product to make?
8. Human Factors Why should your product be safe and easy to use?
9. Customer Participation Who has advised and tested your product?
10. Manufacturing Why will your product be easy and cheap to make?
11. Major Challenges What worries you the most about your approach?
12. Prototyping and Testing How did your prototype evolve. What was the results of your customer testing?

13. Discussion of your Team Dynamics for the Course
14. Reflection on Class experience. Using the benefits of hindsight, how should the project have been better (and the class) been planned and executed?
15. Record your “Lessons Learned” to put future teams’ projects on a stronger footing.

Appendix: Anything you would like to put here. Usually good for raw data, interviews or whatever else.

Length (w/o appendices) 15-20 pages
Final presentation (Rancho)

FINAL PRESENTATION (8 minutes plus 2 minutes discussion)

1. Problem statement  What problem are you trying to solve?
4. Design Approach  What is your design and your solution?
5. Human Factors  Why should your product be safe and easy to use?
6. Evolution  What are improvements you can make in your present product. Advantages and disadvantages
7. Major challenges  What worries you the most about your approach?
8. Prototyping results  How did your prototype evolve?

9. Record your “Lessons Learned” to put future teams projects on a stronger footing.
Future Directions - Next Steps

• I would like each team to be prepared to discuss a strategy for taking their project to the next level.

• Consider
  – Potential Student Involvement
    • Now
    • In future
For a good talk

• Rehearse!
• Don’t ramble
• Don’t read the text. Look at the audience
• Make slides sparse and with big print
• Good contrast between slide and background
• Passion and enthusiasm
• Let everyone talk – smooth transition
• Takeaways from each slide
Poster and Prototype Demonstration Session

Make a poster which illustrates your project
• Precursor to talk
• Size ~ 27X39? Need stands
• KISS
• One hour session
• Don’t obsess!

Prototype and/or simulation
• Come early and set up
Conclusions

• We used the limited time as “best” we could
• We learned by doing
• We had some very inspirational guest speakers
• Every product suffered from hiccups
• Teams functioned well
• Every Team had a user to instruct them
• We are positioned to take some interesting innovations to the next stage – Let’s see what they say at Rancho!
Fundamental questions

1. How do we get worthy projects from here to people who need them?

2. What changes should we make for the next year?
Questionnaire
DFX

A good product development process is characterized by the inclusion of anticipatory team-driven tasks which will

• Avoid downstream surprises
• Cause the product to meet specifications
  – Performance
  – Quality
  – Cost
  – Time to market
DFX detail

- Clear Market Requirements
- Thought-through Architecture
- Rapid Prototyping
- Clear Product/engineering Specs
- Design for Extremely Low Cost
- Design for Human Interface-ergonomics
- Design for Assembly/manufacturability
- Manufacturing Plan (including partners)
- Design for Environment
- Design for sustainability
- Product Platforms
- Risk Mitigation Analysis
- Design for Maintainability
- Design for Reliability
- Other??
DFX detail

- Clear Market Requirements
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- Design for sustainability
DFX detail

- Product Platforms
- Risk Mitigation Analysis
- Design for Maintainability
- Design for Reliability
- Other??
E/ME 105 detail

- Clear Market Requirements not bad
- Thought-through Architecture ?
- Rapid Prototyping` yes
- Clear Product/engineering Specs ?
- Design for Extremely Low Cost yes, a start
- Design for Human Interface-ergonomics yes
- Design for Assembly/manufacturability yes
- Manufacturing Plan (including partners) ?
- Design for Environment ?
- Design for sustainability ?
- Product Platforms ?
- Risk Mitigation Analysis ?
- Design for Maintainability ?
- Design for Reliability ?
- Other??
Lecture

• Review and what I wish I had said...
Purpose of Course

• To study how product development is accomplished and to actually design a product through the early design stages

• To study the business and social context for developing products

• To learn team and communications skills
Important stuff only superficially covered
1. Needs identification
2. Context Discovery
   1. Mkt
   2. Mfg
   3. Technology
   4. Financial
   5. Company Core Competencies
   6. Financial objectives
   7. Financial Constraints
3. Ideation (Brainstorming)
4. Concept Selection
5. Concept Development
   1. System Specification
   2. Architectural Decomposition
   3. Product Plan
6. Detailed Development
   1. Software
   2. Hardware
7. Systems Integration and Test
8. Pre-production
9. Ramp up
10. Field Support

The Product Development Process

We stopped somewhere at step 5
Design Rules!!-
anyone disagree?
Our extreme constraint was Schedule.

Is this necessarily a bad thing?
A great skill is to manage a complex program. Tools of Program Management:

- Work Breakdown Structure
- Program Plans
- Integrated Scheduling
- Critical Path
- Budgeting
- Risk and Risk Abatement
- Staffing and resources
- Communications
Product Development Process
Metrics

• **Quality**
  – First pass success
  – Manufacturing hiccoughs
  – Measured in DPU

• **Cost**
  – Use of Resource V Plan
  – Competitive Development Costs

• **Speed**
  – Do products consistently get to market on time

• **Performance**
  – Did the products perform to specifications

What are your metrics?
Prototype
Appropriate?
  Met needs?
Maturity? Time to first product
Feedback from customer/stakeholders
Compare with initial requirements/
Cost effective?
Market correct?
Realism of requirements?
Grade
Team effectiveness?
Where to look for Projects for “Freedom from Disability”? 

• Needs driven
  – Addresses a basic human need in market (pain)

• Sustainable business model
  – Initial Investment obtainable
  – Profitable
  – Scalable
  – Leverage-able
  – Defensible
  – Removes cultural, technical or commercial barrier that has stymied previous attempts
  – Relationship Driven
  – Builds on past knowledge when appropriate

• Culture Sensitive, Driven and Constrained
  – Realistic
  – Sophisticated

• Robust
  – Withstands minor errors

Did we choose The “best” projects?
X=Sustainable (Engineering) Design Strategies

- Ecological Efficiency/Optimal Function
  - Saving Resources
  - Use of renewable resource
  - Increasing product durability
  - Design for product re-use
  - Recycling oriented design
  - Design for Disassembly
  - Environmental-friendly production
  - Minimizing environmental burdens caused by the product
  - Use of Environmental-friendly packaging
  - Disposal of non-recyclable materials in an ecologically desirable way
  - Building an ecologically favorable logistic system
Design For “X” (DFX) cont.

- Sales and marketing (Customer alignment)
  - Meets Customers’ needs
  - When in doubt- Cheapness Rules
  - Design to Cost to allow Target pricing
  - Product Price/Volume/Feature mix
  - Promotion strategy
Design for a Lead User?

• Who would influence others to buy product
  – Who do others emulate?
  – examples:
    • High school prom queen
    • Specific age group
    • Respected older person
    • Store owner
    • Priest
    • Political leader
    • Sports figure
    • Wealthy

• How could you get the lead user to buy the product?
• How do you spread the word?
Design for Lead User

• Who are the lead users in the Rehabilitation World?
Design for the future
Design platforms

• Planned Evolutionary Changes (Design for upgrades)
• Group changes periodically to create a new platform
• Exploit each platform
Design for Reliability

Fault Tree analysis

Seal Regulator
Valve Fails

Valve Fails Open
when commanded closed

Excessive leakage
Regulates High
Regulates Low
Fails closed when commanded open
Fails to meet response time
Excessive hysteresis

1

2

3

4

5

6

7

8

9
Design for X

• Strategic Issues
  – Makes a Difference
  – Adheres to Company (Developer’s) Strategy
  – Positioned to beat competition
  – Investment required
  – Product and technology platforms
Design For “X” (DFX) cont.

• Quality
  – Serviceability in field
  – Adaptability to variability in materials and manufacturing conditions
  – Adaptability to various use conditions