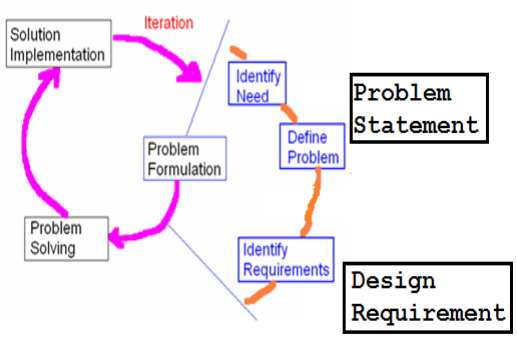
Design Requirements



EECE401 Senior Design

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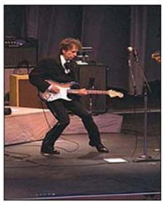
Recall: Problem Formulation Process

- Problem Statement:
  - NABC Proposition (1 sentence for each)
    1. Needs (Dissatisfied Condition/Situation)
       - Customer's undesirable situations
    2. Approach – Conceptual Solution
    3. Benefits
       - How the proposition brings benefit
    4. Competitiveness
  - Combined 4-sentence problem statement



Your team's Problem Statement

- Next Step ?

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Design Requirement

- After the problem statement:
  - We have not proposed a specific solution here yet to convert the ( ) to the benefits , but we can **imagine/visualize the ( )** which provides the promised benefits and its features
- **Design Requirements**
  - A **technical description** of the final product
  - Conversion of "Layman's term" of the desire to "Technical terms and to Specification"
- Specification: Definition: A product specification is a document with a set of ( ) that provides product teams the information they need to build out new features of functionality.

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Image of Final Product → Requirement (or "Spec")

- Conversion of **Description → Specification** (Example)
  - Customer: "My AC Adapter for my old laptop is dead but I could not find replacement in the market."
  - Final Product: "An AC adapter which can replace the dead one for the old laptop"
  - **Design engineer: What questions** do we need ask to **design and manufacture the customized adapter** for the customer?
    - Quantification is essential

Specification:

Replacement Dell Latitude E6500 AC Adapter 90Watt 19.5V 4.62A

Manufacturer: 3rd Party

Input: AC100-240V (worldwide use)
Output: DC19.5V 4.62A
Power: 90W Max

Outlet: 3-Prong

DC Connecter (Barrel) size:
Internal Diameter: 5.0mm
External Diameter: 7.4mm
With central smart-pin

Item Includes: AC Adapter and Power Cord.

Product Specs – Samples (Anything with numbers belongs to "spec")

- **Inputs:** 110 V AC via 3-wire connection
- **Outputs**: 12V DC with Max Current of 4Amps.
- **Response Time**: Output should be available within 1 sec after input command entered
- **Dimensions**: It must fit within 10"x6"X15"
- **Speed**: Max 10 mph and Min 1 mph
- **Energy Use**: The max power 50W
- **Battery**: 12V 12Ah Battery
  Operation Limit: The system should stand more than 4 hours in temperatures ranging from 40°F to 120°F.
- **Weight:** The system must be less than 5 lbs
- **Noise Level:** The noise level of the system should be less than 60dB at 2 feet from front of the device when operating
- **Performance:** Full battery gives minimum 10 hours of operation
- **Software Requirement**: Open source
- **Platform/Hardware**: minimum 64-bit process with 64MB RAM

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Product Specs – for your own project

- 1. Start from the Problem Statement of your team project
- 2. Imagine the final product which satisfies the dissatisfied situations and provides the promised benefits
- 3. Now specify/quantify the final product by
  - Size
  - Weight
  - Speed
  - Response time
  - Material
  - -etc
- 4. Write (fill) the Product Specs for your project

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Product Specification - **Summary**

- What is Specification ?
  - Technical Guide for **Development**
  - Conversion **from** Plain **English description** of problem statement **to** **Technical Terms for Design & Development**
  - **Product Specs**
- BUT, "Design Requirements" are NOT just "specification" – it is **just one component**
- There is **1 more component**

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Component 2. **Constraints**

- **1. Environmental Constraints:** Environmentally concerned/friendly material and design
  - "Container must be made of at least 33% post-consumer materials and must be 100% recyclable"
- **2. Socio-Cultural Constraints**: Customer Cultural Preference-based requirements on material and design,
  - Example - Fengshui.

Ford's 'golden noses' seek edge in slowing China car market

REUTERS

#BUSINESS NEWS JULY 19, 2017 / 7:14 PM /

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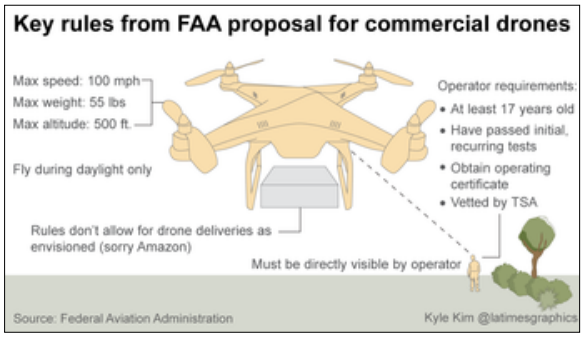
Component 2. Constraints

- **3. Compliance to Regulations**
  - FCC: Electronic devices
    - Part 15 of Title 47 "Low-power, non-licensed transmitters"
    - (Ex) 47 CFR 15.103 "Digital devices oscillating below 1.705 MHz) etc etc"
    - FCC ID --- **traceability** to FCC **compliance**
  - FAA: Aircraft devices
  - FDA: Medical devices
    - (EX) 510(k) Clearance to Market [FDA 21 CFR Part 820]
    - (EX) ISO 13485 Medical Device Quality requirement in International market

FDA 510(k)

  - Others



Constraints – for your own project

1. Start from the <u>image of the Final Product</u>
2. Consider any part/component/fuel which would harmfully impact environment → Find/Search corrective or mitigative approach (material, design, noise, etc)
3. Consider any part/component/fuel which would harmfully impact society/culture → Find/Search corrective or mitigative approach (design, smell, etc)
4. Consider what rules, regulations, or codes the final product should comply with to be cleared for sale. → Find/Search those applied to the similar or same class products in the market.

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Design Requirements - Recap

- **Conversion** from customer needs to the final product to technical terms for guiding development effort
- **2 Components**:
  - (a) Product Specifications,
  - (b) Constraints (Environmental & Socio-Cultural & Compliance)
- Design Requirements should:
  - Be quantitative, measurable, and precise
  - Do not describe specific solution approach
  - Be comprehensive

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Design Requirement Form		
Date:		
Project Name/Title:		
Team Advisor		
Project's Goal/Scope		
Team Members		
4-sentence problem statement		
Requirements	**Items**	**Quantity**
1. Preoduct Specification		
2. Contraints	Environmental Constraints	
	Socio-Cultural Constraints	
	Compliance (Rules, Regulations, and Standards)	

Design Requirement Form

- Check the webpage for Assignment 3 for Design Requirement

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