



Problem Understanding MCHE 470 – Fall 2013

Dr. Joshua Vaughan

Rougeou 225

joshua.v Vaughan@louisiana.edu

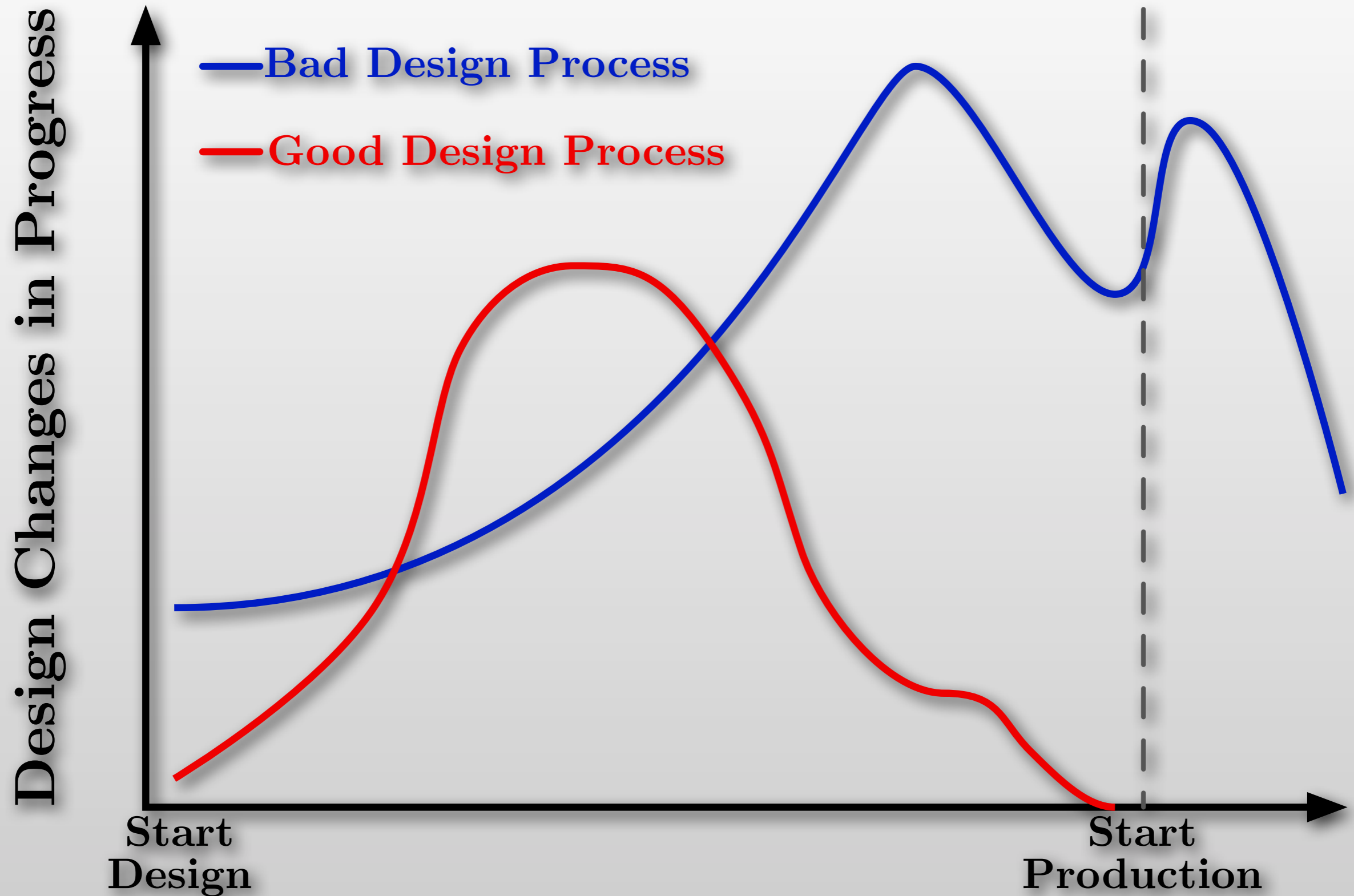
[@Doc_Vaughan](#)

Problem Understanding



- Who is the customer?
 - end-user?
 - reseller?
 - sales team?
 - ...???
- Who *are* the *customers*?
- These customers *will* have some conflicting needs/
demands

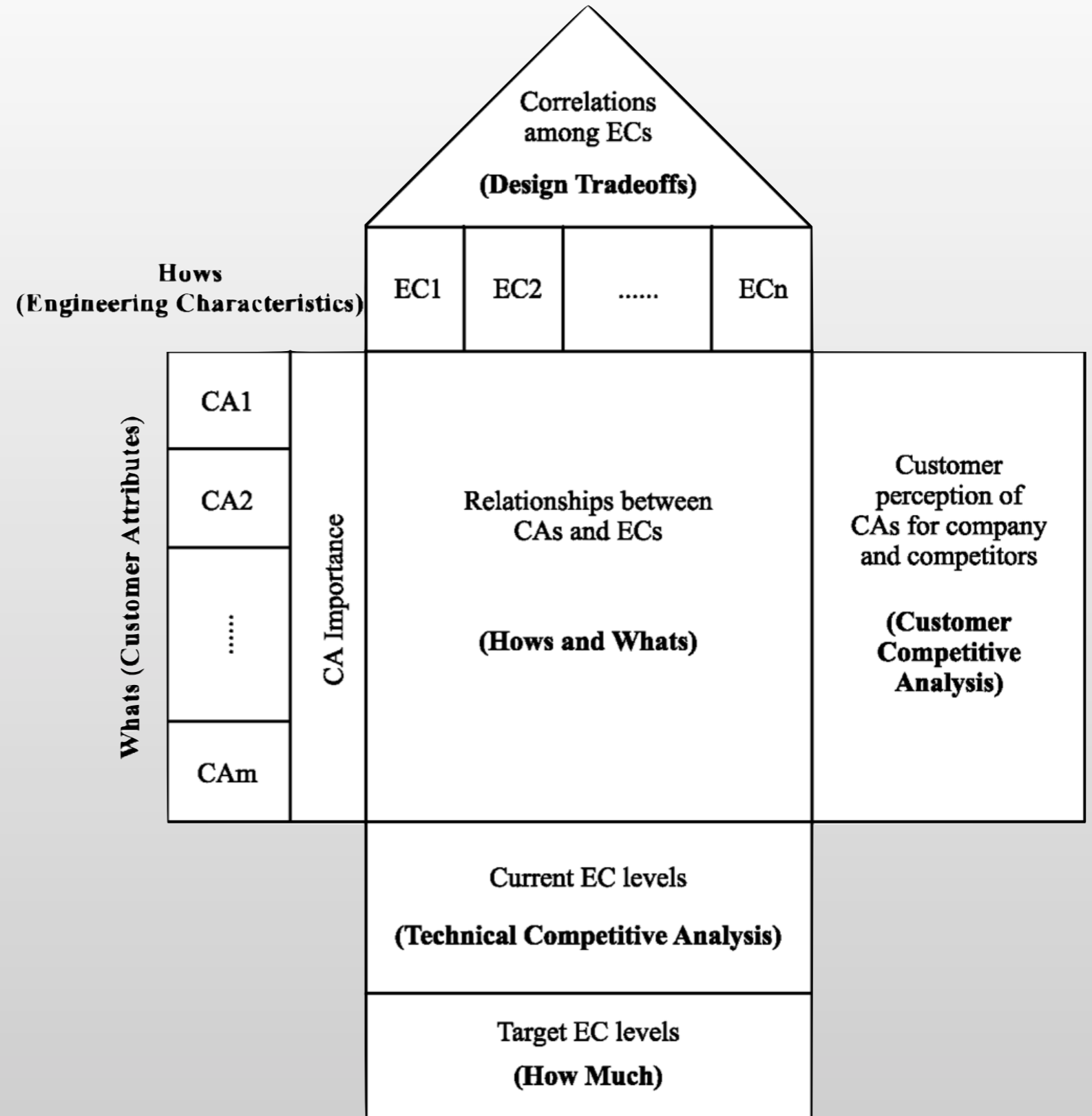
Design Change Comparison



The House of Quality



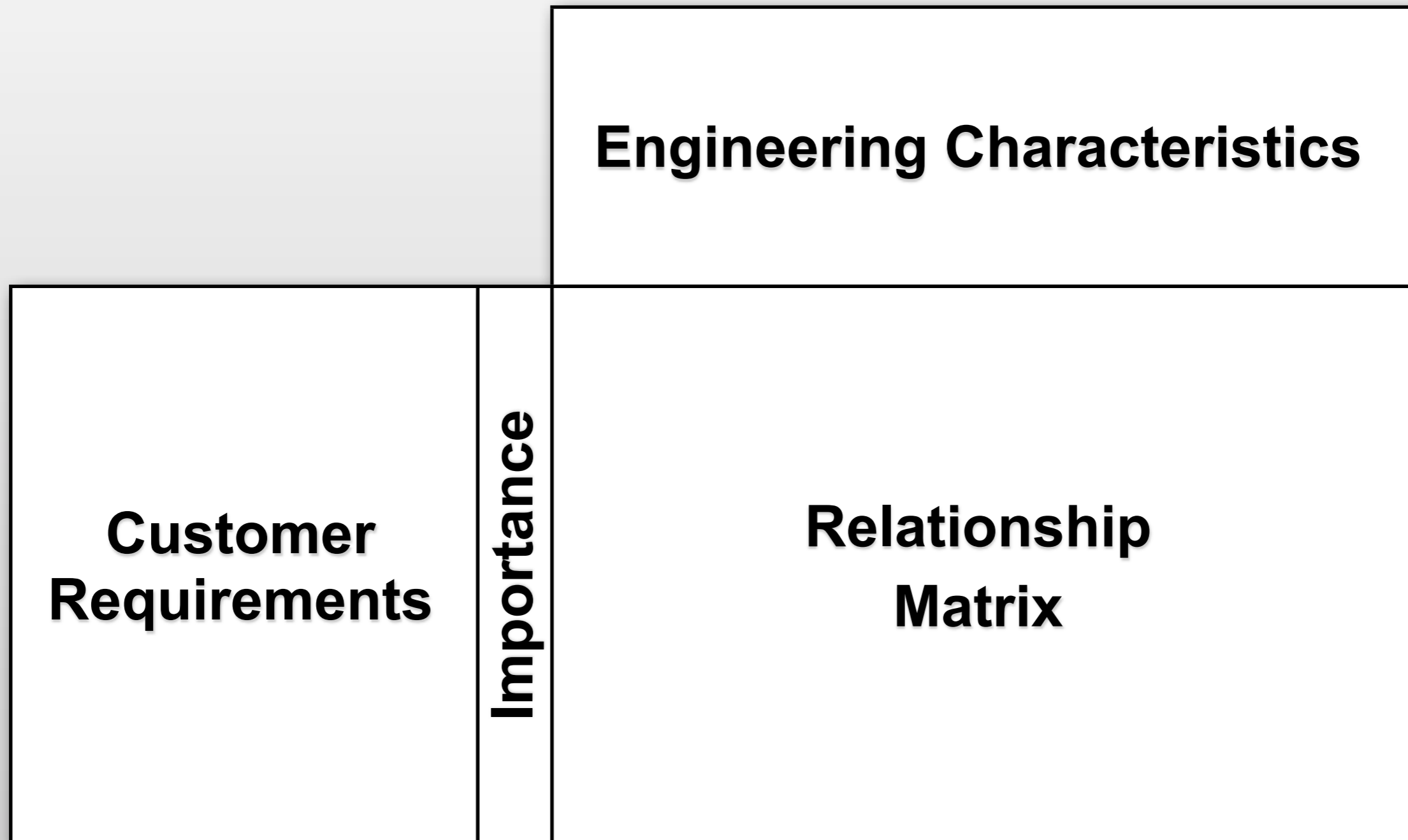
- A lot of the utility is completing the tool
- A “living” document



The Problem Understanding Form



- The “middle” of the House of Quality



The Problem Understanding Form



- The “middle” of the House of Quality

●	Strong = 9
■	Medium = 3
△	Weak = 1

		Engineering Characteristics				
		●	■	△		
Customer Requirements	Importance	●	■	△		

The Problem Understanding Form



- The “middle” of the House of Quality

●	Strong = 9
■	Medium = 3
△	Weak = 1

Engineering Characteristics

Customer Requirements	Importance	●		■	△	

The Problem Understanding Form



- The “middle” of the House of Quality

●	Strong = 9
■	Medium = 3
△	Weak = 1

Engineering Characteristics

Customer Requirements	Importance	●		■	△	
			●	■		■
		●	■		△	
		■	△			■
			●	△	●	△

Using the House of Quality



- Look for:
 - Blank rows

The Problem Understanding Form



- The “middle” of the House of Quality

●	Strong = 9
■	Medium = 3
△	Weak = 1

Engineering Characteristics

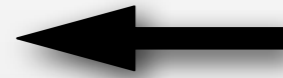
Customer Requirements	Importance	●		■	△	
		Empty Rows are a Problem				
		●	■		△	
		■	△			■
			●	△	●	△

Using the House of Quality



- Look for:

- Blank rows



**Customer Need is not
being addressed**

- Blank columns

The Problem Understanding Form



- The “middle” of the House of Quality

●	Strong = 9
■	Medium = 3
△	Weak = 1

Engineering Characteristics

Customer Requirements	Importance	●		■	△	Empty Cols. are a Problem
			●	■		
		●	■		△	
		■	△			
			●	△	●	

Using the House of Quality



- Look for:

- Blank rows



**Customer Need is not
being addressed**

- Blank columns



**Addressing a Customer
Need that does not exist**

The Problem Understanding Form



●	Strong = 9
■	Medium = 3
△	Weak = 1

Engineering Characteristics

Customer Requirements	5	●		■	△	
	6		●	■		■
	9	●	■		△	
	2	■	△			■
	1		●	△	●	△

Technical Importance(s)



- We can get numbers
- Be careful to not use *only* the numbers as justification for design decisions!
- Absolute Importance - Sum along a column

$$\sum_{\text{col}} (\text{relationship ranking} \times \text{customer importance})$$

- Relative Importance
 - Absolute importance of Eng. Char / Sum of absolute importances

$$\sum_{\text{char.}} \frac{\text{Absolute Importance}}{\sum (\text{Absolute Importances})}$$

The Problem Understanding Form



●	Strong = 9
■	Medium = 3
△	Weak = 1

Engineering Characteristics

Customer Requirements	5	●		■	△	
	6		●	■		■
	9	●	■		△	
	2	■	△			■
	1		●	△	●	△
Absolute Importance		132				

↑ $5*9 + 9*9 + 2*3 = 132$

The Problem Understanding Form



●	Strong = 9
■	Medium = 3
△	Weak = 1

Engineering Characteristics

Customer Requirements	5	●		■	△	
	6		●	■		■
	9	●	■		△	
	2	■	△			■
	1		●	△	●	△
Absolute Importance		132	92	34	23	73

**sum
354**

The Problem Understanding Form



●	Strong = 9
■	Medium = 3
△	Weak = 1

Engineering Characteristics

Customer Requirements	5	●		■	△	
	6		●	■		■
	9	●	■		△	
	2	■	△			■
	1		●	△	●	△
Absolute Importance		132	92	34	23	73
Relative Importance		0.37	0.26	0.10	0.06	0.21

**sum
354**

Design Specifications



- Numerical targets or constraints that *all* possible concepts must meet
- Derived from:
 - Standards
 - Customer requirements
 - Engineering Analysis

Design Specifications (cont.)



- Typical categories include:
 - Geometric
 - Kinematics
 - Dynamics
 - Energy
 - Costs
 - Material
 - Signals
 - Safety
 - Ergonomics
 - Schedules
 - Assembly
 - Transportation
 - Operation
 - Quality Control
 - Recycling

The Spec. Sheet

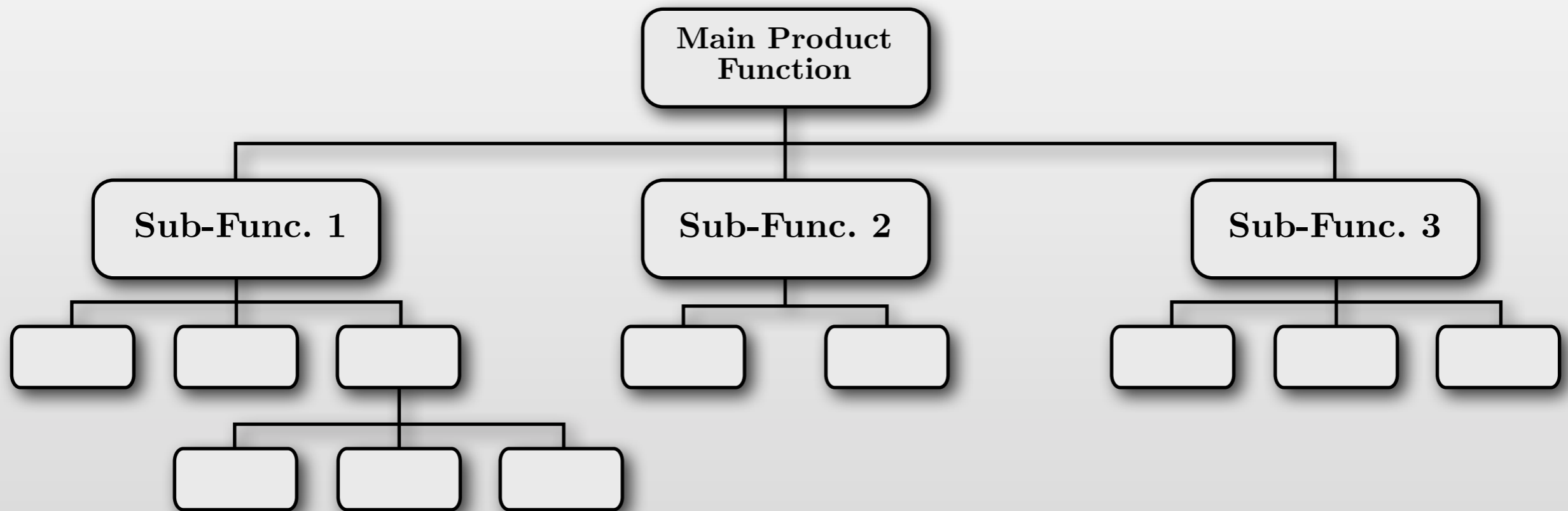


		For: PRODUCT NAME	Issued: mm/dd/yy	
			Page x of N	
Changes	D/W	Requirements	Resp.	Source
Date of last change.	Demand or Wish?	Requirements, sorted by category.	Who is responsible?	What is the source of this requirement?

Function Trees



- Break large, difficult design process into many small easy ones



- Continue until the sub-functions are almost trivial

Function Trees (cont.)



- Functions are actions the concept is capable of *doing*
- Functions are *NOT*
 - Specific solutions - *e.g.* “Move arm 180 deg.”
 - Constraints or specs - *e.g.* “Be smaller than...”

Morphological Charts

