

**I always wanted to be somebody...
I should have been more specific**

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2.009 Product engineering processes



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Today

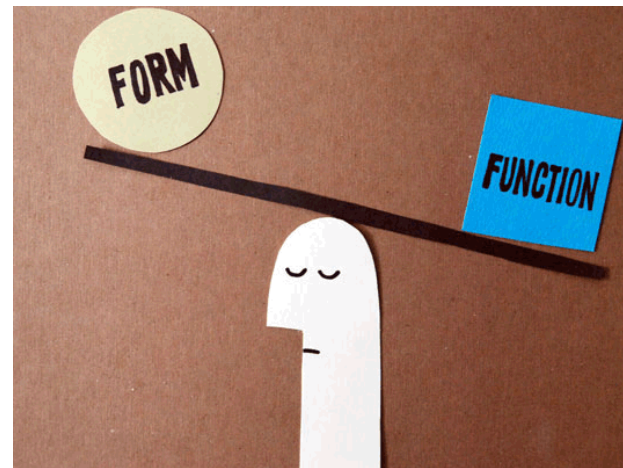
Specifications defining project success



But first a mini quiz!

name on index card
1 minute

form follows function means?



And...

few reminders

team review results online

instructor review open until 5 PM Monday

bring laptops to class on Monday

read chapter 16 before class Monday

Solidworks bootstrap tutorial 4 PM Tuesday

Specifications

mockup review: preliminary product contract

Product Description: Portable electric device for lifting automobiles.

Intended Customers: Backyard mechanics.

Market: Automotive accessories.

Customer Need	Product Attribute(s)	Engineering Specification(s)
Can be easily transported in and out of a house.	Weight	Total weight less than 30 lbs.
Is easily stored in the home and office.	Size	Less than 14" x 14" x 14" in smallest configuration.
Can handle most repair situations.	Lifting capability	more than 15 cycles at 1" per second per charge for a 3000 lb. automobile.
Can be used on many uneven surfaces.	Stability	3000 lb vehicle raised 16 inches will not tip under 400 lb side loading. Base self-levels up to 1 inch discontinuities and 2% slopes in pavement.

Customer needs

Wednesday's class

extracting customer data

observation



one-on-one interviews

converting customer data to customer needs

what, not how
positive, not negative
same specificity
do not prioritize

Identifying attributes

map attributes to needs

Need	Attribute	assemblability	usability	fault detection	wow factor
easy to setup		■			
safe			■	■	
special		■			■

house of quality

Once you have attributes

set specifications

translate the product attributes (customer needs) into quantitative design performance targets

quantify the core benefit of your product

define internal basis for measuring success

provide a basis for resolving trade-offs

keep the development effort focused



Setting specifications

definition

a precise description of *what* the product must do

customer need: easy to install

interpretation: average time to assemble is less than 60 seconds (Floyd)

design attribute: assemblability

metric: time to assemble

unit: seconds

value: less than 60

owner: Floyd

specification

what it must do

Setting specifications

they are **NOT...**

descriptions of *how* to implement the product
(embodiment)

customer need: easy to find

design attribute: visibility

metric: color

unit: rgb

value: 255, 255, 0 (yellow!)

owner: Floyd



metric: time to spot

unit: seconds

value: less than 5

Identifying appropriate metrics

measure the product attributes

metrics should be observable or analyzable
properties/behaviors of the product

metrics should be quantifiable

include metrics used in the marketplace for
benchmarking

Attributes and specifications

example: types of metric values

attribute	metric	unit	value
damage detection	defects visible	binary	yes/no
solidifies in heat	thermo-sets	binary	yes/no
household usability	curing temperature	Celsius	between 50 and 100
producability	manufacturing time	days	less than 2
food safe	FDA approved mat'ls.	binary	yes/no
Atkins-diet friendly	carbohydrate content	grams/product	less than 1

mini quiz! what product might meet these specifications?

Attributes and specifications

example: types of values

attribute	metric
damage detection	defects visible
solidifies in heat	thermo-sets
household usability	curing temperature
producability	manufacturing time
food safe	FDA approved mat'ls.
Atkins-diet friendly	carbohydrate content



Exercise

writing specifications

each section has a 'product' kit

develop specifications consistent with the product

assess specifications developed by another team

interpret specifications and identify products that meet them (and why)

present and critique specifications



Exercise

step 1: 10 minutes

develop specifications consistent with your fruit “product”

use attribute and specification forms provided (one extra copy of each)

write legibly, use black sharpie provided

attribute	metric	unit	value
damage detection	defects visible	binary	yes/no
solidifies in heat	thermo-sets	binary	yes/no
home usability	curing temperature	Celsius	between 50 and 100
producability	manufacturing time	days	less than 2
food safe	FDA approved mat'ls.	binary	yes/no
Atkins-diet friendly	carbohydrate content	grams/unit	less than 1

Exercise

step 2: 7 minutes

review another section's specification

i) use red sharpie to highlight questionable specifications

ii) identify products that fit the specification, using form provided

product is:	metric	unit	value
<input type="text"/>	visible defects	binary	yes/no
could be:	thermo-sets product description?	binary	yes/no
<input type="text"/>	setting temperature	Celsius	between 50 and 100
<input type="text"/>	manufacturing time	days	less than 21 seems long
<input type="text"/>	FDA approved mat'ls.	binary	yes/no
<input type="text"/>	carbohydrate content	grams/unit	less than 1

Exercise

step 3: 7 minutes

present and critique:

what products fit and why, discuss specification

**critiqued a
good specification?**

**critiqued a
less good specification?**