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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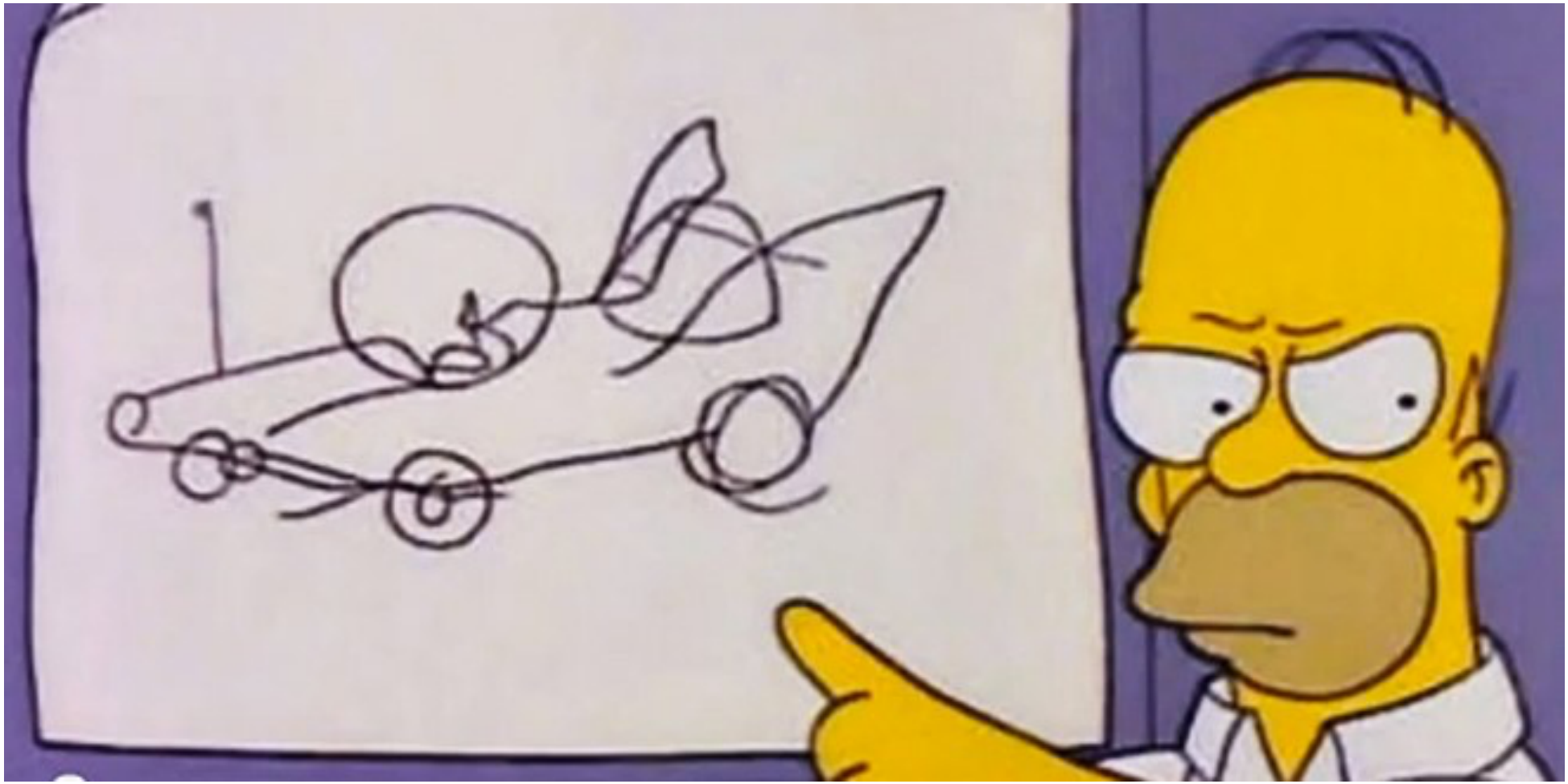
today

specifications define what you want to be!
what you follow for success



but first…

a few reminders

team and peer reviews due 9 PM
digital notebook submissions 10 PM Thursday

user centric design tutorial, Thursday 7 PM in Pappalardo

Customer needs

mockup review: preliminary product contract

Product Description: Portable electric device for lifting automobiles

Intended Customer: Back yard mechanics

Market: Automotive accessories

Customer Needs	Design Attributes	Engineering Specifications
Can be easily transported in and out of a house		
Is easily stored in the home and office		
Comfortable to carry		

Customer needs

class Monday

extracting customer data

observation

one-on-one interviews

converting customer data to customer needs

and now …

a mini quiz!

list 4 guidelines for converting customer data into customer need statements!

customer data	need (correct)	need (incorrect)
"it does not matter if it's wet, I still need to do my work"	operates normally in the rain	is not disabled by the rain

customer data	need (correct)	need (incorrect)
"put protective shields around battery contacts"	protect batteries from accidental shorting	cover battery contacts with sliding door

customer data	need (correct)	need (incorrect)
"I really hate it when the product dies without warning"	the product indicates power reserve	the product must indicate power reserve

customer data	need (correct)	need (incorrect)
"I drop the product all the time"	product operates normally after repeated dropping	the product is rugged

what, not how

positive, not negative

same specificity

do not include priority

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.		
Is easily stored in the home and office.		
Can handle most repair situations.		
Can be used on many uneven surfaces.		

Identifying attributes

map attributes to needs

Need
easy to setup
safe
special

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

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	
Is easily stored in the home and office.	Size	
Can handle most repair situations.	Lifting capability	
Can be used on many uneven surfaces.	Stability	

Once you have attributes

set specifications

translate the product attributes 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 setup

interpretation: average time to assemble is less than 60 seconds

design attribute: assemblability

metric: time to assemble

unit: seconds

value: less than 60

owner: Peter F

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: Peter F

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	detect visibility	binary	yes/no
solidifies in heat	thermo-sets	binary	yes/no
household usability	curing temperature	Celsius	between 50 and 100
producability	manufacturing time	days	between 1 and 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	defect visibility
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	defect visibility	binary	yes/no
solidifies in heat	thermo-sets	binary	yes/no
home usability	curing temperature	Celsius	between 50 and 100
producability	manufacturing time	days	between 1 and 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
	defect visibility	binary	yes/no
could be:	thermo-sets product description?	binary	yes/no
	setting temperature	Celsius	between 50 and 100
	manufacturing time	days	between 1 and 2 seems long
	FDA approved mat'ls.	binary	yes/no
	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?