

## Session 5: Concept Development (or Exploration)

### Concept Generation and Selection

#### Topics

Caleb Chung video (Furby and Pleo)

Concept Generation

Quiz

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Break

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Concept Selection

Hands-on: bath chair concept development

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#### Video: Caleb Chung

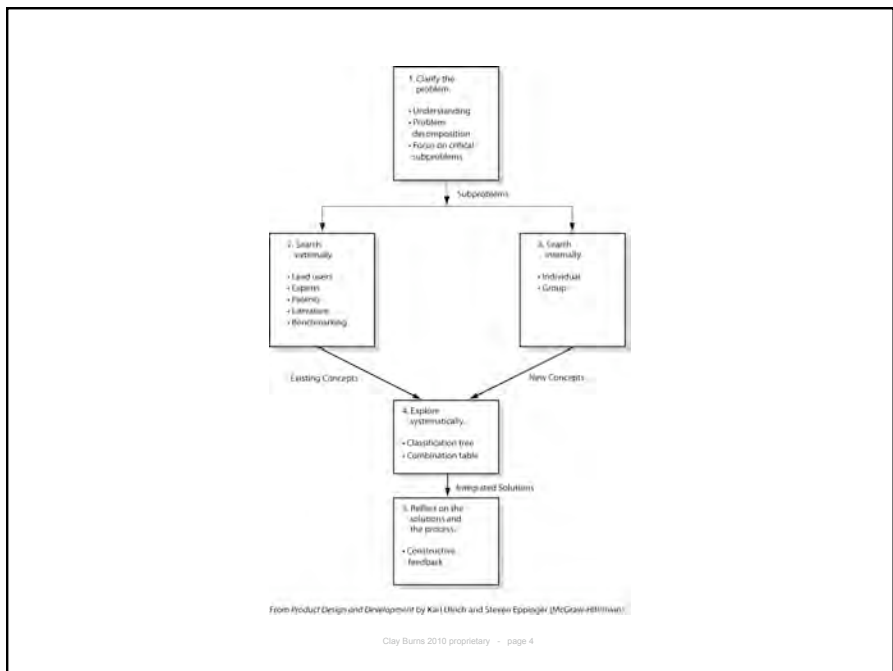
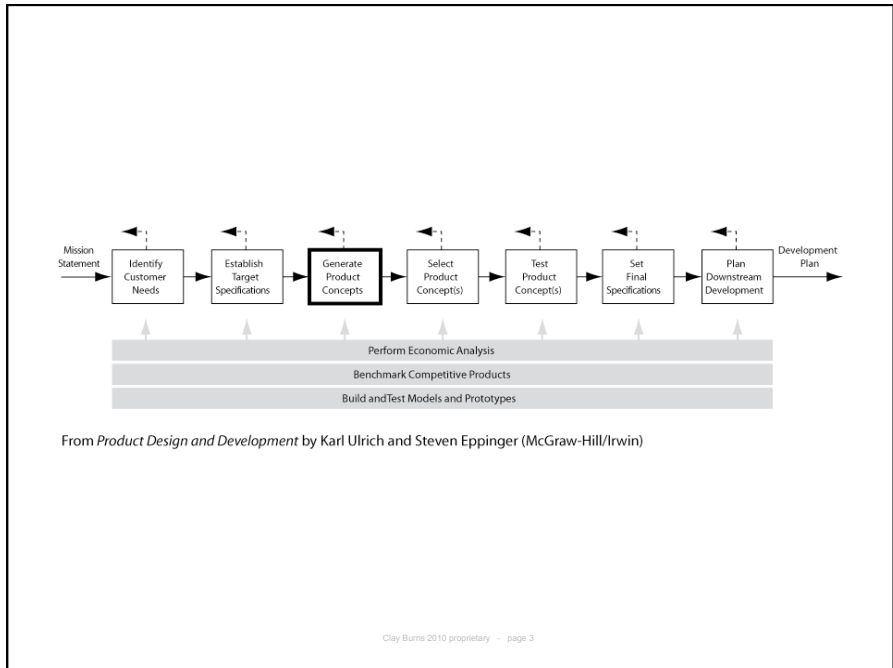
Concept Development of Furby and Pleo toys



[http://poptech.org/popcasts/caleb\\_chung\\_poptech\\_2007](http://poptech.org/popcasts/caleb_chung_poptech_2007)

[www.poptech.org](http://www.poptech.org)

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## Concept Generation **12 Methods and Tips**

Clarify and break down the problem (diagram, storyboard)

Ideation, sketching, brainstorming (group or solo)

Simulation of task or activity

Look for analogies (e.g. biomimicry)

Technology search and transfer

Post images to stimulate thinking

Noodling or ruminating while doing something else

Get outside, walk, explore!

Build from existing products

Stay positive....avoid "that won't work..."

Build on other people's ideas

Follow the energy

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## **Break down the problem – task analysis of user interaction or functional components**

Detailed look at Espresso project from Smart Design

>Espresso PDF



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## CONSOLIDATED ESPRESSO PROCESS

A STEP BY STEP DESCRIPTION AND ANALYSIS OF THE ESPRESSO MAKING PROCESS, FROM SET UP TO CLEAN UP.

INTERGRATING INFORMATION GARNERED FROM OUR RESEARCH ALLOWS US TO HIGHLIGHT KEY ISSUES AND EXTRACT AREAS FOR OPPORTUNITY.

Throughout the process a both home users and experts users are represented. Expert users allow up to understand the 'proper' way to execute along with their shortcuts and efficiency. As well as creating an aspirational, confident point of view. Amateur users highlight problems with home setups. And many people create on the go work-around solutions that can be a source of inspiration.

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## Step Through Process

COFFEE PREPARATION  
EQUIPMENT

### Issues/ opportunities

space  
locating tools  
timing  
cleaning equipment  
how/when the machine is ready  
visibility  
positive or negative experience



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## Step Through Process

COFFEE PREPARATION  
INGREDIENTS, BEANS AND STUFF

**Issues/ opportunities**  
opening the bag  
spilling  
space on countertop  
things located in different places

Get the Beans ready for grinding

Load Water

Gather Milk Sugar Spice etc



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## Step Through Process

COFFEE MAKING  
GRIND BEANS

**Issues/ opportunities**  
how do you know how fine?  
Spilling  
opening/sealing the bag  
knowing the right amount  
cleaning the grinder  
scooping

Set the grind level

Place lid and activate grinder

Smell the coffee

Seal unused coffee



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### Step Through Process

#### COFFEE MAKING SCOOPING INTO PORTOFILTER

**Issues/ opportunities**  
how much – single/double?  
finding the scoop  
where does scoop live  
cleaning  
spilling

Or position Porto  
filter under ground  
station and go  
Clack, clack.

Locate scoop/ spoon

Scoop coffee into Porto filter

Fill to appropriate level.



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### Step Through Process

#### COFFEE MAKING TAMPING

**Issues/ opportunities**  
describing the importance  
education  
right size tamper  
sharp edges  
correct bow  
correct pressure  
getting the loose stuff off  
holding the portafilter steady  
right grip and feel

Having filled the Portafilter to  
edges

Give an initial press with the  
tamper

Press more firmly

Clear away loose  
grains and check  
compactness.



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### Step Through Process

#### COFFEE MAKING EXTRACTING SHOT

**Issues/ opportunities**  
time – when to stop  
fitting tight  
cleaning  
placing the cup  
correct cup size

**Locate Portafilter into machine,  
ensuring a tight fit**



**Place cup(s) under extraction  
head Activate the hot water**



**Allow extraction for the  
appropriate period**



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### Step Through Process

#### COFFEE MAKING TRANSFER SHOT

**Issues/ opportunities**  
locating the cup  
stability  
container temperature  
avoid spilling  
pouring, no burnt fingers  
wide opening, spout  
container storage  
cleaning

**Locate Portafilter into machine,  
ensuring a tight fit**



**Pour shot into destination vessel**

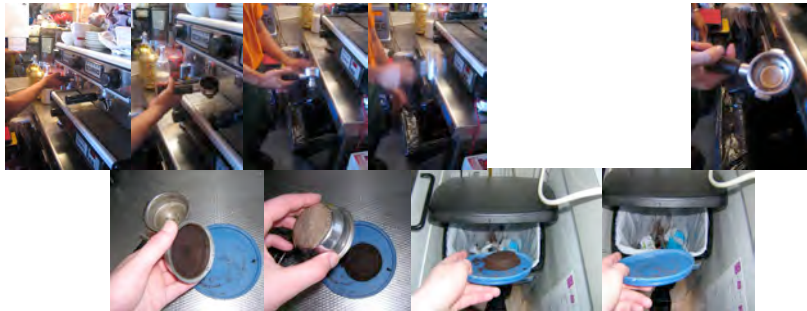
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### Step Through Process

COFFEE MAKING  
EMPTY USED COFFEE FROM  
PORTOFILTER

### Issues/ opportunities

wet or dry puck  
knock box location  
other refuse options  
noise, damage  
getting it all out  
cleaning  
speed – need to make next  
cup



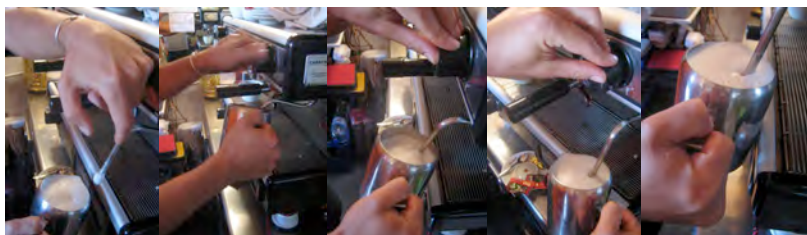
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### Step Through Process

MILK PROCESS  
FROTHING

### Issues/ opportunities

quantity of milk  
temperature desired  
how far to insert steam nozzle  
position/angle of nozzle  
what kind of froth desired  
cleaning nozzle  
steam noise, temperature  
hand protection  
visibility



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### Step Through Process

#### MILK PROCESS MILK TRANSFER TO CUP

#### Issues/ opportunities

- spilling, pouring
- quantity of milk to transfer
- maintaining froth
- using spoon to assist pour
- spout shape
- frother handling
- what to do with extra milk



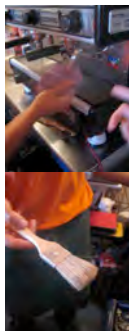
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### Step Through Process

#### CLEANING EQUIPMENT/MACHINE/GRINDER

#### Issues/ opportunities

- where equipment is kept
- where are the cleaning things
- what kind of cleaning is best
- when / how often
- damage to equipment
- nooks & crannies
- machine cleaning cycles



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## Step Through Process

ENJOY!

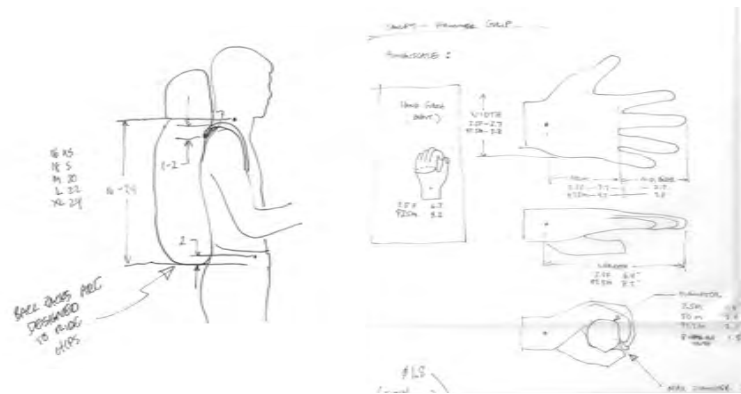
**Issues/ opportunities**  
what are good combinations  
timing of accompaniments  
repeat orders (more please!)

Chocolate, biscotti, brandy, cigars....in the morning, after lunch.....



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Sketching **anthropometry and ergonomics** as a way to explore constraints and develop concepts



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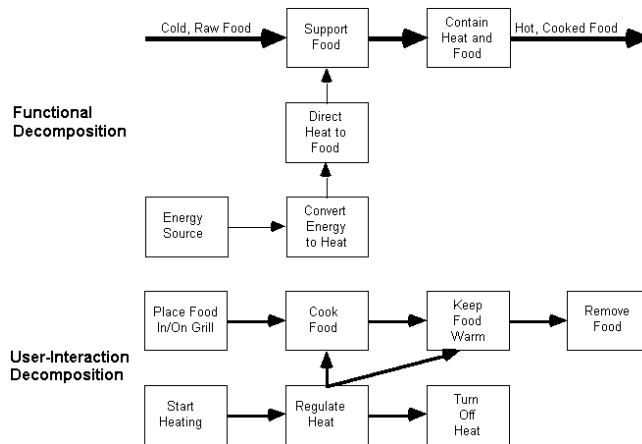


EX 6.1

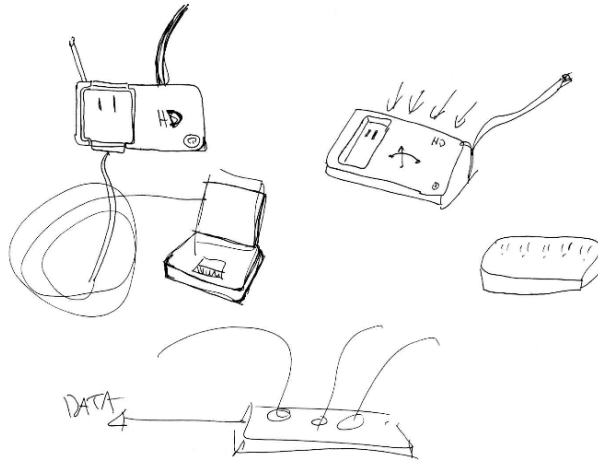
Decompose the problem of designing a new barbecue grill. Try a functional decomposition as well as a decomposition based on the user interactions with the product.

EX 6.1

Decompose the problem of designing a new barbecue grill. Try a functional decomposition as well as a decomposition based on the user interactions with the product.

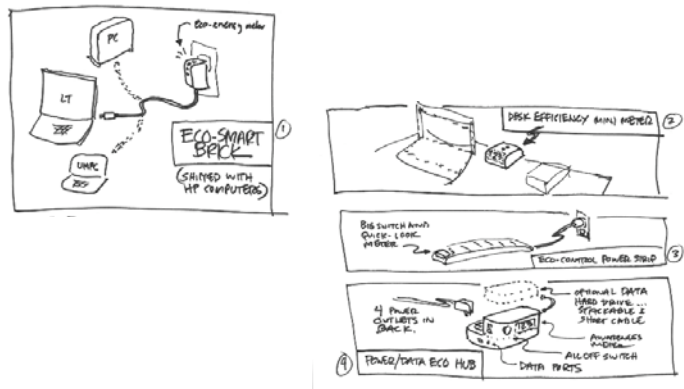


Sketching brainstorming & basic idea communication

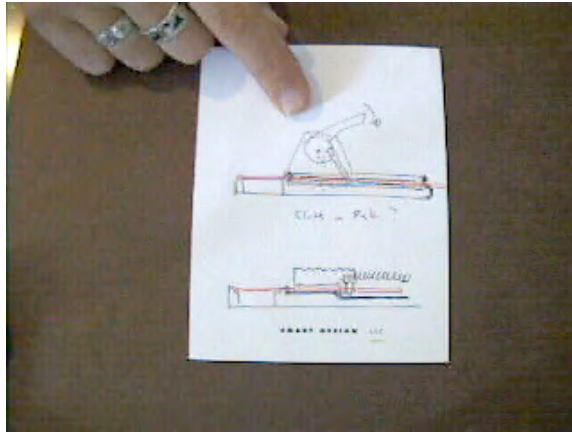


Sketching basic storytelling

Don't have to be an artist, just need to convey concept!



Sketching functional details



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EX 6.2

*Generate 20 concepts for the subproblem "prevent fraying of end of a rope" as part of a system for cutting lengths of nylon rope from a spool.*

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EX 6.2

*Generate 20 concepts for the subproblem "prevent fraying of end of a rope" as part of a system for cutting lengths of nylon rope from a spool.*

*(Based on a solution by Jim Colgan)*

- 1. Tape the end of the rope.*
- 2. Use a torch to melt the end of the nylon rope*
- 3. Press fit a plastic cap.*
- 4. Dip end of rope into a glue.*
- 5. Tie end of rope in a knot.*
- 6. Use a machine that clips the rope while at the same time applies heat to the end of the rope.*
- 7. Dip the end of the rope into paint.*
- 8. Shrink wrap plastic around the end of the rope.*
- 9. Use a process similar to that used for the end of a shoelace.*
- 10. Attach a steel ring around the rope.*
- 11. Apply a twisting action to the end of the rope to create friction/heat that will ultimately melt the separate strands together.*

*Usually there are more possible concepts to a problem than you think!*

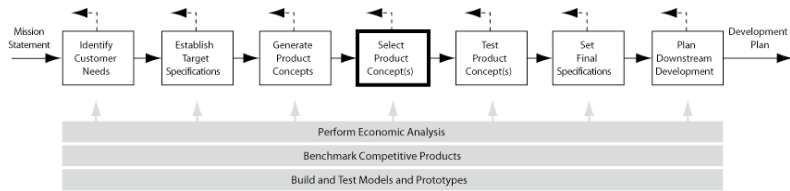
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# Quiz



# BREAK

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From *Product Design and Development* by Karl Ulrich and Steven Eppinger (McGraw-Hill/Irwin)

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### Concept Selection (screening and scoring)

*A decision-making method (like a pro-con)*

Over the years I have found scoring matrices to be useful in telling me what I already know, sometimes what I don't, and once in a while what I don't want to see!

In some cases, we make the ratings come out the way we wanted in the first place! Beware of this...

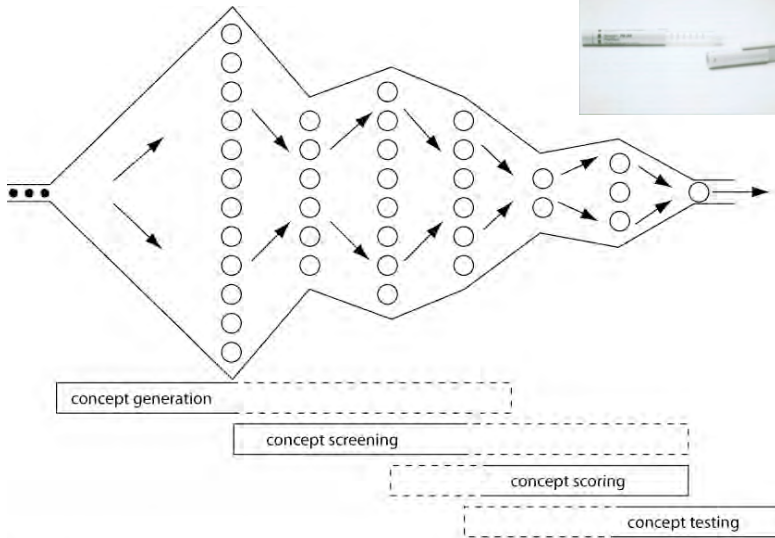
Sometimes the analysis is not decisive, and we have to "go with our intuition or hunch".

**In *Blink*, Gladwell suggests any over-analysis is risky. For one person that might be true, but if you are operating within a team or organization, where decisions do not just affect you, analysis is recommended.**

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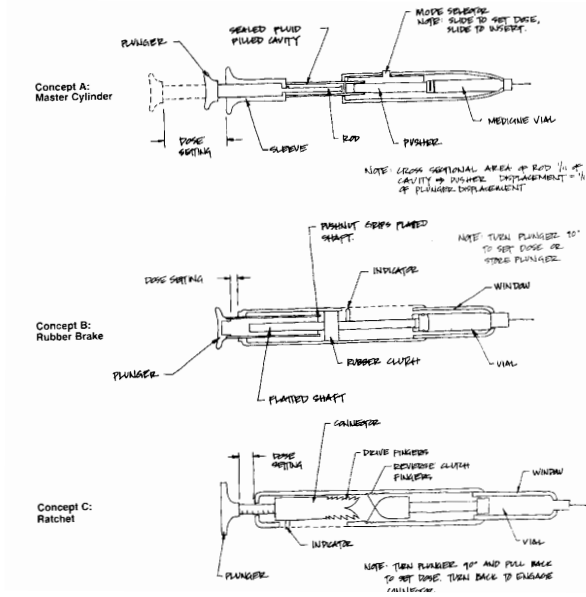


From *Product Design and Development* by Karl Ulrich and Steven Eppinger (McGraw-Hill/Irwin)



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## Example Concepts for insulin pen

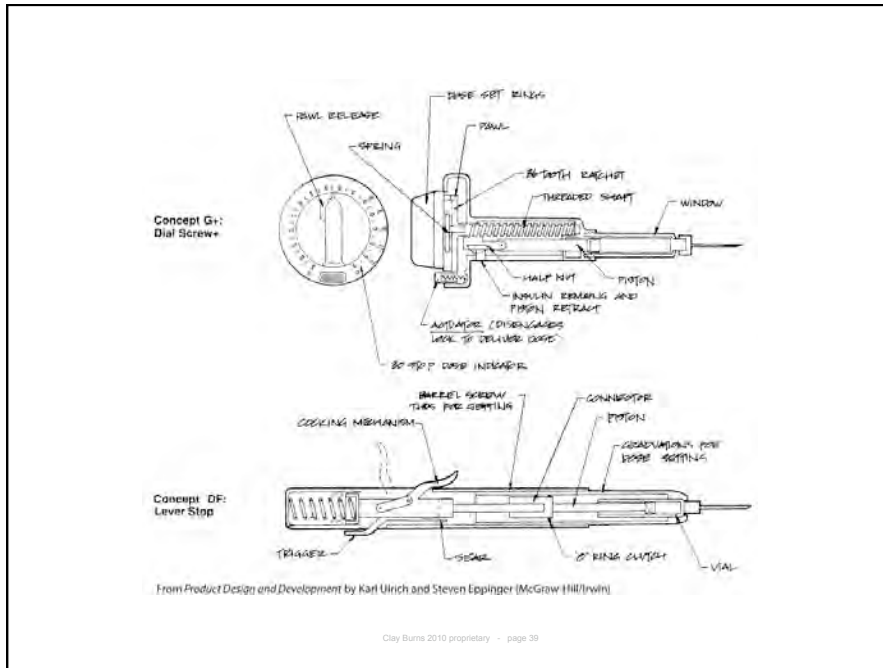


## Concept Selection Method

- Prepare the Matrix
  - Criteria
  - Reference Concept
  - Weightings
- Rate Concepts
  - Screening (+/-/0) or Scoring (e.g. 1-5)
- Rank Concepts
  - Sum Scores (and weightings if used)
- Combine and Improve
- Select Best Concept
  - May Be More than One
  - Beware of Average Concepts

The goal of concept selection is to develop the best concept.





## Concept Scoring

		Concepts							
		A (reference) Master Cylinder		DF Lever Stop		E Swash Ring		G+ Dial Screw+	
Selection Criteria	Weight	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
Ease of Handling	5%	3	0.15	3	0.15	4	0.2	4	0.2
Ease of Use	15%	3	0.45	4	0.6	4	0.6	3	0.45
Readability of Settings	10%	2	0.2	3	0.3	5	0.5	5	0.5
Dose Metering Accuracy	25%	3	0.75	3	0.75	2	0.5	3	0.75
Durability	15%	2	0.3	5	0.75	4	0.6	3	0.45
Ease of Manufacture	20%	3	0.6	3	0.6	2	0.4	2	0.4
Portability	10%	3	0.3	3	0.3	3	0.3	3	0.3
Total Score		2.75		3.45		3.10		3.05	
Rank		4		1		2		3	
Continue?		No		Develop		No		No	

Hands-on: Flashback to bath chair for elderly / disabled



Quote or observation

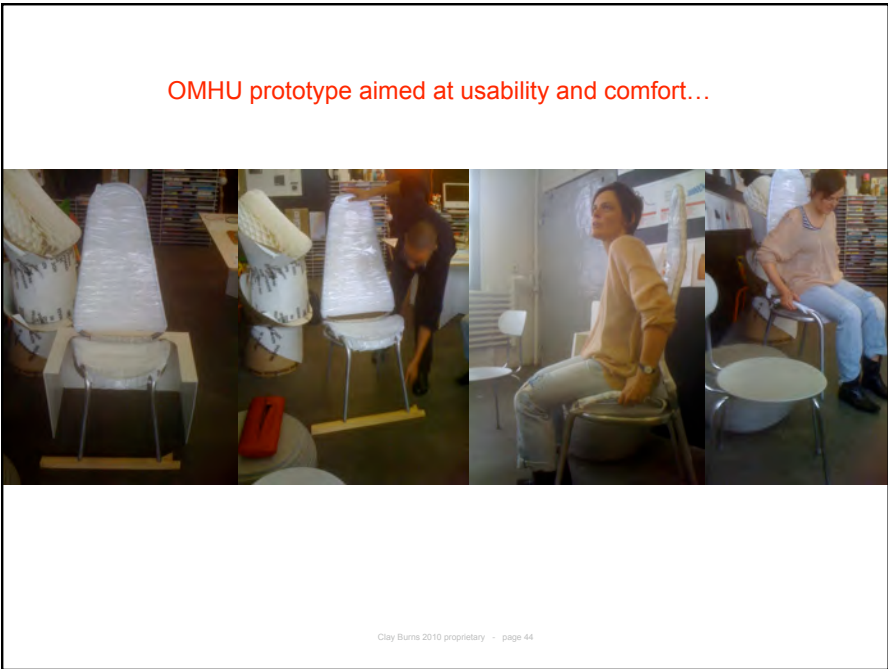
*"I need to change the height to fit me"*  
*"It takes too long to adjust all 4 legs"*  
*"My tub is too narrow to fit those chairs"*  
*"I don't like to leave it in the tub"*  
*"I'm worried about germs on the seat"*

Need Statement

The chair height fits many users  
The chair height can be adjusted quickly  
The bath chair fits in narrow tubs  
The chair is easy to store elsewhere  
The chair inhibits germs



Advanced bath chairs



**Hands-on: Bath chair concepts**

1. Break into teams of 5-6
2. 15 min: Generate concepts or features that meet one or more Needs and Specs, or any need you identify  
*[Prof/TA: Draw a screening matrix to pick the best ones]*
3. Draw concepts on the blackboard
4. Screen and select concepts to pursue
5. If time: Build scoring matrix to arrive at the top direction



Need Statement	Metric	Target Value/units
<i>The height fits many users</i>	height range	8 inches min
<i>The height can be adjusted quickly</i>	time to adjust	5 seconds max for avg user
<i>The bath chair fits in narrow tubs</i>	leg stance width	16 inches max
<i>The bath chair is easy to store elsewhere</i>	a. compacts/folds	pass folding test
<i>The bath chair inhibits germs</i>	b. weight	8 pounds max
	Special germ test	95% or higher germ test score
<i>Or identify a new need....</i>		

Tomorrow: Industrial Design

- History and role of ID in product development
- Explore the look and feel of your concept
- In-class mock-up workshop

Next week:

- Tues: Field Trip
- Weds: 2-Team Concept presentations, including mock-up of lead concept. *Make sure you have this mostly done by Tuesday since we will not return from field trip until 8pm!*