

■ **TO DO:**

- **Goals for Sprint 1 & New Calendars**
- **Determining Design Requirements – Customer Feedback & Universal Design**
- **Work time to compile Design Requirements**
- **IP and Patents**
- **Work time to do some Market Research**
- **Assign team lockers and check in before you go**

■ **LOOKING AHEAD:**

- **Week 3 BEEST posts due by 11:59 pm on 9/14**
- **Week 4 BEEST posts due by 11:59 pm on 9/21**
- **Part 1 of IPP due by 11:59 pm on 9/17**

**WEEK 4  
DAY 1  
(T/TH)**

**WEEK 4  
DAY 2  
(M/W)**



WEEKS 1-3

**Project Pitch**

WEEK 4-6

**SPRINT 1 REVIEW**

WEEKS 7&8

**SPRINT 2 REVIEW**

WEEKS 10-13

**SPRINT 3 REVIEW**

WEEK 15-16

**IDENTIFICATION & JUSTIFICATION OF THE OPPORTUNITY**

- Accessibility Simulation & Design Theme
- Ethnography & Site Observation Activity
- Opportunity Proposals
- Team formation, mission statements, team logo & team charters
- Identify primary Subject Matter Expert (SME)
- Background/Rationale Research
- **PROJECT PITCH PREP**
- **BINDER CHECKS**
- **PART 1 of IPP**

**SPRINT 1**

- Outcome-driven Innovation & customer needs statements
- Compile "Must do, might do, must NOT do" requirements
- Patent Searches, Market Research
- Concept Generation activities
- Concept Screening & Selection, Decision matrices
- Prototyping in Design
- Mock-up (small scale, Level 1) prototypes of top 2 concepts to gather customer feedback
- **SPRINT REVIEW PREP**
- **BINDER CHECKS**

**SPRINT 2**

- Final concept selection based on feedback
- Iterate Design Requirements based on feedback
- Quantify at least one design requirement into a target specification related to customer productivity
- Revise design and build next level prototype (full scale)
- Create bill of materials with cost, place material orders
- Gather customer feedback including price
- **SPRINT REVIEW PREP**
- **BINDER CHECKS**
- **PART 2 of IPP**

**SPRINT 3**

- Iterate Design Requirements based on feedback
- Revise and/or add additional quantifiable target specifications
- Revise bill of materials with cost
- Final product architecture drawing (with component info)
- BOM & Target Costing
- Build Final Prototype
- Robust Design & Product Testing
- Test final prototype and gather customer feedback
- **SPRINT REVIEW PREP**
- **BINDER CHECKS**
- **PART 3 of IPP**

**FINAL SPRINT**

- Final product refinements based on feedback and test data
- Deliver the working prototype to the customer
- **FINAL BINDER CHECKS**
- **FINAL INDIVIDUAL PROJECT PAPER (IPP)**
- **FINAL PROTOTYPE**
- **FINAL EXPO POSTER**
- **FINAL EXPO VIDEO**

Photo Documentation of the Design Process

PROJECT TIMELINE

EGE 2123 Entrepreneurial Engineering Design Studio

**By the end of Sprint 1, your team will:**

- **Create design requirements based on what the design “Must Do, Might Do, Must NOT Do”**
- **Perform an analysis of prior solutions**
- **Generate multiple solution concepts**
- **Screen these concepts based on Design Requirements to identify the top 2**
- **Create small scale prototypes of top 2 for customer feedback**

## **GOALS FOR SPRINT 1 WEEKS 4-6**

### **SPRINT 1**

- Outcome-driven Innovation & customer needs statements
- Compile “Must do, might do, must NOT do” requirements
- Patent Searches, Market Research
- Concept Generation activities
- Concept Screening & Selection, Decision matrices
- Prototyping in Design
- Mock-up (small scale, Level 1) prototypes of top 2 concepts to gather customer feedback
- **SPRINT REVIEW PREP**
- **BINDER CHECKS**



# THE ENGINEERING DESIGN PROCESS

**COMMUNICATE**  
your solution

**ITERATE**  
to improve  
your prototype

**TEST**  
and evaluate  
your prototype

**DEFINE**  
the problem

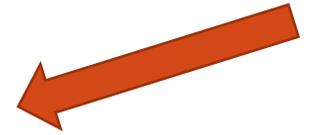
**IDENTIFY**  
constraints on your  
solution (e.g. time, money,  
materials) and criteria  
for success

**BRAINSTORM**  
multiple solutions  
for the problem

**SELECT**  
the most  
promising solution

**PROTOTYPE**  
your solution

**YOU  
ARE  
HERE**



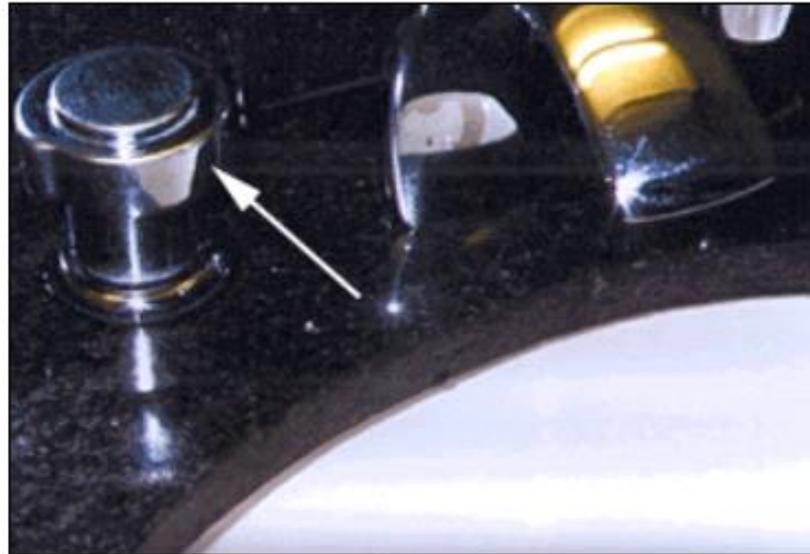
**“ From a product development standpoint, defining what is “required” is one of the most important steps, and *it will be done*, one way or another, like it or not – on purpose or by accident – before the product is finished. The way you do it, and when you do it will certainly influence the final outcome.**

**My suggestion? Do it early, and be as complete as possible then revise as necessary. It will streamline your processes and save a lot of headache. “**

**- Synthesis Engineering Services, Inc.**



Collapse of the 1940 Bridge  
GPHSM, Bashford 2786

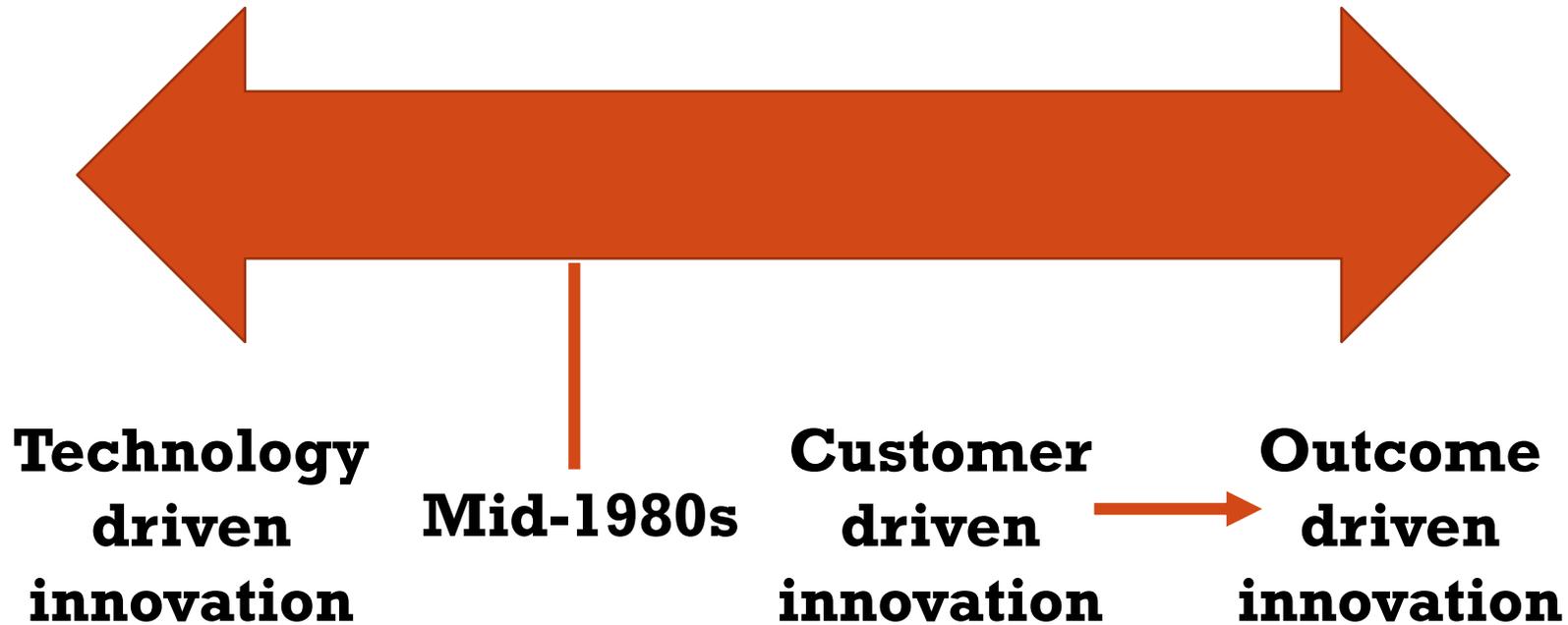


## **DETERMINING DESIGN REQUIREMENTS –**

## **WHAT'S THE BIG DEAL?**



# LEARNING FROM THE PAST



Ulwick, Anthony W. *What Customers Want, Using Outcome-Driven Innovation to Create Breakthrough Products and Services*. New York: McGraw-Hill, 2005. Print.



- **Design constraints given in the syllabus**
- **Site specific customer input (multiple viewpoints?)**
- **Universal Design principles**
- **What you learn from prior solutions**

**HOW DO WE  
DETERMINE  
WHAT IS  
REQUIRED  
OF OUR  
DESIGN?**



Getting the right customer inputs is essential to success.  
Why?

“People don’t buy drills, they buy holes”  
- Theodore Levitt

- **Virtually all products and services are acquired to help get a job done...focus on the job as the unit of analysis.**
- **Customers have a set of metrics they use to judge whether a job is getting done well.**
- **We must deconstruct the job into process steps and determine how success is measured at each step.**
- **INNOVATION can occur when we figure out which of these metrics is not well-addressed with today’s solution.**

# GATHERING CUSTOMER INPUT



**To focus on the job the customer is trying to get done →  
DECONSTRUCT THE JOB**

### Job Map

Job executors go through a series of steps to cut a piece of wood in a straight line



- **Use what you know about the job(s) your customer needs to get done and deconstruct the job(s) into steps.**

**LET'S TRY IT**



**“Did customers know they needed a microwave?”**

**-Anthony Ulwick**

- **We need to capture customer requirements about the job NOT the product**
- **The job’s perfect execution reflects the customer’s true definition of value**
- **Products come and go but the job remains stable**
- **Innovation must better satisfy the needs related to getting the job done**

# **GATHERING CUSTOMER INPUT**



# METRICS FOR GETTING A JOB DONE PERFECTLY...

**FOCUS ON SPEED,  
STABILITY, AND  
OUTPUT**

- **For each step in your job process, discuss the following -**
  - 1. What makes that step slow?**
  - 2. What makes that step inconsistent or unpredictable?**
  - 3. What makes that step wasteful or costly?**

<b>STEP IN THE JOB PROCESS</b>	<b>What makes this slow?</b>	<b>What makes this inconsistent or unpredictable?</b>	<b>What makes this costly or wasteful?</b>
1.			
2.			
3.			



- **Using the speed, stability, and output feedback, create outcomes or customer needs statements that take the form-**
  - **Direction....Unit of Measure....Outcome Desired**
  - **You can only use MINIMIZE and INCREASE statements.**
  
- **Examples:**
  1. **Minimize the time it takes to prepare the skin for hair removal.**
  2. **Increase the number of songs that can be stored in the device.**
  3. **Minimize the amount of auditory distraction during work time.**
  4. **Increase the surface area available for applying pressure needed to assemble parts.**

## **CREATING CUSTOMER NEED STATEMENTS**



Using the 'speed/stability/output' table create outcomes or customer need statements that take the form:

*Direction . . . Unit of Measure . . . Outcome Desired*

You can only use  
either 'INCREASE'  
Or 'MINIMIZE'

- e.g. **MINIMIZE** the time required to prepare the skin for hair removal.  
**INCREASE** the number of parts that can be concurrently assembled.

**As a final step, take these Customer Needs/Outcome Statements and translate them into Design Requirements that fall into one of three categories:**

**MUST DO**

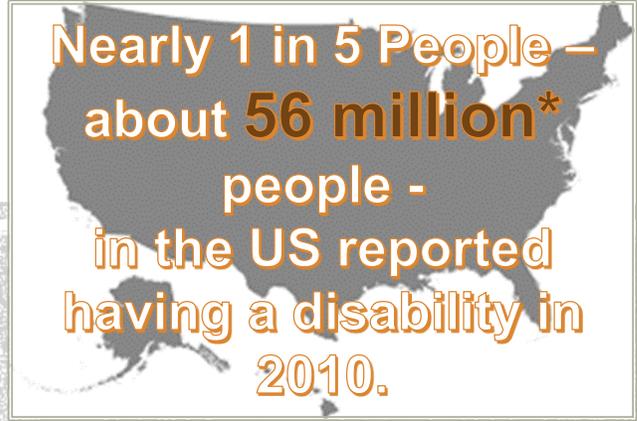
**MIGHT DO**

**MUST NOT DO**

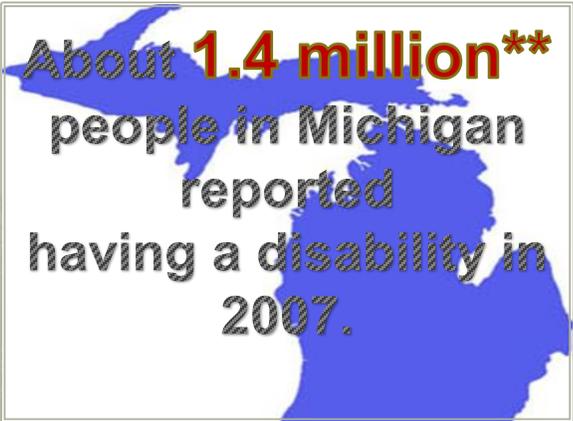
**Include relevant requirements from the syllabus, customer feedback, and universal design.**

## **CREATING CUSTOMER NEED STATEMENTS & DESIGN REQUIREMENTS**

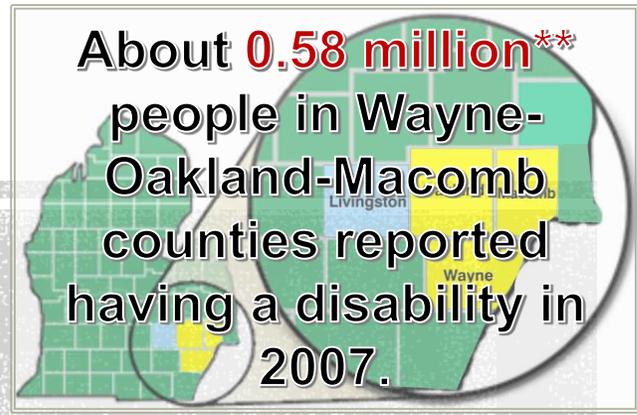




Nearly 1 in 5 People –  
about **56 million\***  
people -  
in the US reported  
having a disability in  
2010.



About **1.4 million\*\***  
people in Michigan  
reported  
having a disability in  
2007.

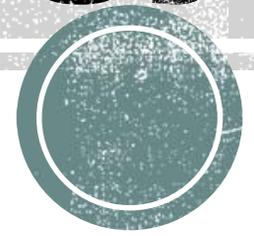


About **0.58 million\*\***  
people in Wayne-  
Oakland-Macomb  
counties reported  
having a disability in  
2007.

# Universal Design & Assistive Technology

**More than likely at some stage in our lives, we will find ourselves (or a loved one) in the position where we are unable to perform a desired task because we are physically unable to manipulate a general-use device.**

\* From US Census Bureau, 2010    \*\* From American Community Survey (ACS), 2007



# UNIVERSAL DESIGN



Making design accessible to everyone in society

“The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.”

# UNIVERSAL DESIGN

## 7 PRINCIPLES OF UNIVERSAL DESIGN:



Equitable



Flexibility



Simple & intuitive



Perception information



Tolerance for error



Low physical effort



Size & space





# UNIVERSAL DESIGN Principles:

**When UD principles are applied, products and environments meet the needs of potential users with a wide variety of characteristics ...disability being one example.**



# Who here has used some form of Assistive Technology?

## ANSWER: We all have.



In general, when products or environments are ***made more accessible*** to persons with disabilities, they become **easier for everyone to use.**

(Vanderheiden, 1990; Trace Research Institute, 1998)



Using the 'speed/stability/output' table create outcomes or customer need statements that take the form:

*Direction . . . Unit of Measure . . . Outcome Desired*

You can only use  
either 'INCREASE'  
Or 'MINIMIZE'

- e.g. **MINIMIZE** the time required to prepare the skin for hair removal.  
**INCREASE** the number of parts that can be concurrently assembled.

**As a final step, take these Customer Needs/Outcome Statements and translate them into Design Requirements that fall into one of three categories:**

**MUST DO**

**MIGHT DO**

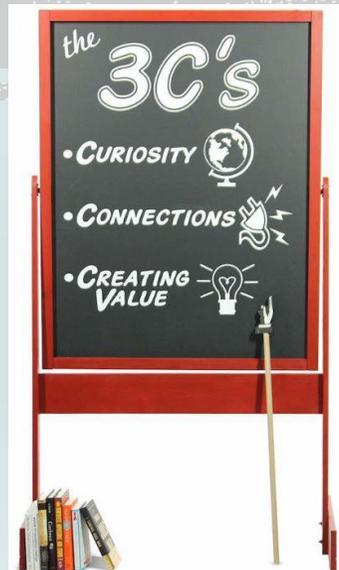
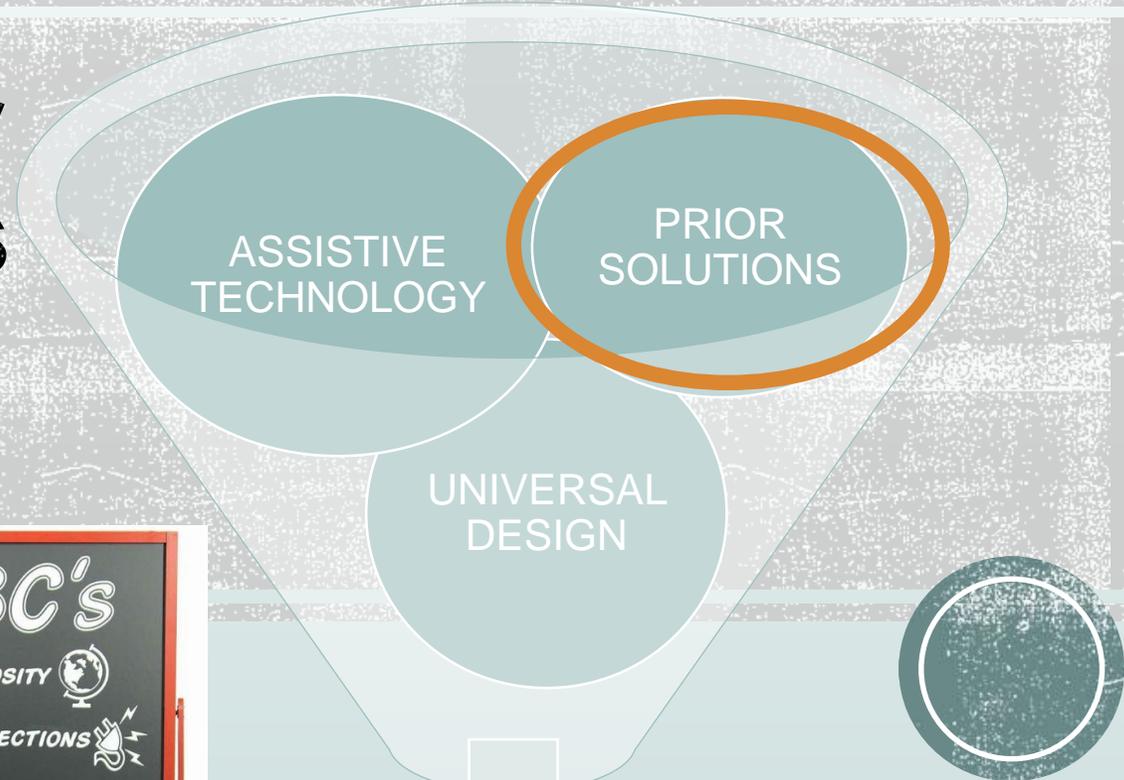
**MUST NOT DO**

**Include relevant requirements from the syllabus, customer feedback, and universal design.**

## **CREATING CUSTOMER NEED STATEMENTS & DESIGN REQUIREMENTS**

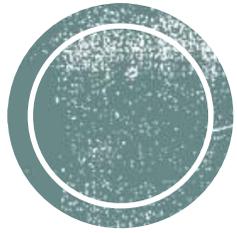


# How will your team address the opportunity?



**Curiosity**  
**Connections**  
**Creating Value**

# Are there already solutions out there that address this opportunity ...

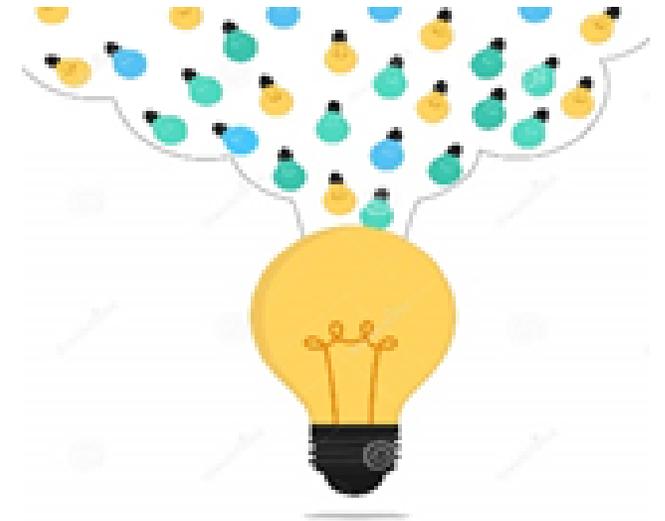


**If so, where can we find them?**

**Why are they NOT being used by your customer?**

**What is intellectual property?**

**What is the purpose of a patent?**





*Literary Works*



# What is IP?

- **INTELLECTUAL PROPERTY (IP) REFERS TO CREATIONS OF THE MIND.**
- **IP IS PROTECTED IN LAW BY PATENTS, COPYRIGHTS & TRADEMARKS, WHICH ENABLE PEOPLE TO EARN RECOGNITION OR FINANCIAL BENEFIT FROM WHAT THEY INVENT OR CREATE.**



• <https://youtu.be/3T-NBDGovno>

# MARKET RESEARCH: Patent Search

The sum total of existing knowledge is referred to as *state of the art* or *prior art*.

## PATENT SEARCH (<https://patents.google.com>)

- **Patents** are a rich and readily-available source of technical information.
  - Detailed drawings
  - Descriptions of product function
  - Prior art



***Innovation often comes from combining existing ideas that had never been put together before.***

*(From Designing Engineers, McCahan et al., Wiley, 2015)*





SEARCH TERMS

sleeve × + Synonym

beverage × + Synonym

cups × + Synonym

+ Search term or CPC

SEARCH FIELDS

Before YYYY-MM-DD

+ Assignee

MORE ▾



Note: You can filter/modify your search with these SEARCH TERMS

About 602 results ordered by relevance ▾ grouped by classification ▾

Y10S220/903?  
Insulating jacket for beverage container

**Insulative sleeve for beverage cup**

Grant US5222656A • Joel A. Carlson • Carlson Joel A

Priority 1992-09-02 • Filing 1992-09-02 • Grant 1993-06-29 • Publication 1993-06-29

**Sleeve** for insulating the hand while holding a **beverage cup**. A tubular body of felt-like material having first and second ends, wherein the body is conically arrayed about an axis which intersects the centers of the first and second ends, ...

**Sleeve protector for cups**

Grant US6053352A • Liming Cai • Dopaco, Inc.

Priority 1998-09-14 • Filing 1998-09-14 • Grant 2000-04-25 • Publication 2000-04-25

A **sleeve** protector with an air insulating central gripping portion and an upper rim flange. The **sleeve** is enhanced by an upper protective stacking shoulder immediately below the rim flange, gripping points inwardly directed about the lower ...

**Paper cup insulation**

Grant US5454484A • Jim Chelossi • Sleeveco

Priority 1992-02-28 • Filing 1994-05-19 • Grant 1995-10-03 • Publication 1995-10-03

A paper **sleeve** of with gradually changing shape, stored in folded configuration, easy to expand for receiving a **cup** with at least a section being conical and containing hot **beverage** provides thermal protection to the hand carrying the **cup**.

→ [Search within classification Y10S220/903 \(341 results\)](#)

**Sleeve for beverage cups**

Grant US5842633A • Robert I. Nurse • Ivex Corporation

Priority 1996-03-26 • Filing 1997-03-25 • Grant 1998-12-01 • Publication 1998-12-01

A **sleeve** is provided for a frusto-conical **beverage cup**, configured to fit around the outside of the **cup**, thus protecting the fingers of the user from excessive temperatures in the case of a hot drink, and to provide a measure of insulation ...

Go to <https://patents.google.com> and in the search window type **sleeve beverage cup <ENTER>**



And you can search using CPC (Cooperative Patent Classification) codes





## SEARCH TERMS

sleeve × + Synonym

beverage × + Synonym

cups × + Synonym

+ Search term or CPC

## SEARCH FIELDS

Before YYYY-MM-DD

+ Assignee

MORE ▾

BACK TO 602 RESULTS

## Sleeve for beverage cups

## Abstract

A sleeve is provided for a frusto-conical beverage cup, configured to fit around the outside of the cup, thus protecting the fingers of the user from excessive temperatures in the case of a hot drink, and to provide a measure of insulation for the contents of the cup. The sleeve is an arcuate band of flexible, single-face corrugated material with curved side walls, oppositely extending slots adjacent the ends of the band and tabs lying alongside the slots, the tabs projecting only part-way across the width of the band, to facilitate the setting up of the sleeve.

## Classifications

[A47G23/0216](#) Glass or bottle holders for drinking-glasses, plastic cups, or the like for one glass or cup

[View 3 more classifications](#)

And you can search  
using CPC (Cooperative  
Patent Classification) codes

US5842633A

US Grant

Download PDF Find Prior Art

Legal status: Expired - Fee Related

Application number: US08823162

Inventor: [Robert I. Nurse](#)Current Assignee: [Ivex Corp](#)Original Assignee: [Ivex Corp](#)Priority date: [1996-03-26](#)Filing date: [1997-03-25](#)

Publication date: 1998-12-01

Grant date: 1998-12-01

Info: [Patent citations \(10\)](#), [Cited by \(61\)](#), [Also published as \(2\)](#),  
[Legal events](#), [Similar documents](#)External links: [USPTO](#), [USPTO Assignment](#), [Espacenet](#), [Discuss](#)

# US PATENT # 5,842,633

## sleeve for beverage cup



US005842633A

### United States Patent [19] Nurse

[11] Patent Number: 5,842,633

[45] Date of Patent: Dec. 1, 1998

- [54] SLEEVE FOR BEVERAGE CUPS
- [75] Inventor: Robert I. Nurse, Toronto, Canada
- [73] Assignee: Ivex Corporation, Ontario, Canada
- [21] Appl. No.: 823,162
- [22] Filed: Mar. 25, 1997
- [30] Foreign Application Priority Data
- |               |      |                |         |
|---------------|------|----------------|---------|
| Mar. 26, 1996 | [GB] | United Kingdom | 9606288 |
|---------------|------|----------------|---------|
- [51] Int. Cl.<sup>6</sup> ..... B65D 5/42
- [52] U.S. Cl. .... 229/403; 220/737; 229/198.2
- [58] Field of Search ..... 229/4.5, 104, 198.2,  
229/400, 403; 220/737, 738, 739, 903,  
441, 443; 217/3 FC; 294/31.2

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5,454,484	10/1995	Chelossi	229/4.5

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1,758,827	5/1930	Dudley	217/3 FC
1,929,065	10/1933	Hiatt	217/3 FC
2,154,985	4/1939	Lower	217/3 FC

Primary Examiner—Gary E. Elkins  
Attorney, Agent, or Firm—Shoemaker and Mattare, Ltd

#### [57] ABSTRACT

A sleeve is provided for a frusto-conical beverage cup, configured to fit around the outside of the cup, thus protecting the fingers of the user from excessive temperatures in the case of a hot drink, and to provide a measure of insulation for the contents of the cup. The sleeve is an arcuate band of flexible, single-face corrugated material with curved side walls, oppositely extending slots adjacent the ends of the band and tabs lying alongside the slots, the tabs projecting only part-way across the width of the band, to facilitate the setting up of the sleeve.

6 Claims, 1 Drawing Sheet





# Time to put on your detective hat...



- Your team needs to find 4 patents *related*\* to the opportunity your team is addressing.
- For each resource found complete the Market Research worksheet block shown below:

PATENT TITLE	Patent # & CPC	How does this relate to your opportunity?
<p>What does it do? (Include sketches when possible):</p>		
<p><i>You want to demonstrate that you have a thorough knowledge of the prior art.</i></p>		
Strengths:	Weaknesses:	



■ **TO DO:**

- **Turn in Site Visit #2 worksheet with at least 5 Design Requirements (one per team)**
- **Turn in your Market Research worksheet with 4 patents as they relate to your opportunity (one per team)**
- **Assign team lockers and check in before you go**

■ **LOOKING AHEAD:**

- **Week 3 BEEST posts due by 11:59 pm on 9/14**
- **Week 4 BEEST posts due by 11:59 pm on 9/21**
- **Part 1 of IPP due by 11:59 pm on 9/17**

**WEEK 4  
DAY 1  
(T/TH)**

**WEEK 4  
DAY 2  
(M/W)**

**RE-CAP**



## TO DO:

- Ideation and Concept Generation activities– teams generate and compile 6 – 8 design concepts

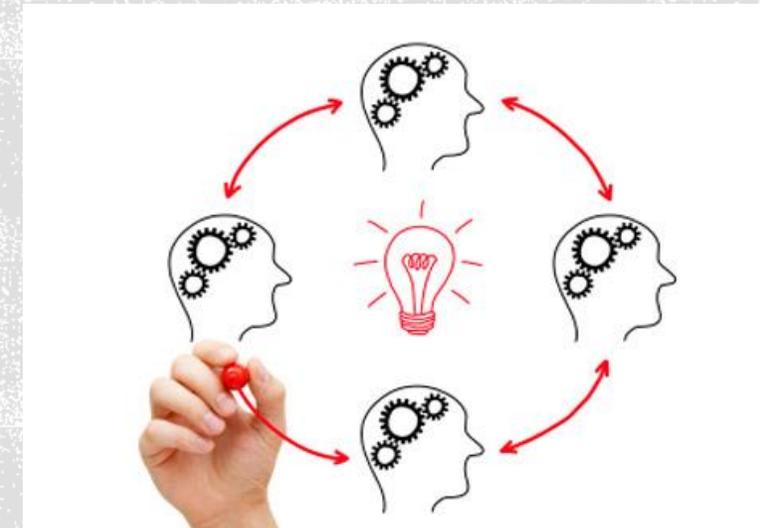
## LOOKING AHEAD:

- Teams turn in their 'Concepts for Consideration' worksheets before you leave
- IPP Part 1 – Due by 11:59 pm on 9/17
- Week 3 BEEST posts due by 11:59pm on 9/14
- Week 4 BEEST posts due by 11:59 pm on 9/21
- **Tu/Th NO CLASS – University Assessment Day 9/19**

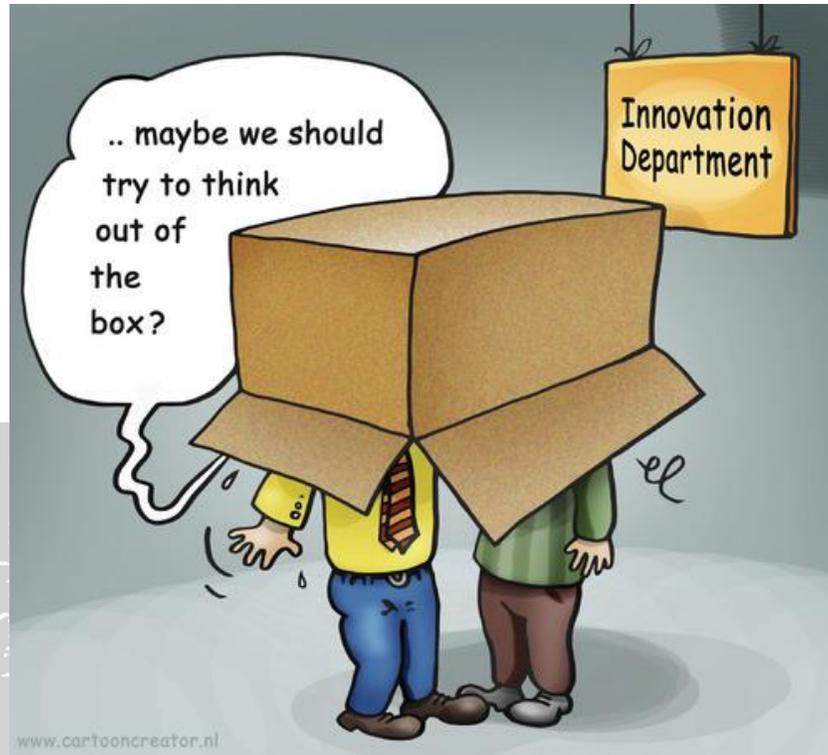
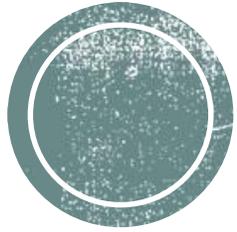
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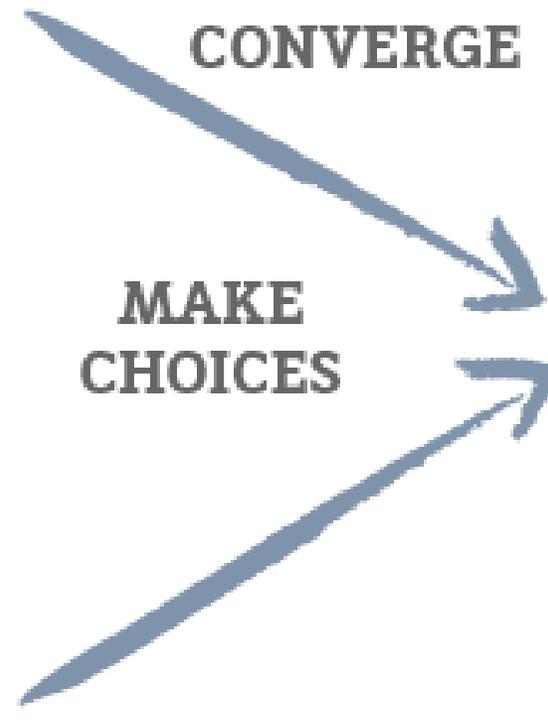
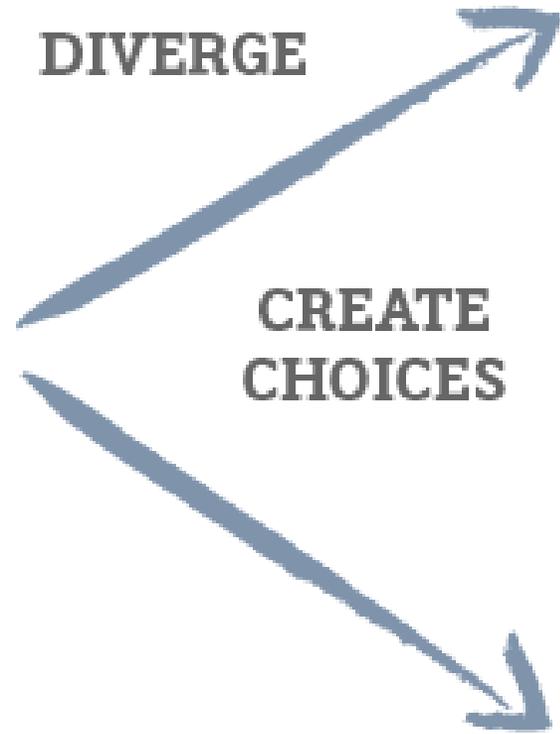
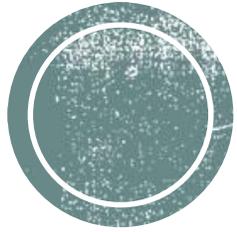
**WEEK 4 - DAY 2  
(T/Th)**

**WEEK 5 - DAY 1  
(M/W)**



**Did they say we could  
think about solutions  
yet??**

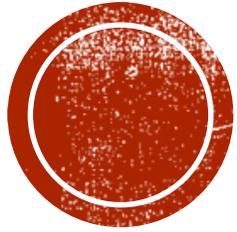




Today:  
Concept  
Generation

Next class:  
Concept  
Selection

# GOAL: TO GENERATE *MANY, MANY* CONCEPTS



- A concept is an idea; an approximate description of your product's:  
**Function**                      **Form**                      **Features**
- Usually expressed as a sketch or rough 3D model, often accompanied by a brief textual description.

**“The best way to get a good idea is to get a lot of ideas.”**

**-- Linus Pauling**

# SEVEN SECRETS FOR BETTER IDEATION:

- SHARPEN THE FOCUS
  - Start with a well-honed problem statement
- PLAYFUL RULES
  - No critiquing ideas
  - Go for **quantity**
  - Encourage wild ideas
  - Be visual (sketch things!)
- BUILD AND JUMP
  - Other's ideas may lead you to new ideas
- THE SPACE REMEMBERS
  - Old-fashioned methods work! SHARPIE & POST-ITS
  - Intensely group-oriented process
- GET PHYSICAL
  - Synergy in moving round the room
- NUMBER YOUR IDEAS
- STRETCH YOUR MENTAL MUSCLES
  - Need to warm-up!

~~CRITIQUING  
IDEAS~~

- We need to work to overcome **OBSTACLES** to creative thinking. Most barriers are **SELF-IMPOSED**. Can you think an obstacle to your creativity?



# Time to flex those creative muscles!

## EXERCISE:

For the next two minutes...

On the piece of paper in front of you, write down the names of all the people you know.



Now look at your list of names...

Can you explain how your list “flowed” from the first name you listed to the last one?

See the *jumps* and **CONNECTIONS** your mind made as you thought of more and more names.



*Innovation often comes from combining existing ideas that had never been put together before.*

*(From Designing Engineers, McCahan et al., Wiley, 2015)*



## BRAINSTORMING

- Participants vocalize their responses (facilitator interprets and writes down everyone's response).
- Can be disrupted by a few participants who dominate the session.
- Often, no external stimuli available to stimulate idea generation (creativity on demand).
- Group can lose focus on the problem.
- May find the total # of ideas lacking.

## BRAINWRITING

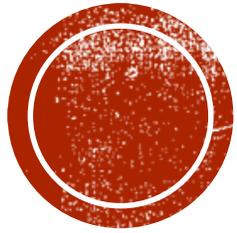
- Participants write down their responses (a set # of ideas in a fixed amount of time) and silently pass their responses to next participant (no facilitator required).
- Tailored to participants who are reticent and would be unlikely to participate in an open discussion.
- As participants papers are passed to the next participant, ideas often spark improvements on other's ideas and/or inspire completely new ideas.
- Generates a greater # of ideas (quantity is the focus).

## BRAINWRITING (6-3-5 IDEATION TOOL)

How is brainwriting different than brainstorming?



# BRAINWRITING

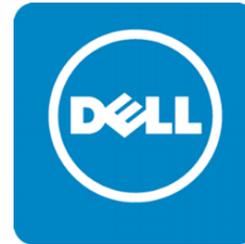


## GENERAL GUIDELINES

- Make sure everyone has the opportunity to contribute.
- Accept partial ideas enthusiastically.
- Accept unique (crazy?) ideas enthusiastically.
- Seek connections using *others' ideas* as stimuli.
- Be open to others' new ideas.

The easiest way to explain Bisociation is to show some well-known examples:

- ❑ Retail sale of computers + Mail Order



- ❑ Bookstore + Internet



- ❑ Auction + Internet

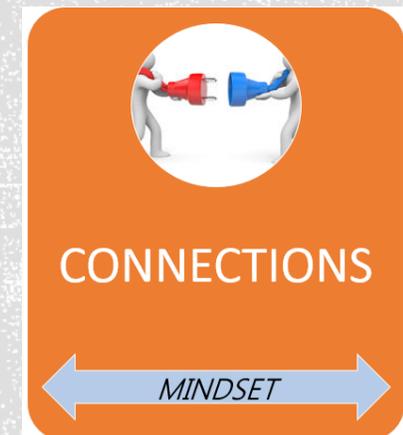
[KEEN Bisociation Video](#)



The basic idea here is to take a diverse stimulus, list some features or characteristics of that stimulus, and try to make a **CONNECTION** to the opportunity that you're addressing.

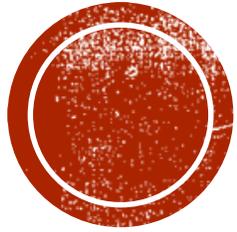
## BISOCIATION: AN IDEATION TOOL

This is an activity based on 'forced association'. Bisociation involves connecting two *seemingly* unrelated things.



## DIVERSE STIMULI:

SELECT AN ITEM FROM THE BAG TO ACT AS A STIMULUS FOR IDEAS



### Exercise: ON YOUR BISOCIATION HANDOUT

1. Choose one of the stimuli in the bag
2. Write down all the things you can think of about the stimuli...
3. Can you make any connections to your opportunity/problem? (If not, choose another...)

## BISOCIATION:

*Try pairing your **Opportunity** with one or more **Diverse Stimuli** to generate more new ideas.*

# NOW, AS A TEAM, YOU SHOULD HAVE A **MULTITUDE** OF CONCEPTS GENERATED FROM IMPLEMENTING THESE IDEATION EXERCISES...

Time for your team to reflect on the concepts that you've come up with...

Next steps:

1. Take the Post-it notes and write one for each concept that you generated.
2. Sort or categorize common concepts by placing them together on the table.  
**NO JUDGMENT – just sorting at this point**

**Once the concepts are laid out in front of your team:**

- ❖ Discuss and debate the merits of the ideas in front of you. Always be thinking about those design requirements.
- ❖ Have you fully explored the design space? Can you combine any of the concepts?

**Use the **THINKERTOYS WORKSHEET** to help you filter your concepts and come to a consensus on your team's best 6-8 concepts.**

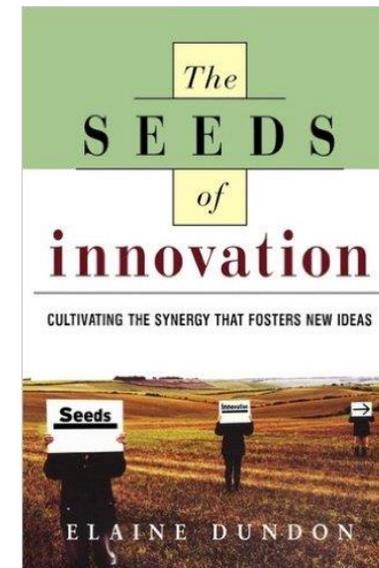
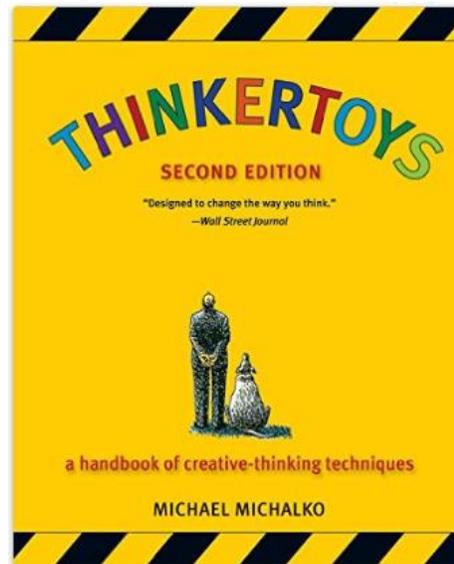
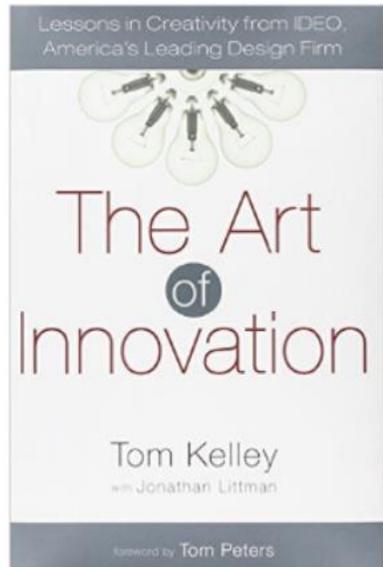
**PRESENT YOUR TEAM'S BEST 6 - 8 CONCEPTS ON THE CONCEPTS FOR CONSIDERATION WORKSHEET.**

**Submit one per team before you leave.**



# RESOURCES

- Kelley, T. with Littman, J. (2001). *The Art of Innovation*. New York: Doubleday.
- Dundon, E. (2002). *The Seeds of Innovation: Cultivating the Synergy that Fosters New Ideas*. New York: AMACOM.
- Michalko, M. (2006). *Thinkertoys: A Handbook of Creative-thinking Techniques* (2nd ed.). Berkeley, Calif.: Ten Speed Press.



## TO DO:

- Ideation and Concept Generation – teams generate and compile 6 – 8 design concepts
- File *Brainwriting, Bisociation, and ThinkerToys* worksheets in the team binder under the '*Concept Generation, Analysis, and Selection*' tab

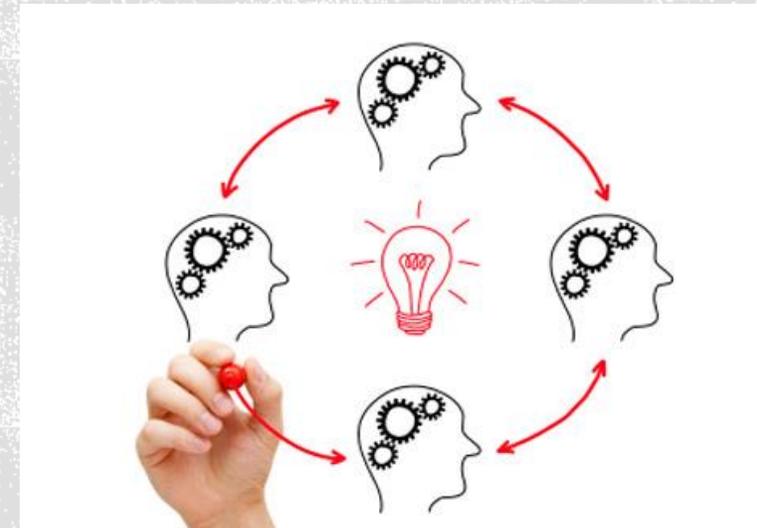
## LOOKING AHEAD:

- Turn in 'Concepts for Consideration' worksheets before you leave (one per team)
- IPP Part 1 – Due by 11:59 pm on 9/17
- Week 3 BEEST posts due by 11:59pm on 9/14
- Week 4 BEEST posts due by 11:59 pm on 9/21
- **Tu/Th NO CLASS – University Assessment Day 9/19**

# EGE 2123

**WEEK 4 - DAY 2  
(T/Th)**

**WEEK 5 - DAY 1  
(M/W)**



## To Do:

- How do we choose which concept to develop?
- Teams prepare selection matrix and screen potential concepts to **identify top two concepts** for development.
- Teams **create small-scale mock prototypes** of top two concepts alternatives.

## LOOKING AHEAD:

- **In-class 'Consulting Day'** where you will get feedback from your classmates on your two concept alternatives.
- Guidelines for SPRINT 1 REVIEW and Site Visit
- Team Binder Check #2 next class
- Week 5 BEEST posts due by 11:59 pm on 9/28

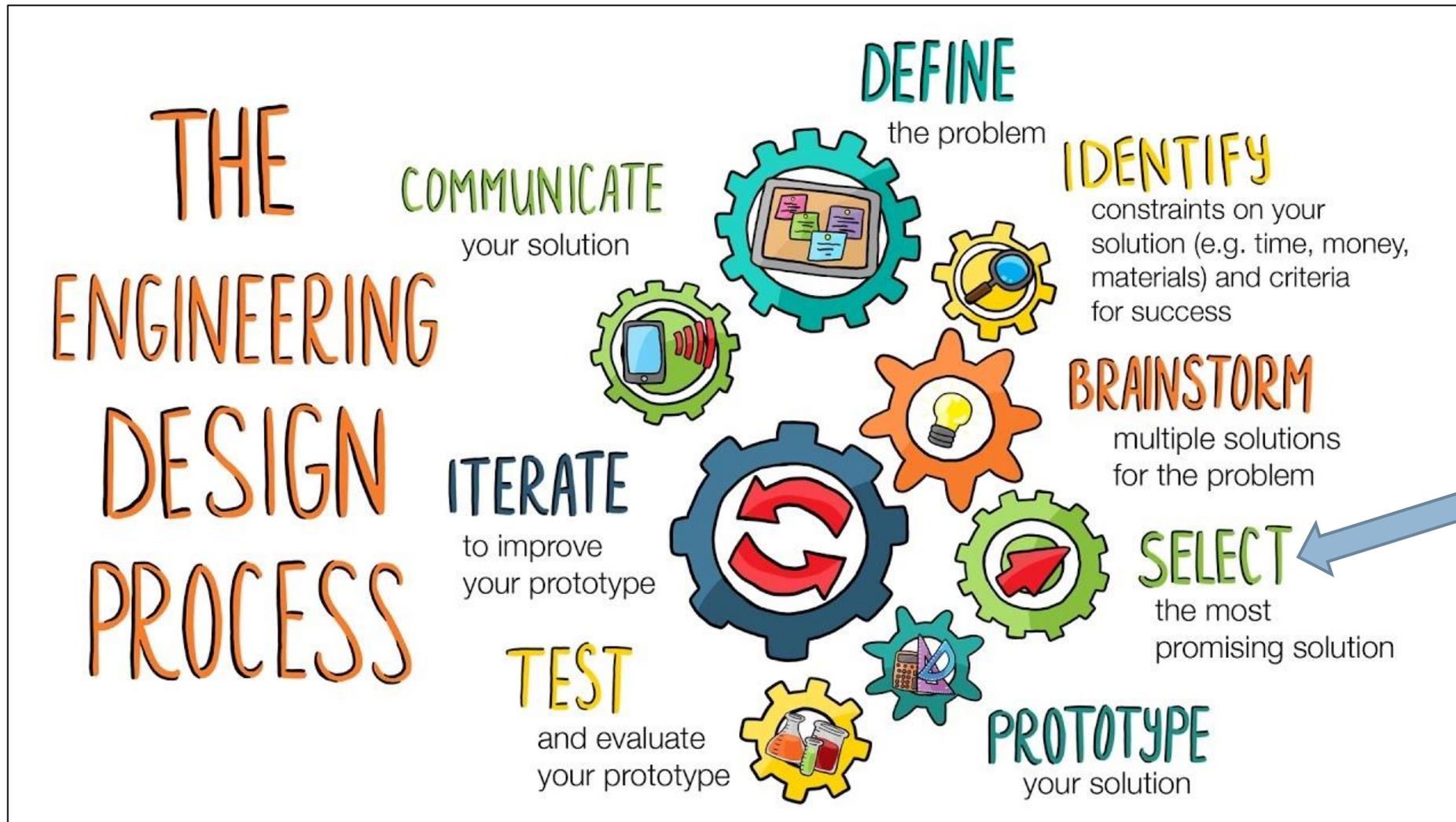
# CONCEPT SCREENING & SELECTION

## WEEK 5, Day 2

We now bring the customer back into the picture...front & center!

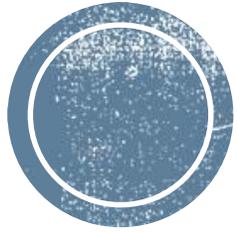


You've developed some design requirements and conceived multiple solutions that span the design space...what's next?



**YOU  
ARE  
HERE**

# So you've got these great ideas ...



## HOW DO YOU CHOOSE?



ASK THE CUSTOMER?  
WOULD THEY ALL AGREE?  
DO THEY ALWAYS KNOW BEST?

IS THERE A BETTER WAY  
TO DECIDE?



# CONCEPT SCREENING (ALSO CALLED PUGH MATRIX)

This structured method employs *DECISION MATRICES* to

- **rate**
- **rank**
- **select**

the *best* concept(s) to develop.

1. **Prepare the decision (selection) matrix.**
  - ✓ CONCEPT ALTERNATIVES & REFERENCE CONCEPT\* PLACED IN TOP ROW
  - ✓ SELECTION CRITERIA BASED ON DESIGN REQUIREMENTS PLACED IN FIRST COLUMN
2. **Rate each concept relative to the reference concept\*.**

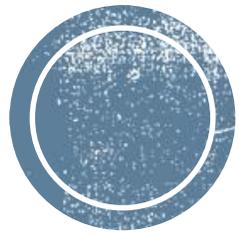
Place one of three possible ratings in the corresponding matrix row/column:

'better than'  'worse than'  'no difference' 
3. **Rank the concepts.**

TOTAL EACH COLUMN,  
RANK THE CONCEPTS 
4. **Combine and improve the concepts.**

Re-do steps 1-3.
5. **Select top concepts.**
6. **Reflect on the results and the process.**





Lead

The

Way



**Lead The Way® Corp.** meets the erasable writing/drawing needs of college engineering students by providing robust, inexpensive writing utensils.

# CONCEPT SELECTION EXERCISE:

mechanical pencils

# MECHANICAL PENCILS



## Customer Needs:

- ✓ Good writing quality
- ✓ Good resistance to lead-breakage
- ✓ Comfortable grip
- ✓ Ease of lead advancement
- ✓ Ease of eraser usage
- ✓ Size of eraser
- ✓ Ease of lead refilling
- ✓ Low cost
- ✓ Good durability

We asked our customers what they look for when buying mechanical pencils. This is what they told us...



# PRODUCTION COSTS OF MECHANICAL PENCIL CONCEPTS

A. \$2.50 a piece



B. \$2.30 a piece



C. \$1.08 a piece



D. \$1.00 a piece



E. \$0.20 a piece



F. REF Lead the Way – Model 2a

\$0.48 a piece



# STEP 1: PREPARE THE DECISION (SELECTION) MATRIX

What do we choose as our reference concept?

SELECTION CRITERIA

	CONCEPTS					
	A	B	C	D	E	F
Writing quality						
Lead-breakage resistance						
Comfortable grip						
Ease of lead advancement						
Ease of eraser usage						
Size of eraser						
Ease of lead refilling						
Cost						
Durability						

Your reference concept can be:

- what the customer is already using
- a prior solution that your team discovered in your market research



## STEP 2: RATE EACH CONCEPT RELATIVE TO A REFERENCE CONCEPT

### CONCEPTS

SELECTION  
CRITERIA

	A	B	C	D	E	F*
Writing quality	+	0	+	0	0	0
Lead-breakage resistance	+	+	-	-	+	0
Comfortable grip	+	+	+	+	-	0
Ease of lead advancement	+	-	+	+	0	0
Ease of eraser usage	0	0	-	-	0	0
Size of eraser	+	+	-	-	0	0
Ease of lead refilling	-	-	+	+	+	0
Cost	-	-	-	-	+	0
Durability	-	+	+	+	-	0

Rate the concepts in each category relative to the reference concept: '+' better than', '-' worse than', '0' same as'



F



## STEP 3: RANK THE CONCEPTS (I.E., ADD THE COLUMNS...DO THE MATH)

	A	B	C	D	E	F*
Writing quality	+	0	+	0	0	0
Lead-breakage resistance	+	+	-	-	+	0
Comfortable grip	+	+	+	+	-	0
Ease of lead advancement	+	-	+	+	-	0
Ease of eraser usage	0	0	0	-	0	0
Size of eraser	+	+	-	-	-	0
Ease of lead refilling	0	-	+	+	+	0
Cost	-	-	-	-	+	0
Durability	-	+	+	+	-	0
	PLUSES	5	4	5	4	3
	MINUSES	2	3	3	4	4
	<b>Net</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>-1</b>
	<b>Rank</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>4</b>	<b>5</b>



# CONCEPT SCREENING: RESULTS OF THE FIRST ITERATION

**#1** \$2.50 a piece



**#3** \$2.30 a piece



**#2** \$1.08 a piece



**#4** \$1.00 a piece



**#5** \$0.20 a piece



**Ref** Lead the Way – Model 2a \$0.48 a piece



# NOW WE'VE RANKED THE CONCEPTS, THEN WHAT?

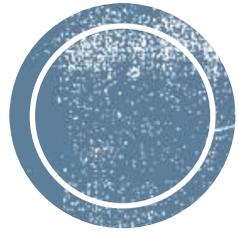
- 3 Combine and improve the concepts. (HOW?) Re-do steps 1-3.
- 4 Select top concepts.
- 5 Reflect on the results and the process as a team. DO YOUR RESULTS MAKE SENSE (keep the customer in mind!)



Can you foresee any potential pitfalls in the process?

How could you improve the process?





# NOW IT'S YOUR TURN!

Show instructors your  
Concept Selection Matrix  
Before you leave.

Step 1: Prepare your decision matrix. Select a reference concept.

Step 2: Rate each concept relative to your reference concept.

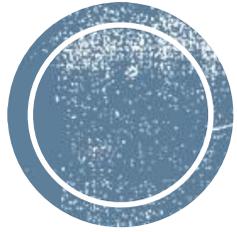
Step 3: Rank the concepts.

Step 4: Combine and improve the concepts. Re-do Steps 1-3.

Step 5: Select **YOUR TOP 2 CONCEPTS.**

Step 6: Reflect on the results and the process. Does the team all agree on the results?

# And then there were two ...



WE THINK WE HAVE TWO  
PRETTY SOLID  
CONCEPTS, EITHER OF  
WHICH WOULD  
TRANSLATE TO VALUE-  
ADDED FOR OUR  
CUSTOMER ?



HOW CAN WE BEST  
COMMUNICATE OUR  
CONCEPTS TO THE  
CUSTOMER FOR  
FEEDBACK?



- Prototypes are created to **UNDERSTAND, EXPLORE** and **COMMUNICATE** proposed designs.
- Different levels of prototyping address different questions about your proposed designs – ranging from:
  - “Looks like...”
  - to:
  - “Functions like...”
- Prototypes aid designers in an **iterative approach** to working out the details, requirements, and trade-offs that eventually lead to a design that **creates the most value** for their customer.
- Why is prototyping so valuable?
  - ‘Build-to-learn’ approach to explore and evaluate design ideas
  - User-centered design gives your customer a ‘hands-on’ holistic experience of your vision
  - Provides the team with a common vision of what the goal is.

# PROTOTYPING

Simply put, prototyping is taking the design from the virtual , imaginary realm into the physical world.



# PROTOTYPING IN EGE 2123

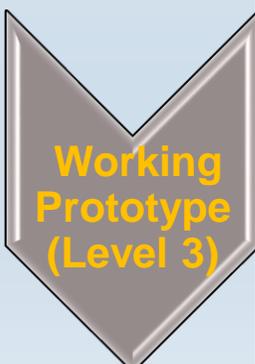
In our course we will be creating prototypes at *three different stages* of our design process:



- Small-scale model used to communicate and compare concept alternatives (you will build & compare your 2 selected concepts)
- Used to represent *form* of design concept for feedback
- Typically built with cardboard, tape, clay, re-purposed materials, etc.

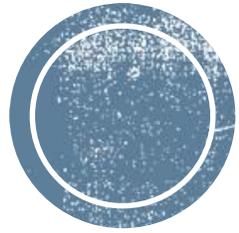


- Full-scale model of final concept selected
- Provides more emphasis on *function* of design concept
- May be built with materials similar to scaled model but may also included 3D printed parts, off-the-shelf components from hardware store, etc. to create a more functional model
- Used to provide the customer a hands-on experience while gathering feedback



- Full-scale, fully-functional final design built according to the product architecture assembly drawings and the detail design drawings, using materials and fabrication methods specified on the bill of materials.
- Should be robust enough so that customer would be able to use this prototype.
- Will be used to demonstrate your design at the final milestone review.





# TIME TO BUILD



- Today, your team is to build **small-scale, mock-up prototypes (Level 1)** of the **top 2 concepts** your team selected.
- NEXT CLASS, you will demonstrate them to the class (Option A versus Option B) to get some feedback from your classmates & instructors (consultants).  
*Divide and conquer, you have 2 prototypes to make, 4 team members.*
- Remember to **take photos of your mock-up prototypes** for documenting the process.

## To Do:

- Teams prepare selection matrix and screen potential concepts to *identify top two concepts* for development.
- Teams *create small-scale mock prototypes* of top two concepts alternatives.

## LOOKING AHEAD:

- **In-class 'Consulting Day'**- Teams present top 2 concepts to class get feedback from your classmates and instructors
- Guidelines for SPRINT 1 REVIEW and Site Visit
- Team Binder Check #2 next class
- Week 5 BEEST posts due by 11:59 pm on 9/28

# CONCEPT SCREENING & SELECTION

**WEEK 5, Day 2**

## RE-CAP



## To Do:

- **Teams complete mock-up prototypes of top 2 concepts.**
- **In-class 'Consulting Day'** (today) where you will get feedback from your classmates on your two concept alternatives.
- Teams prepare for SPRINT REVIEW 1 and Site Visit
- Binder Check #2

## LOOKING AHEAD:

- SPRINT 1 REVIEWS and Site Visit – next class
  - M/W email presentations to instructors by 11:00 am on 9/27
  - T/Th email pdf of presentations before leaving class
- Gather and document customer feedback
- Week 6 BEEST posts due by 11:59 pm on 10/05

# EGE 2123

## WEEK 6 DAY 1



# CONSULTANT DAY



- Pitch both Option A and Option B to the class (no more than 2-3 minutes)  
*ALL team members must participate.*
- Briefly remind everyone of your opportunity (could be as simple as stating your Mission Statement)
- Describe your concepts by showing mock-ups and pointing out what your team perceives as the *PRO's* and *CON's* of both options.
- Answer the consultants' questions to the best of your ability.
- Have at least one team member record questions/concerns/comments that the consultants may provide.

