Bootcamp
Engineering Design

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Associate Professor – Teaching Stream
- Mechanical & Industrial Engineering
- Applied Science & Engineering – UofT

Professional Engineer

Education:
- Bachelors - Engineering Physics (UofS)
- Masters Education (UofT - In progress)

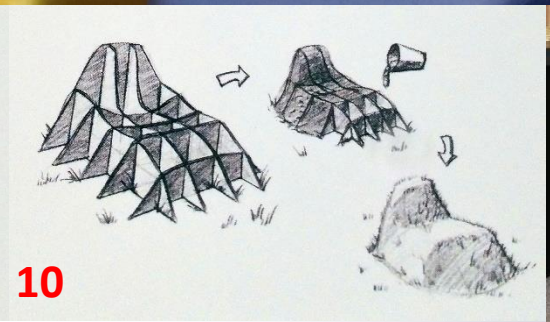
Teaching Area: Engineering Design

Research Area:
- Engineering Education
- Diversity in Engineering

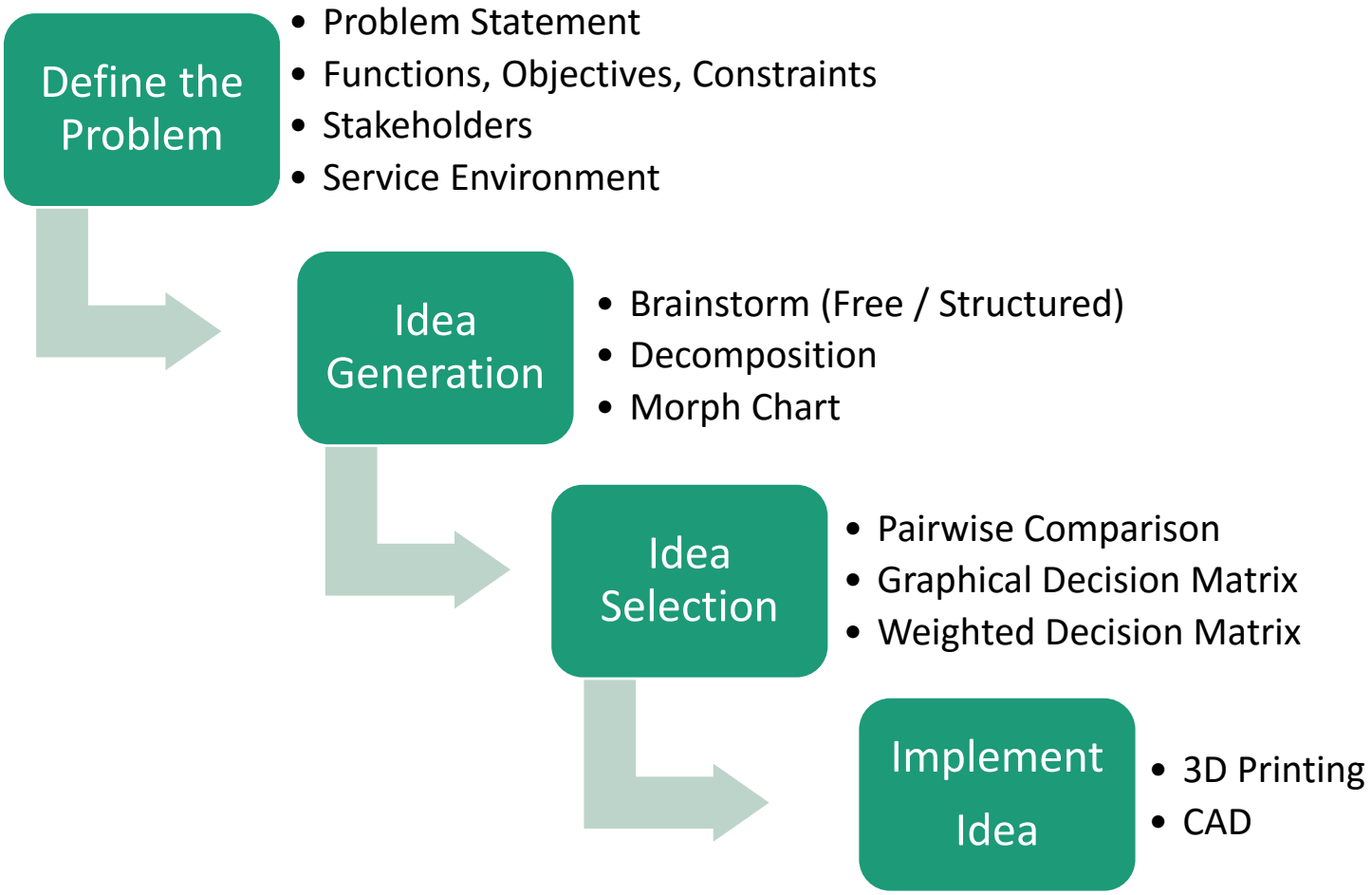
World's Best Chair Design

By: netalloy (public domain)

Vote for the Best Chair Design

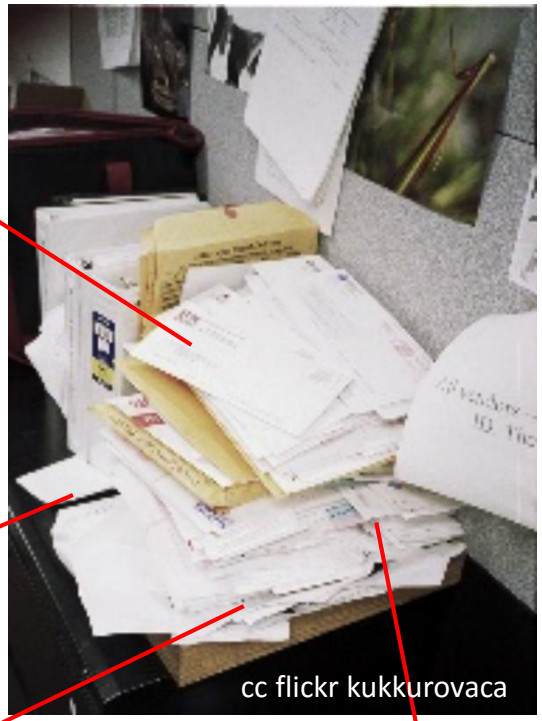


The Engineering Design Process



Define the Problem

Client Statement



Bias

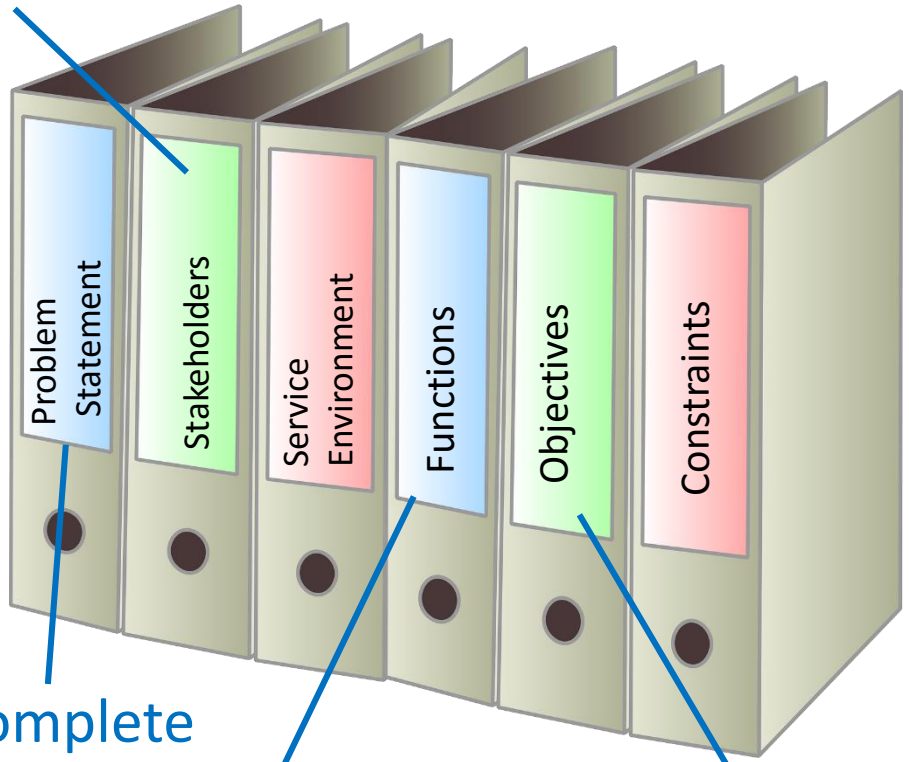
Errors

Implied solutions

Missing information

Project Requirements

Unbiased



Complete

Measurable

Prioritized

pd OpencCipartVector

Problem Statement:

states the gap in the world that the technology you are creating will fill.

- Problem Statement
- Stakeholders
- Service Environment
- Functions
- Objectives
- Constraints

Stakeholders:

people or organizations that have a stake or interest in the technology you are creating.

- Problem Statement
- Stakeholders
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Service Environment:

all aspects of the environment that may influence the design.

- Problem Statement
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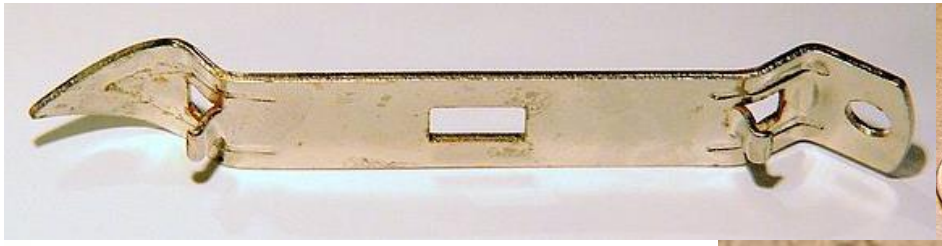
UNIVERSITY OF TORONTO

Function:

what the technology you are creating does.
(no evaluation of how well it does it)

- Problem Statement
- Stakeholders
- Service Environment
- Functions
- Objectives
- Constraints

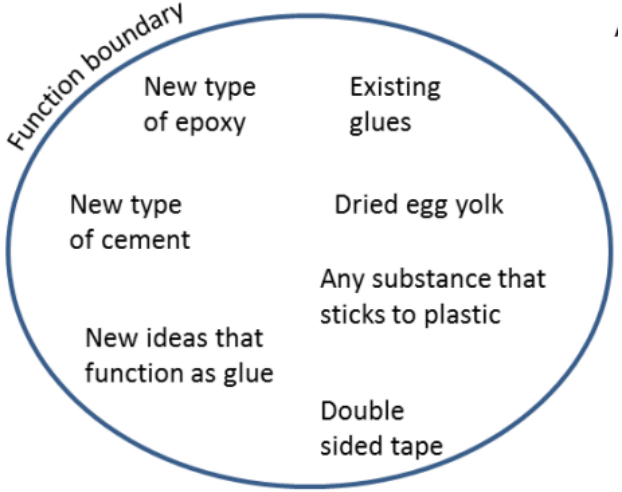
All of these Open Cans



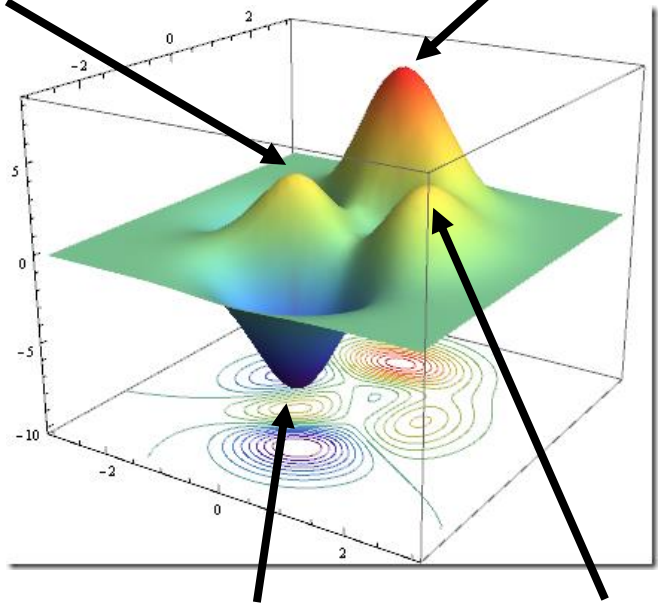
Objectives:

distinguish between better or worse solutions

- Problem Statement
- Stakeholders
- Service Environment
- Functions
- Objectives
- Constraints



Existing Glues

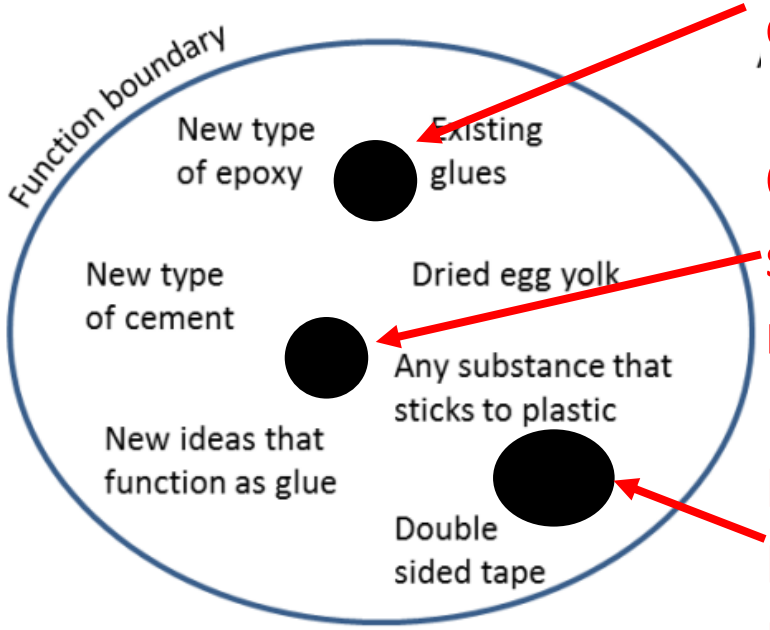


If the function is to stick two materials together…

Constraints:

what the design solution must or must not be.

- Problem Statement
- Stakeholders
- Service Environment
- Functions
- Objectives
- Constraints

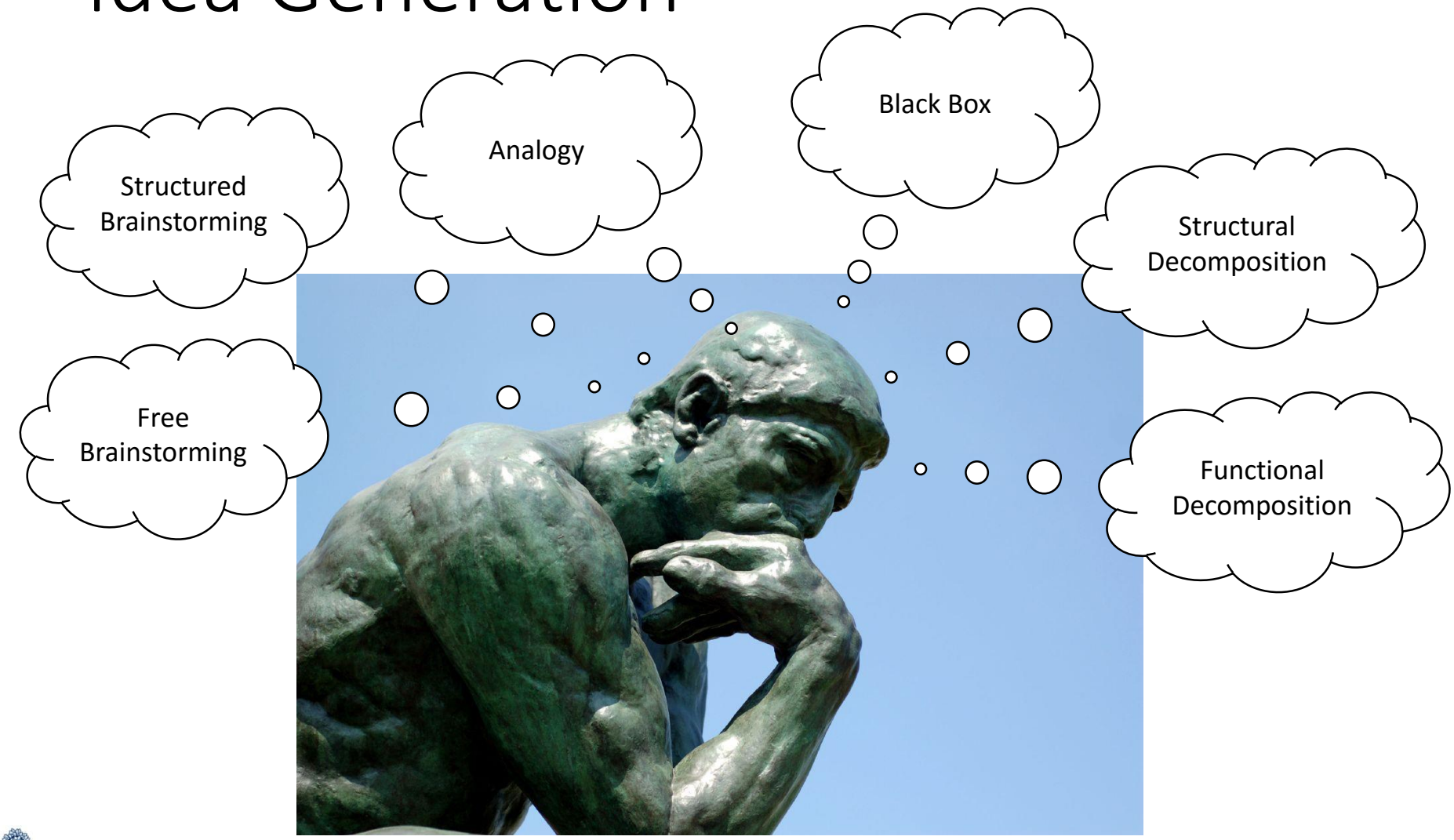


Cannot utilize any existing Patents.

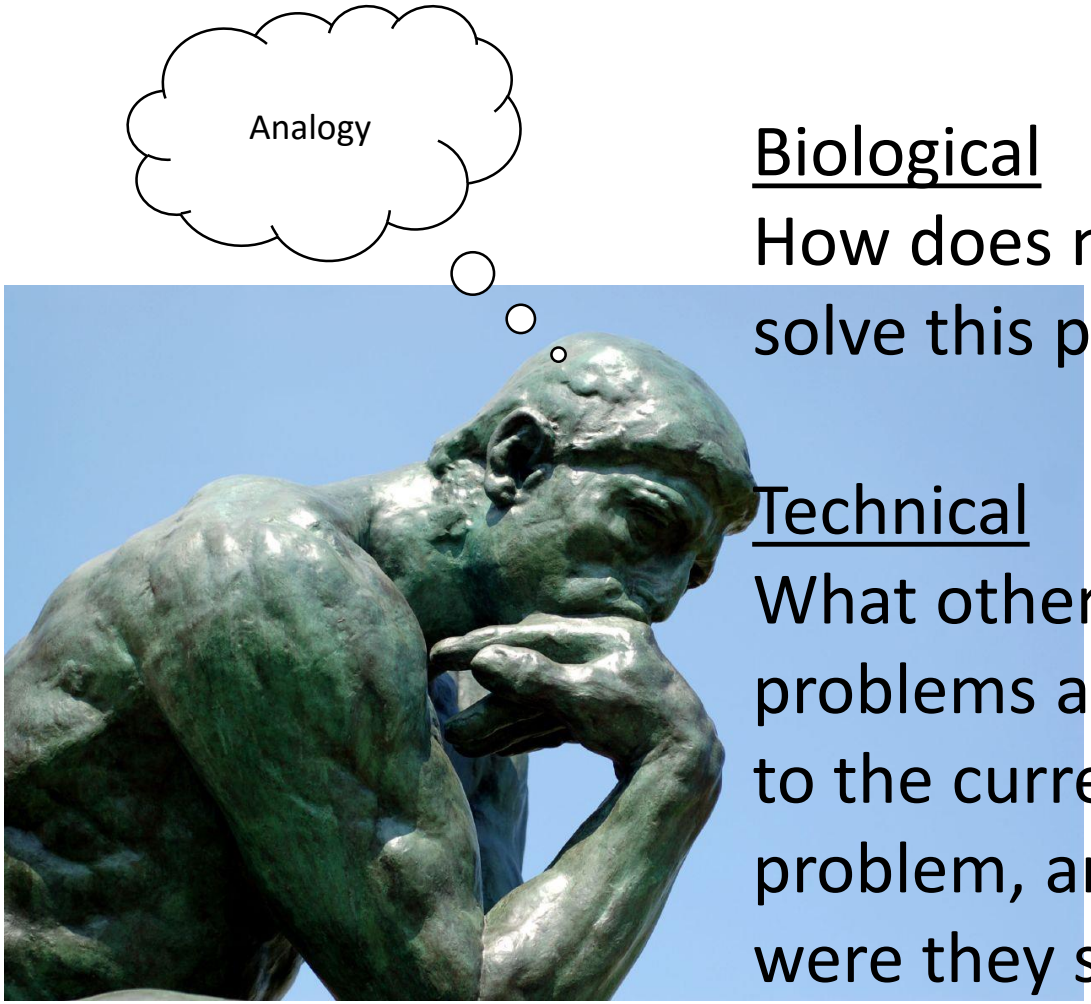
Cannot contain any significant organic materials.

Must achieve Environmental Protection Agency Toxicity category IV.

Idea Generation



Idea Generation



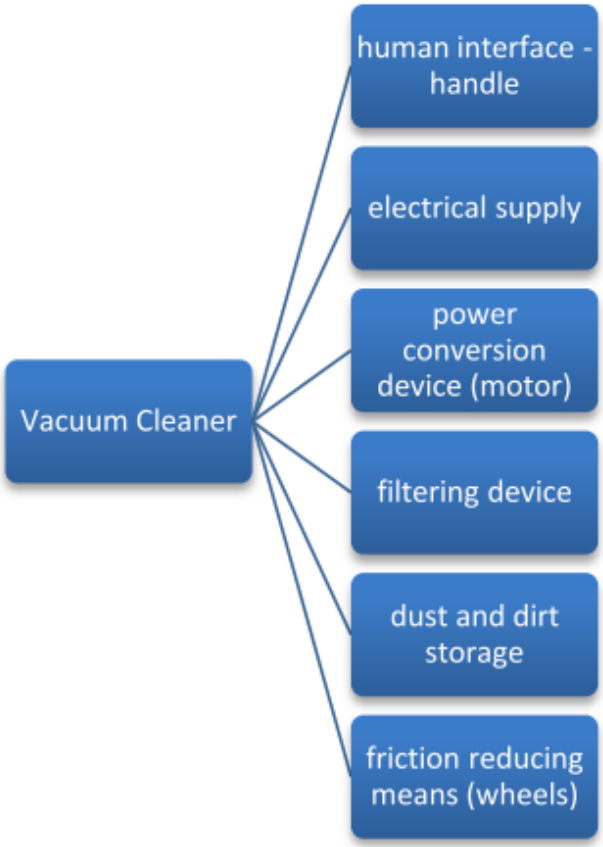
<u>Biological</u>

How does nature solve this problem?

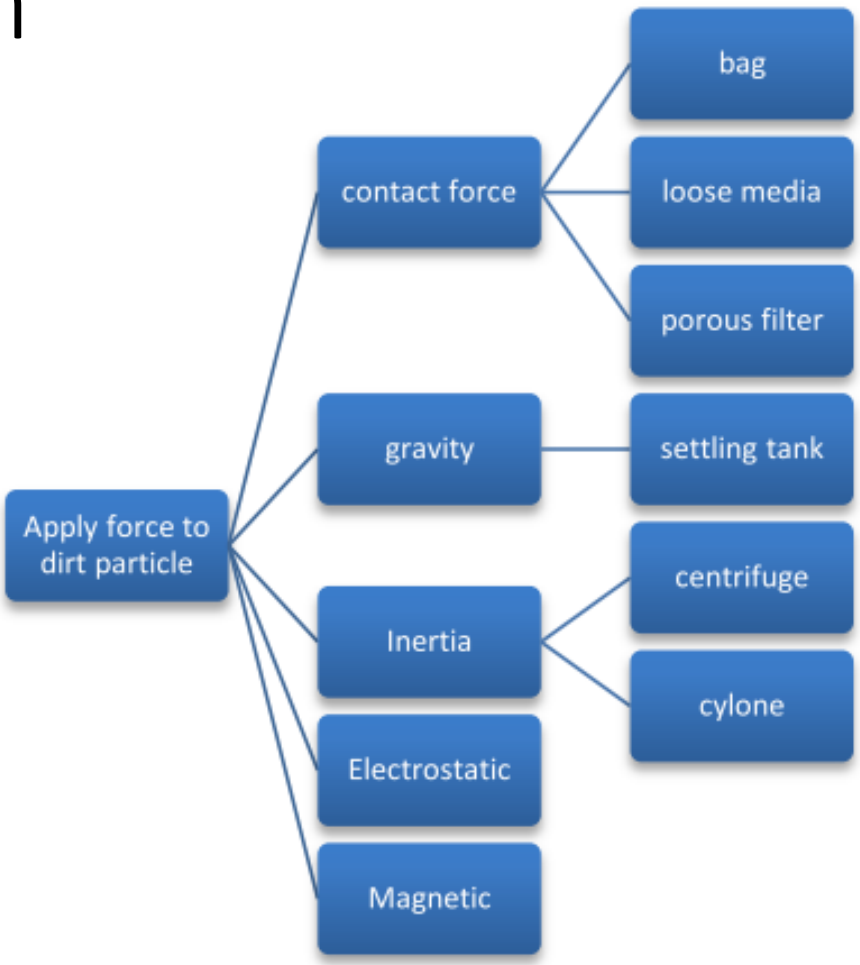
<u>Technical</u>

What other technical problems are similar to the current problem, and how were they solved?

Decomposition

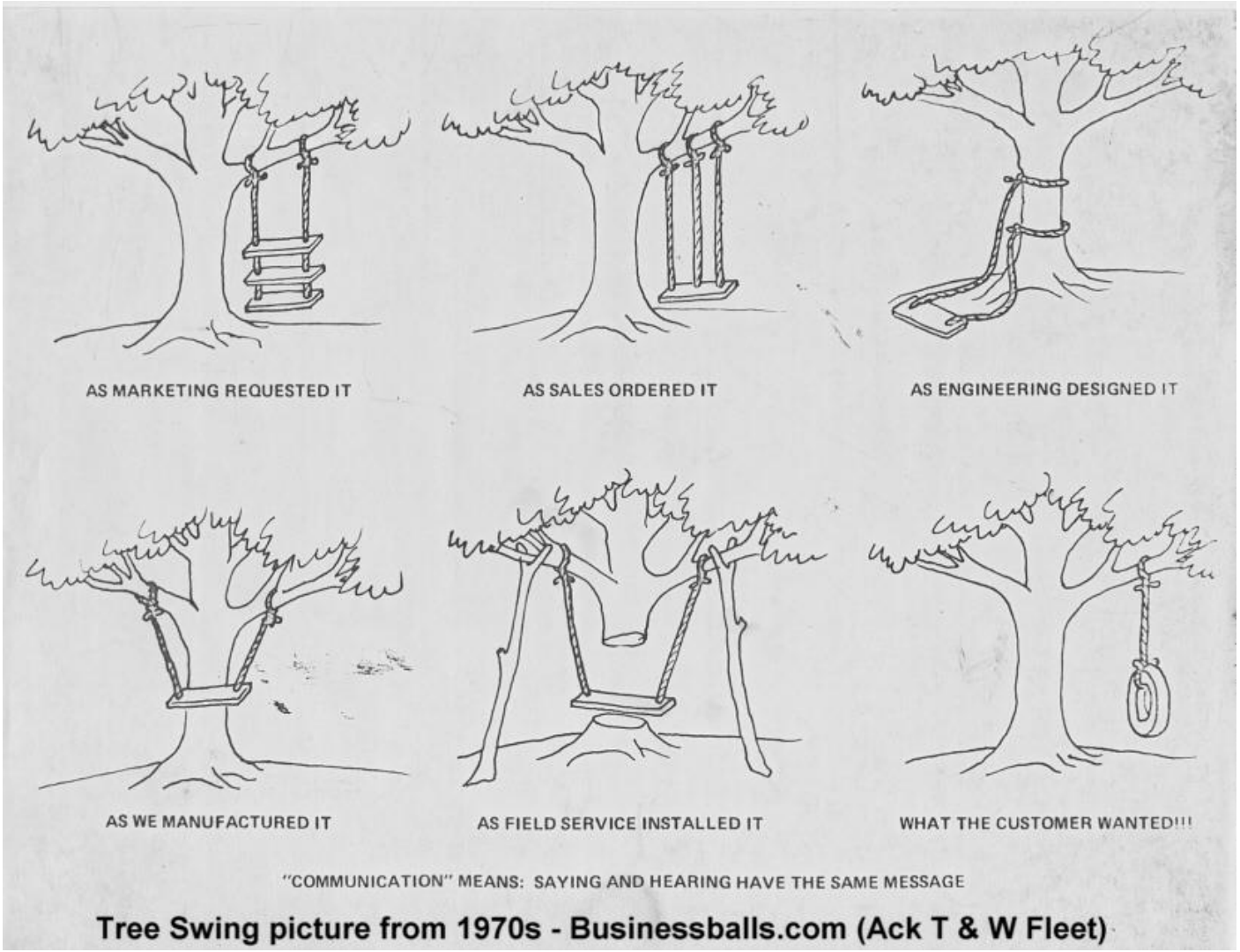


Structural



Functional

Idea Selection



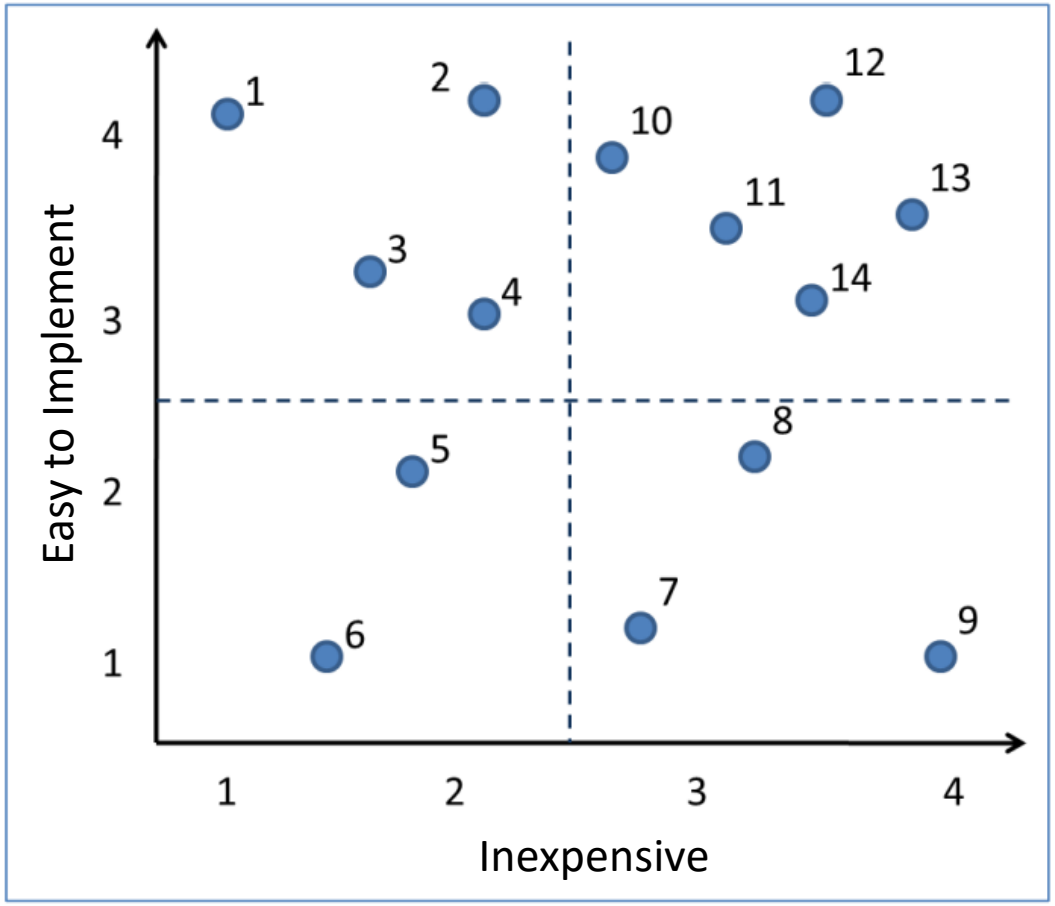
Tree Swing picture from 1970s - Businessballs.com (Ack T & W Fleet)

Idea Selection Tools: Multi-Voting

Narrow down from 50+ ideas to 10+ ideas

Idea Selection Tools: Graphical Decision Matrix

Narrow down from 10+ ideas to 5+ ideas



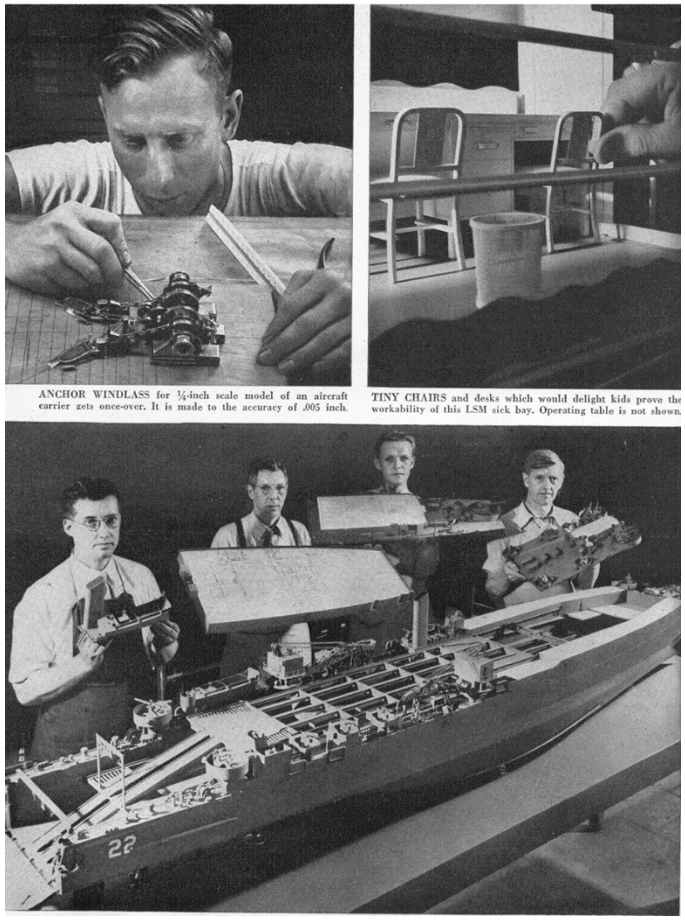
Idea Selection Tools: Weighted Decision Matrix

Objectives	Weight	Score			
Connectivity	0.4 X 3 = 1.2	4 = 1.6	0 = 0	4 = 1.6
Stylus	0.4 X 1 = 0.4	4 = 1.6	0 = 0	1 = 0.4
Light	0.1 X 3 = 0.3	2 = 0.2	1 = 0.1	4 = 0.4
Battery	0.1 X 3 = 0.3	1 = 0.1	1 = 0.1	4 = 0.4
Total	1.0	2.2	3.5	0.2	2.8

Scoring System: 0 = Inadequate; 1 = Weak; 2 = Satisfactory; 3 = Good; 4 = Excellent

Idea Implementation

Prototyping….



ANCHOR WINDLASS for ¼-inch scale model of an aircraft carrier gets once-over. It is made to the accuracy of .005 inch.

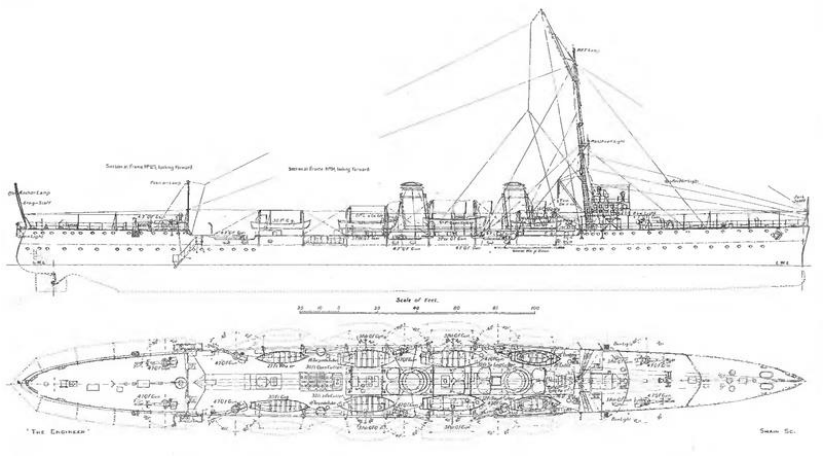
TINY CHAIRS and desks which would delight kids prove the workability of this LSM sick bay. Operating table is not shown.

Cira 2010's

Cira 1940's

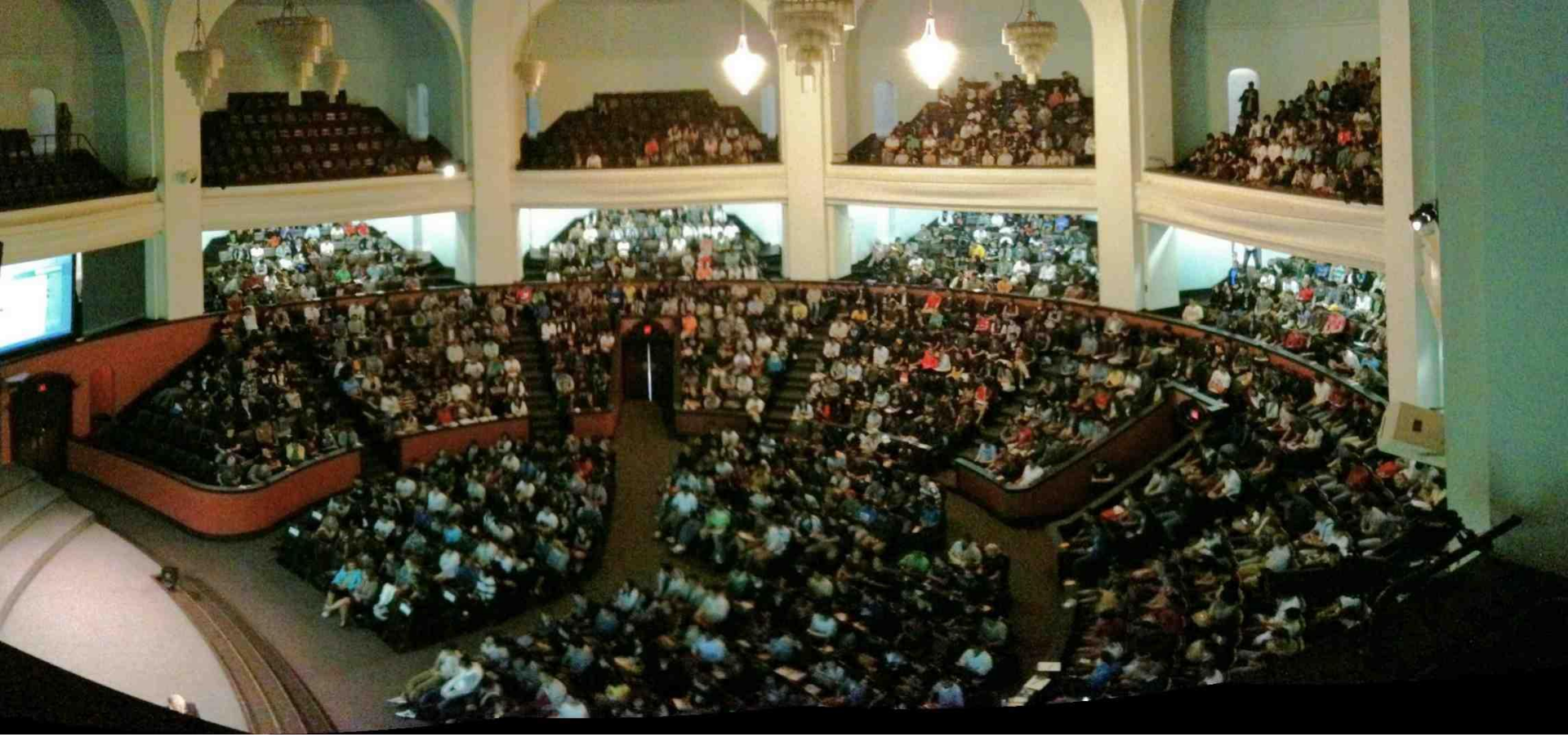
Idea Implementation

Design Drawings….



Cira 1910

Cira 2010’s



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