

Methods in Early Product
Development

“Concept Selection”



Concept Selection

Find the best concept by,

- ...narrowing down to the most promising ideas
- ...evaluating those against our criteria
- ...improving the concepts
- ...working more on the concepts, testing them, getting more data in order to make the final selection

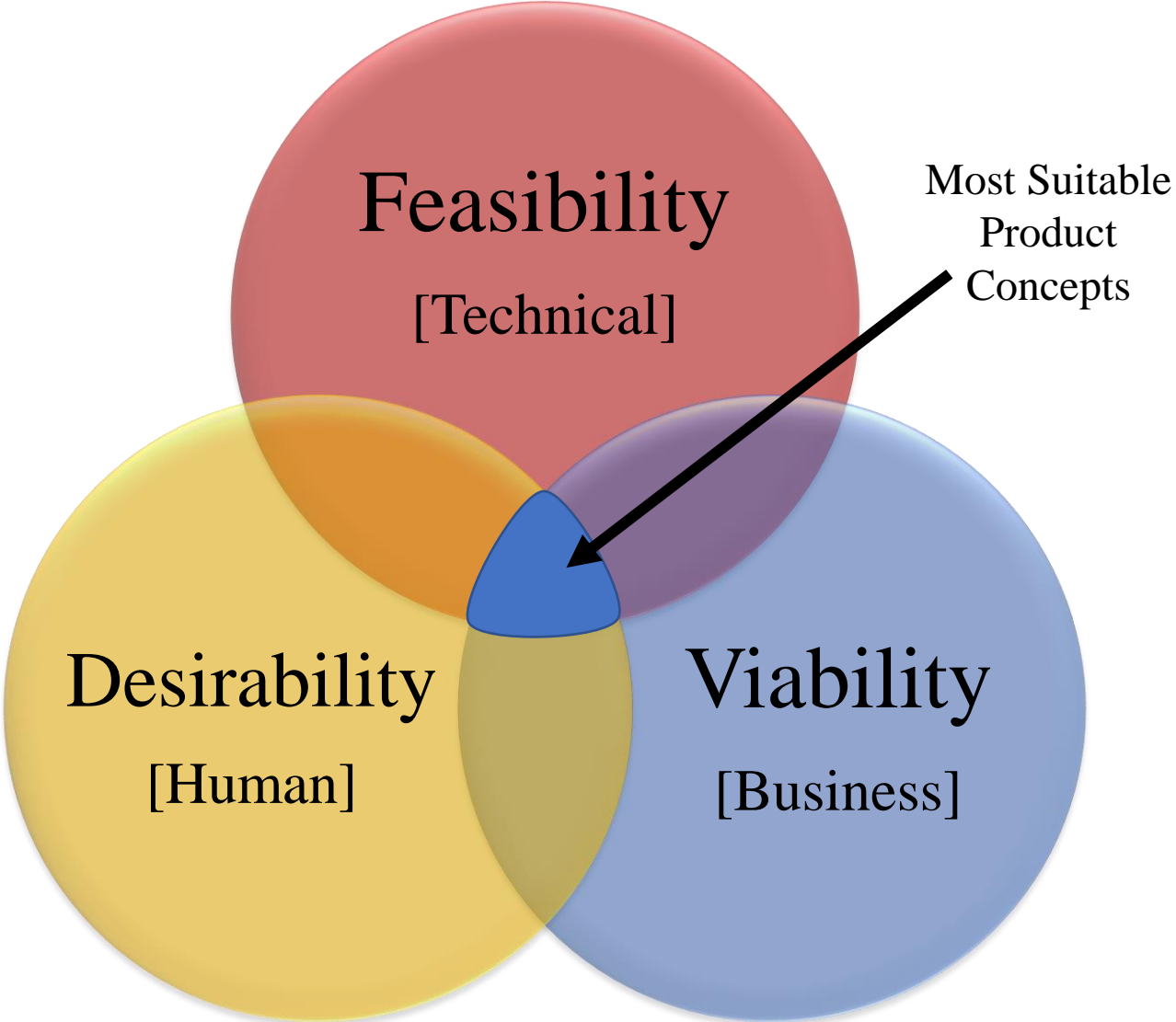




At what stages in the product design and development do we perform concept selection?

Fuzzy Front-End Concept Selection

-  Experience
-  Fast decisions
-  Less scientific expertise
-  Better business understanding
-  Market understanding



Engineering Concept Selection Approach

- Suitable for Novice Designers
- Excellent repeatability
- Systematic Approach
- No personal biases
- Some degree of Scientific expertise



CUSTOMIZABLE INTERFACE

Concept Selection Guidelines

01

Clarify
product
requirement

02

Determine
evaluation
criteria

03

Identify
selection
metrix

04

Identify
reference
product

05

Run the
matrix to
attain scores

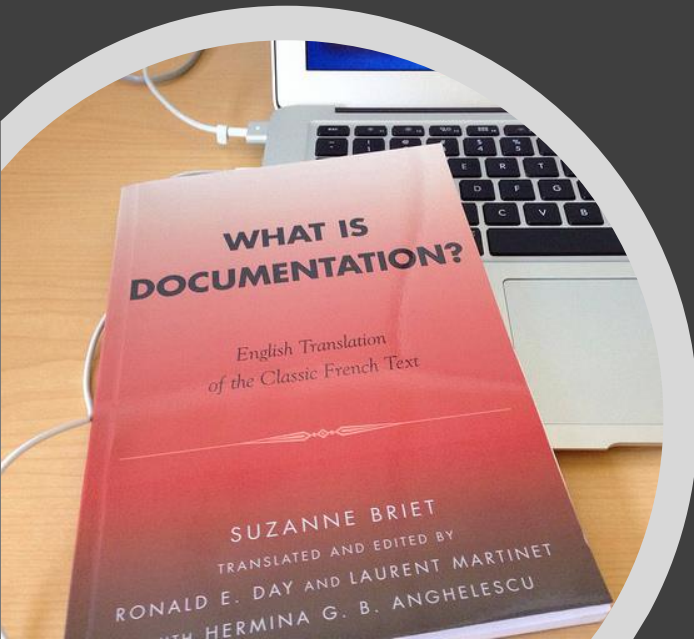
06

Either
improve or
select the
best concept

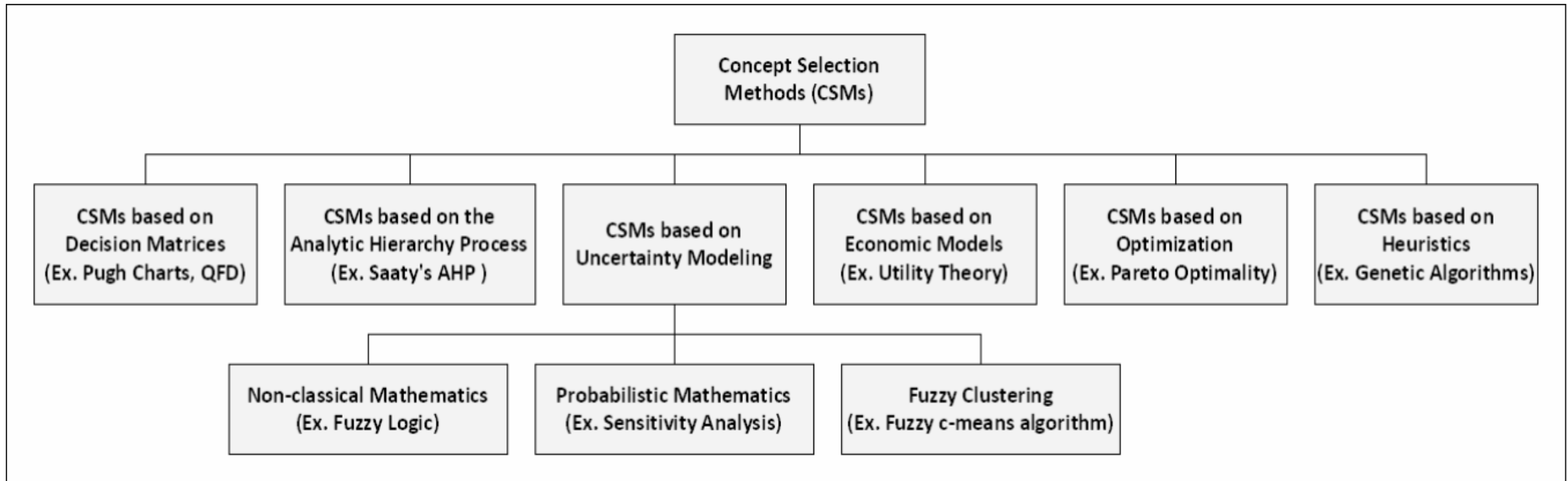


Key features of a good concept selection approach:

- Enables comparison to customer needs/requirements
- Enables joint agreement on all selection criteria
- Enables team discussion
- Enables concept improvement
- Records the process and decision
- Removes personal biases
- Ensures process is well documented



Concept Selection Methods 1980 - 2008



Concept Selection Tools

Most tools or techniques are some sort of multi-criteria decision-making (MCDM) methods.

A few examples of MCDM are,

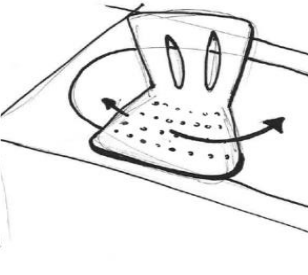
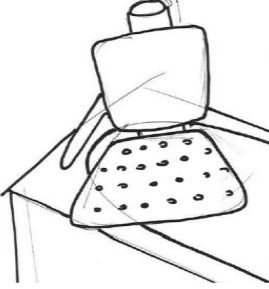
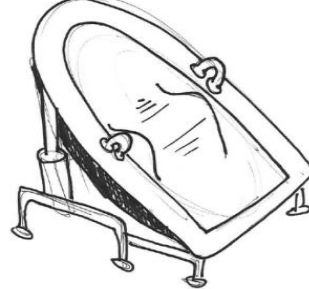
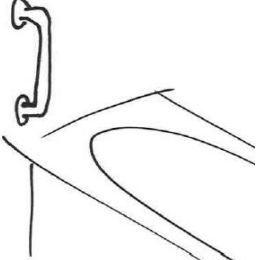
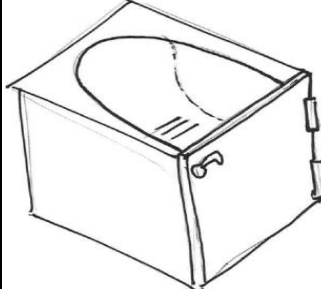
- Pugh's Chart ₁
- Saaty's Analytical Hierarchy Process ₂
- Roy's Electre III (Electre) ₃
- House of Quality ₄



Case Study:
A Bathtub For Specially Abled Individuals

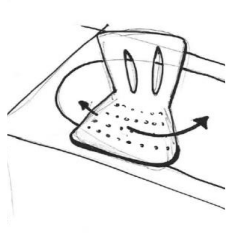
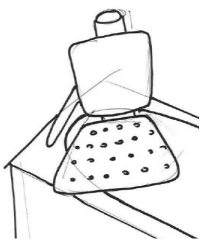
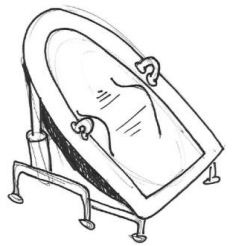
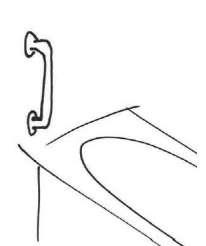
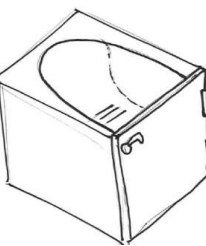
Pugh Matrix: Primary Concepts

Sketches

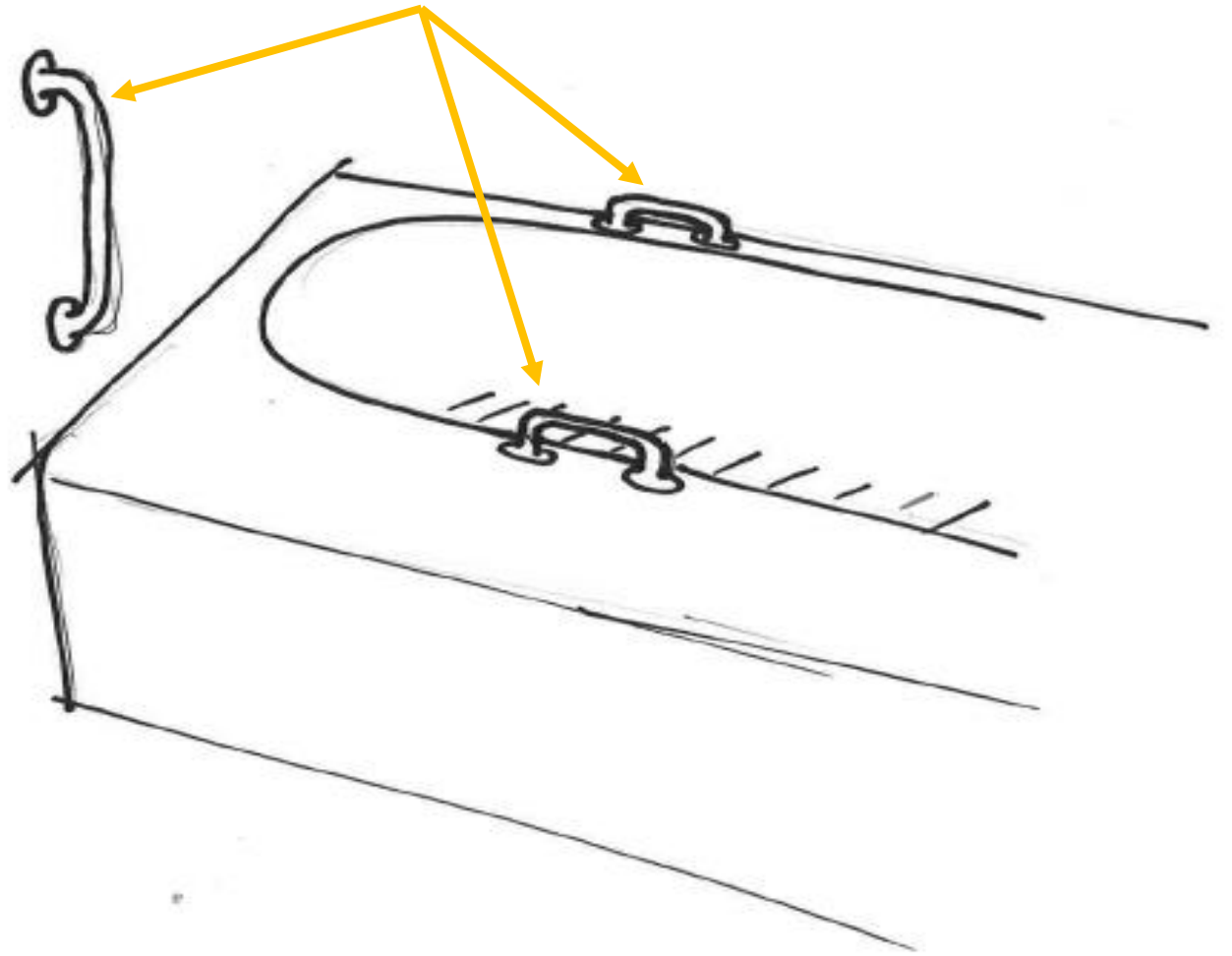
DATUM	OPTION 1	OPTION2	OPTION 3	OPTION 4
Swivel Chair w/ Hinge Leg	Hydraulic Swivel Chair	Pivoting Tub	Shower Grips	Tub Door
				

CRITERIA						
Aesthetics			0	-	+	+
Cost (low preferred)			-	-	+	0
Ease of installation			0	-	+	-
Safety in use			0	-	-	+
Ease of getting in and out of tub			+	0	-	0
Intuitive use			0	-	+	0
Ease of maintenance			-	-	+	0
Bathing comfort (ability to relax and lay in bath)			0	+	+	0
Noise			-	-	0	0
Space required			0	-	+	+
Universal			0	-	+	0
Total	+	0	1	1	8	3
Total	0	0	7	1	1	7
Total	-	0	3	9	2	1
TOTAL		0	-2	-8	6	2

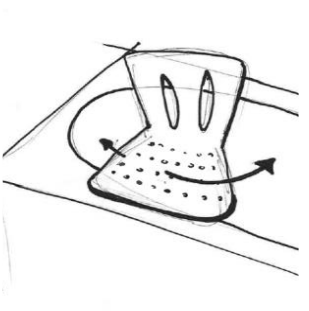
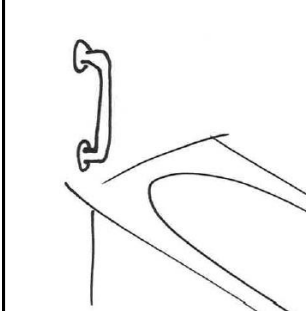
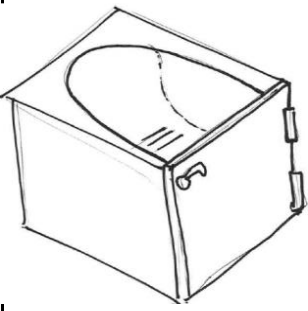
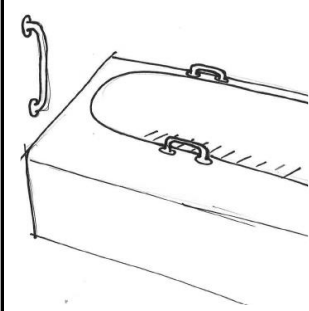
Attack The Minuses

		DATUM	OPTION 1	OPTION2	OPTION 3	OPTION 4	
		Swivel Chair w/ Hinge Leg	Hydraulic Swivel Chair	Pivoting Tub	Shower Grips	Tub Door	
Sketches							
	CRITERIA						
	Aesthetics		0	-	+	+	
	Cost (low preferred)		-	-	+	0	
	Ease of installation		0	-	+	-	
	Safety in use		0	-	-	+	
	Ease of getting in and out of tub		+	0	-	0	
	Intuitive use		0	-	+	0	
	Ease of maintenance		-	-	+	0	
	Bathing comfort (ability to relax and lay in bath)		0	+	+	0	
	Noise		-	-	0	0	
	Space required		0	-	+	+	
	Universal		0	-	+	0	
	Total	+	0	1	1	8	3
	Total	0	0	7	1	1	7
	Total	-	0	3	9	2	1
	TOTAL		0	-2	-8	6	2

Improved Concept



Pugh Matrix: Improved Concept

	Swivel Chair w/ Hinge Leg	Shower Grips	Tub Door	Seating ledge
Sketches				

CRITERIA						
Aesthetics			+	+	+	
Cost (low preferred)			+	0	+	
Ease of installation			+	-	+	
Safety in use			-	+	0	
Ease of getting in and out of tub			-	0	0	
Intuitive use			+	0	+	
Ease of maintenance			+	0	+	
Bathing comfort (ability to relax and lay in bath)			+	0	+	
Noise			0	0	0	
Space required			+	+	0	
Universal			+	0	+	
	Total	+	0	8	3	7
	Total	0	0	1	7	4
	Total	-	0	2	1	0
	TOTAL		0	6	2	7

DATUM

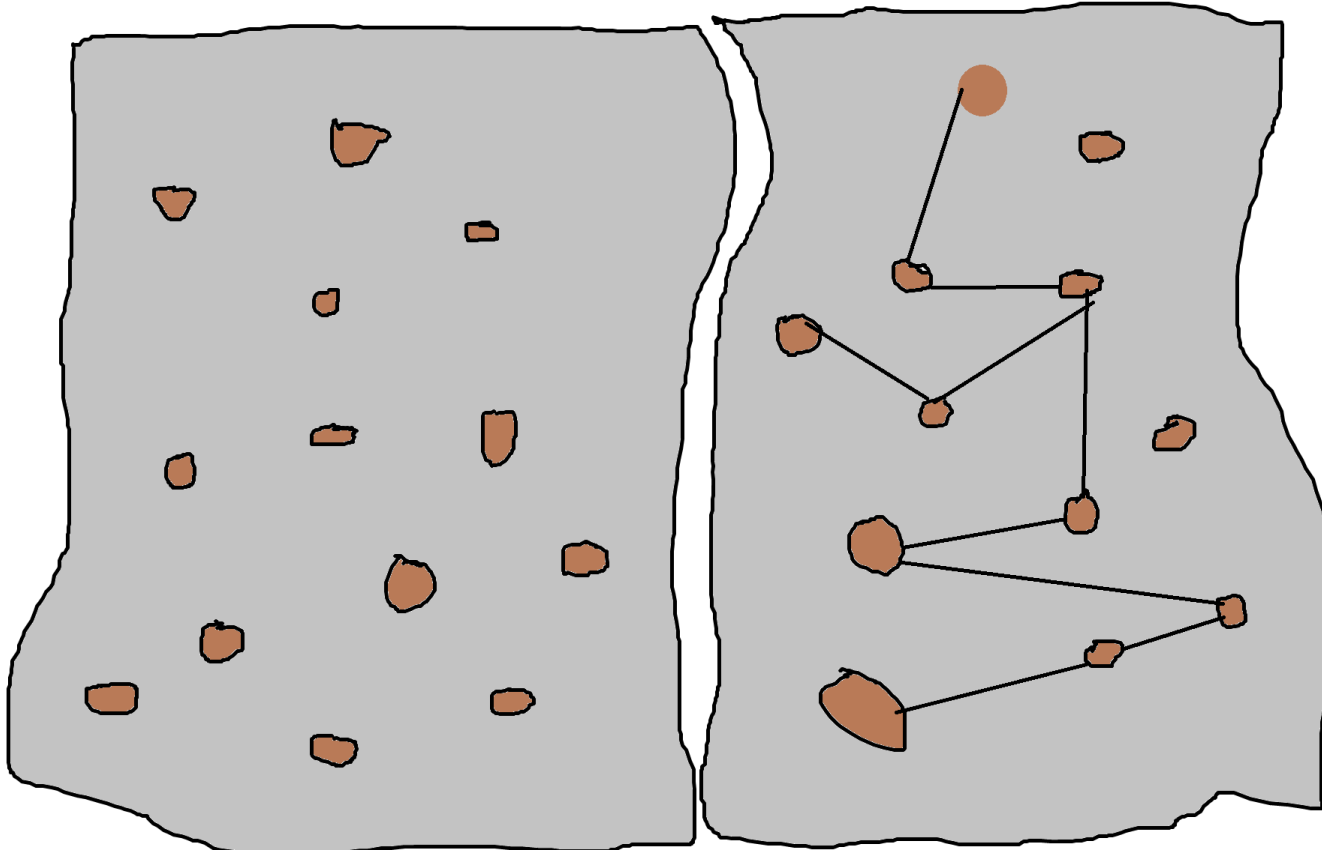
Challenges in Concept Selection

- The nature of available information is usually based on subjective perceptions and speculations of people involved in the design process
- The stakeholders, users, designers and producers can have conflicting requirements concerning, e.g., product design and manufacturing, or product performance and sales price
- Finalizing a product concept can have far-reaching effects on product costs and customer satisfaction, which can only be fixed with additional costs and time

Findings from Scientific Studies

Experiential

Scientific



Birkhofer et al. :

- Very few of the scientific methods were actually used in industry and the ones they use are more or less based on experience rather than scientific testing
- The academia has not correctly understood the actual industrial demand and application environment [1]

Salonen & Perttula :

- Finnish industries very rarely used scientific methods. The methods they used, in reality, were most often informal in nature but,
- Those who used were satisfied and confident in their concept selection [2]



There is no one BEST Concept selection method/matrix/tool



The fundamental procedure remains somewhat similar across different methods



Some methods simply show the best concept, and others offer the possibility of improvement in weaker ideas



The application of concept selection methods depends on factors such as need, time, experience, money, market etc.

Take Home Message

