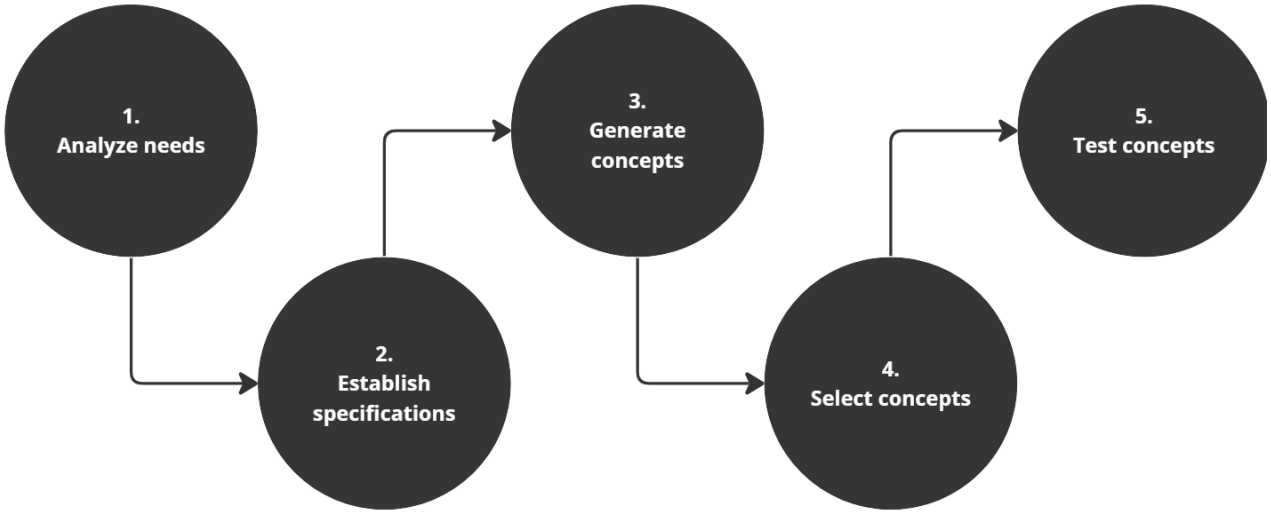
The FlexLink New Product Conceptualizing Handbook™

Last Modified on 11/09/2023 10:14 am CEST

This is the flowchart you can follow for this handbook. Either start from the beginning or jump to the relevant chapter.



1. Analyze needs

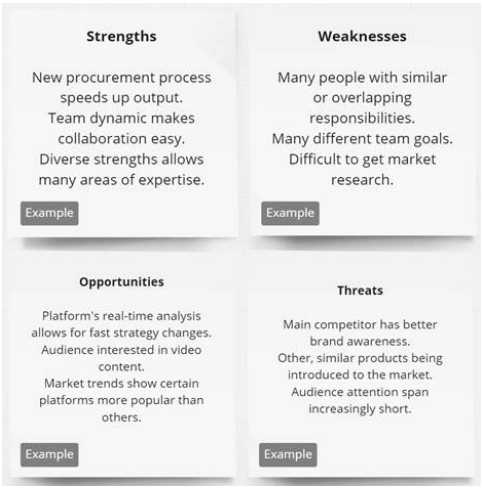
Understand the customer's needs so you don't solve problems that nobody asked for.

Tools

SWOT-analysis

Analyze strengths, weaknesses, opportunities & threats to gain information about products/teams to ensure appropriate milestones.

Example:



2. Establish specifications

Plot the criteria in a preliminary product design specification sheet. The template can be found here: 67-XXXX.

Example:

Document type:	Initial Requirement specification				FLEXLINK® a coesia company	
Project/title:	Sensor support bracket, Quickguide					
Created by:	Martin Bredberg	**Date:** 2022-12-15				
Modified by:	Max Bensryd	**Date:** 2023-07-10				
N:O	**Criterion/ Description**	**D/W**	**Imp.**	**Reason**	**Verification method**	**Reference**
1	**Design**					
1.1	Able to fit into the QuickGuide bracket system	D		QuickGuide assortment	Assessment using CAD and prototyping	Design engineer
1.2	Enable free orientation of the sensor	D		For quick adjustment	Assessment using CAD and prototyping	Design engineer
1.3	Minimal usage of tools	W	4	For quick installation	Assessment using CAD and prototyping	Design engineer
1.4	Surface finish to comply with other FlexLink parts	D		Coherent design language	Initial samples	Quality department
2	**Function**					
2.1	Use as few parts as possible	W	4	Decrease manufacturing lead time and cost	DFMA	Supplier
2.2	Easy to operate	W	3	Market competition	Prototypes/ initial samples	Test engineer
3	**Economics**					
3.1	High volume parts suitable for plastic injection moulding	W	4			Design engineer/tool make
4	**Environment**					
4.1	Suitable for food and beverage	W	4	Market prerequisite	No dirt traps. Easy to clean	Refer standards
4.2	Suitable for dry/clean room	W	4	Market prerequisite	No dirt traps. Easy to clean	Refer standards
5	**Legal & Safety**					
5.1	Fulfilment of European safety standards	D		Market prerequisite	2006/42 EC (machinery)	Refer standards
5.2	No interference with existing/valid patents	D		Fine cost/license	Patent search, inhouse or third party	

Tools

Needs-Metrics Matrix:

Create a simple needs-metrics matrix that represents the relationship between needs and metrics

Example:

		1	2	3	4	5	6	7
	Metric	Attenuation from dropout to handlebar at 10 Hz	Spring preload	Damping coefficient adjustment range	Time to assemble to frame	Special tools required for maintenance	JIS test	Bending strength
1	Reduces vibration to the hands	●						
2	Allows traversal of difficult terrain		●					
3	Remains rigid during cornering		●					
4	Allows sensitivity adjustment			●				
5	Works with current fenders				●			
6	Allows easy replacement of worn parts					●		
7	Is safe in a crash						●	●

- Collect benchmarking information

  Example:

No.	Need	Imp.	ST Tritrack	Maniray 2	Rox Tahx Quadra	Rox Tahx Ti 21	Tonka Pro	Gunhill Head Shox
1	Reduces vibration to the hands	3	•	••••	••	•••••	••	•••
2	Allows easy traversal of slow, difficult terrain	2	••	••••	•••	•••••	•••	•••••
3	Enables high-speed descents on bumpy trails	5	•	•••••	••	•••••	••	•••
4	Allows sensitivity adjustment	3	•	••••	••	•••••	••	•••
5	Preserves the steering characteristics of the bike	4	••••	••	•	••	•••••	•••••
6	Remains rigid during hard cornering	4	•	•••	•	•••••	•	•••••
7	Is lightweight	4	•	•••	•	•••	••••	•••••
8	Provides stiff mounting points for the brakes	2	•	••••	•••	•••	•••••	••
9	Fits a wide variety of bikes, wheels, and tires	5	••••	•••••	•••	•••••	•••	•
10	Is easy to install	1	••••	•••••	••••	••••	•••••	•
11	Works with fenders	1	•••	•	•	•	•	•••••
12	Instills pride	5	•	••••	•••	•••••	•••	•••••
13	Is affordable for an amateur enthusiast	5	•••••	•	•••	•	•••	••
14	Is not contaminated by water	5	•	•••	••••	••••	••	•••••
15	Is not contaminated by grunge	5	•	•••	•	••••	••	•••••
16	Can be easily accessed for maintenance	3	••••	•••••	••••	••••	•••••	•
17	Allows easy replacement of worn parts	1	••••	•••••	••••	••••	•••••	•
18	Can be maintained with readily available tools	3	•••••	•••••	•••••	•••••	••	•
19	Lasts a long time	5	•••••	•••••	•••••	•••	•••••	•
20	Is safe in a crash	5	•••••	•••••	•••••	•••••	•••••	•••••

EXHIBIT 6-7 Competitive benchmarking chart based on perceived satisfaction of needs. (Scoring more "dots" corresponds to greater perceived satisfaction of the need.)

- Set ideal and marginally acceptable target values for each metric

  Example

Metric No.	Need Nos.	Metric	Imp.	Units	Marginal Value	Ideal Value
1	1, 3	Attenuation from dropout to handlebar at 10 Hz	3	dB	>10	>15
2	2, 6	Spring preload	3	N	480–800	650–700
3	1, 3	Maximum value from the Monster	5	g	<3.5	<3.2
4	1, 3	Minimum descent time on test track	5	s	<13.0	<11.0
5	4	Damping coefficient adjustment range	3	N-s/m	0	>200
6	5	Maximum travel (26-in. wheel)	3	mm	33–50	45
7	5	Rake offset	3	mm	37–45	38
8	6	Lateral stiffness at the tip	3	kN/m	>65	>130
9	7	Total mass	4	kg	<1.4	<1.1
10	8	Lateral stiffness at brake pivots	2	kN/m	>325	>650
11	9	Headset sizes	5	in.	1.000 1.125	1.000 1.125 1.250
12	9	Steertube length	5	mm	150 170 190 210	150 170 190 210 230
13	9	Wheel sizes	5	List	26 in.	26 in. 700C
14	9	Maximum tire width	5	in.	>1.5	>1.75
15	10	Time to assemble to frame	1	s	<60	<35
16	11	Fender compatibility	1	List	None	All
17	12	Instills pride	5	Subj.	>3	>5
18	13	Unit manufacturing cost	5	US$	<85	<65
19	14	Time in spray chamber without water entry	5	s	>2300	>3600
20	15	Cycles in mud chamber without contamination	5	k-cycles	>15	>35
21	16, 17	Time to disassemble/assemble for maintenance	3	s	<300	<160
22	17, 18	Special tools required for maintenance	3	List	Hex	Hex
23	19	UV test duration to degrade rubber parts	5	hr	>250	>450
24	19	Monster cycles to failure	5	Cycles	>300k	>500k
25	20	Japan Industrial Standards test	5	Binary	Pass	Pass
26	20	Bending strength (frontal loading)	5	kN	>7.0	>10.0

EXHIBIT 6-8 The target specifications. Like the other information systems, this one is easily encoded with a spreadsheet as a simple extension to the list of specifications.

- Reflect on result and process

3. Generate concepts

Use different techniques to generate a solid base of concepts.

1. Clarify the problem TO BE FINISHED
2. Understand the problem and decompose it into simpler sub-problems if possible/needed
3. Search externally TO BE FINISHED
4. Consult Experts
5. Search Patents
6. Search Published Literature
    - Existing solutions (don’t waste time reinventing the wheel)

- Benchmark Related Products
- Search internally TO BE FINISHED
- Brainstorming
- Working alone

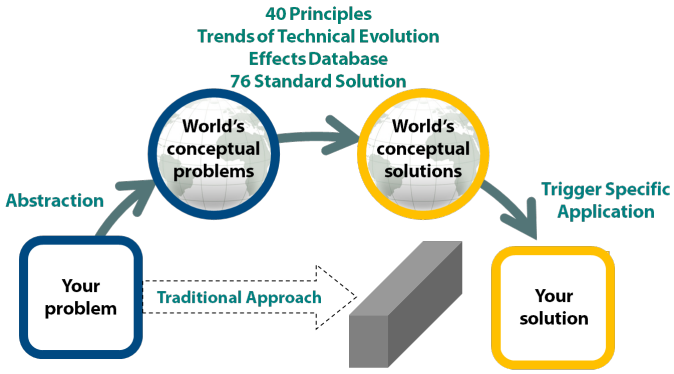
- Does FlexLink already have a similar product/solution?
- Have FlexLink investigated this kind of problem before? Conclusions?
- Explore systematically TO BE FINISHED
- Reflect on the solutions and the process TO BE FINISHED

Tools

TRIZ

Russian theory of inventive problem solving to help you systematically generate solutions.

The 40 principles can be viewed **here**.



Example:

You own a furniture store in a small building. The store wants to attract customers, so it needs to have its goods on display. But it also needs to have enough storage space to keep a range of products ready for sale.

The furniture needs to be large (to be useful and attractive), but also small (to be stored in as little space as possible).

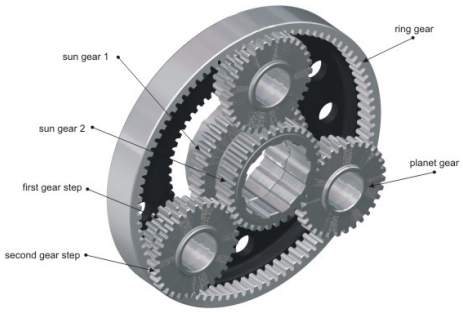
Using TRIZ, you can generalize this contradiction into a general problem and apply one of the 40 Principles of Problem Solving – a key TRIZ technique – to it. Something like general solution "Principle 1 – Segmentation".

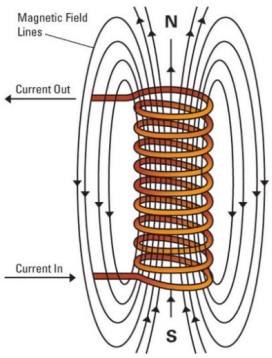
This solution advocates dividing the product and making it easy to assemble/disassemble. And you develop ready-to-assemble versions of all your furniture, so that display models can take up the room that they need while inventory occupies much less space per unit.

bild för exemplet

Mechanical? principles

Consider the typical solutions that already is tried and tested. TO BE FINISHED



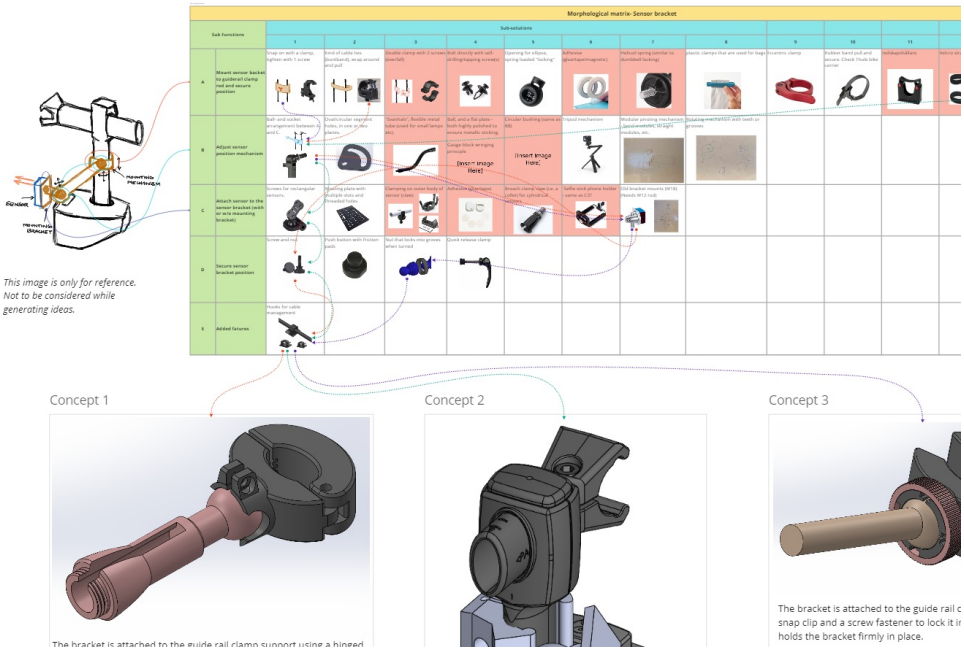


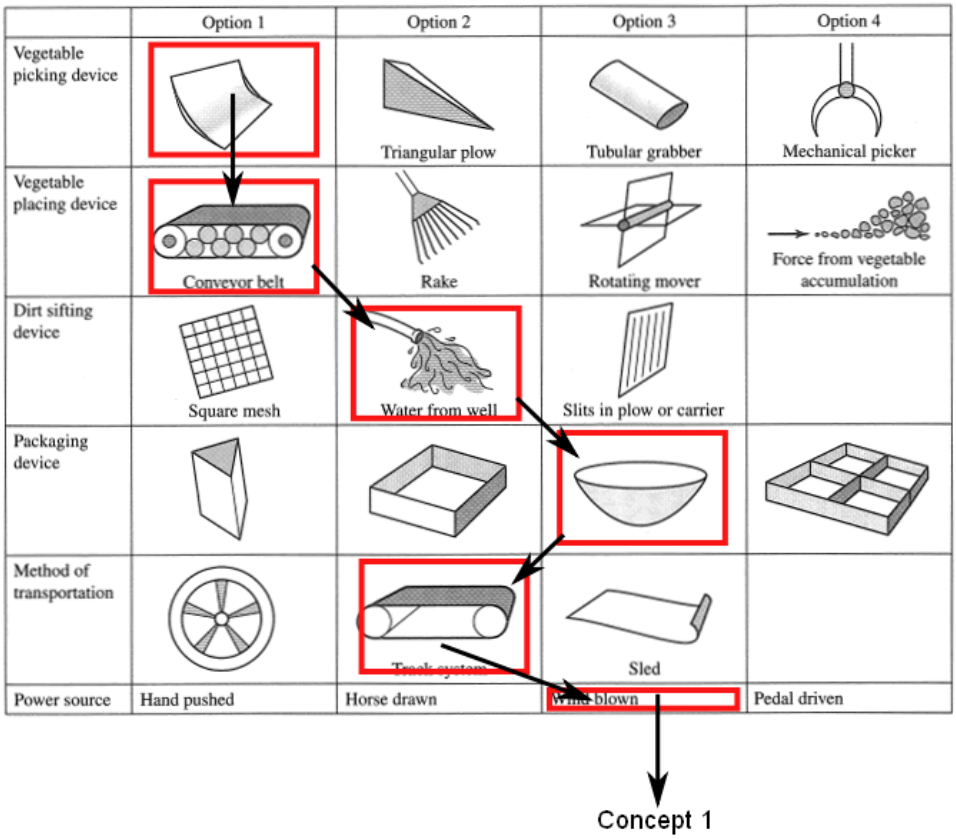
Brainstorming

Involve several people, i.e put together a Team TO BE FINISHED

Morphological Matrix

A chart or design matrix (table) that aims to provide a framework within which new or different ideas can be produced or considered.





Starbursting

Challenge in the middle and on each of the points write: Who, what, where, when, why & how. Generate questions from these keywords. TO BE FINISHED

Five whys

Ask whys to reach the ultimate cause of the problem. Childish but surprisingly effective. Investigate the link between cause and effect!

Brainstorming

Set it up as a team exercise, describe the problem and use a time limit. No judging for now. TO BE FINISHED

Reverse brainstorming

Gives a different perspective. Focus on the problems and encourage thinking backwards. We have a natural tendency to see problems over solutions.

Example:

When creating a new sports car design:

- How do we make this sports car engine less reliable?
- Can we make the interior more dangerous?
- Where can we make the seat more uncomfortable?
- How do we remove this paddle shifter functionality?

Reverse thinking

Expand your thinking by asking yourself what someone else would do in your situation. What would the opposite approach be? Reflect on the ramifications.

Mind mapping

Tool for visualizing different concepts. Group, organize and draw connections like branches from a tree. TO BE FINISHED

Gap filling

State where you currently are and where you'd like to be. Fill the gap with a variety of solutions.

The 6-3-5-method

6 people | 3 ideas | 5 min Then rotate the worksheet and either add 3 ideas or develop previous ideas.

(At most 108 ideas in 30 minutes)

Slip-writing

Write ideas on cards and submit anonymously. Ideas are then shared and modified. Submit anonymous concerns, suggestions and thoughts for each idea. Good for transparency.

Preselection

Gather data to validate or invalidate concepts early.

4. Select concepts

Rank the concepts to arrive at the best solutions.

Tools

Kesselring matrix

It is nice b/c TO BE FINISHED

Example:

Table 4: Kesselring matrix.

Chalmers		Kesselring matrix											
				Created: 120416								Page 1	
				Modified: 120502									
Criteria		**Solution alternative**											
		Ideal		**A**		**B**		**D**		**E**		**F**	
Name	w	v	t	v	t	v	t	v	t	v	t	v	t
Ergonomics	5	5	25	4	20	5	25	5	25	5	25	4	20
Cost	3	5	15	5	15	3	9	1	3	3	9	2	6
Productivity	3	5	15	4	12	4	12	3	9	3	9	5	15
Feasibility	4	5	20	5	20	3	12	2	8	2	8	3	12
Safety	4	5	20	3	12	4	16	5	20	4	16	3	12
Applicability	4	5	20	4	16	4	16	1	4	2	8	1	4
Total		30	**115**	25	**95**	23	**90**	17	**69**	19	**75**	18	**69**
Rank					1		2		4		3		4
Decision		Propose both alternative A and B											

FLEXLINK
a coesia company

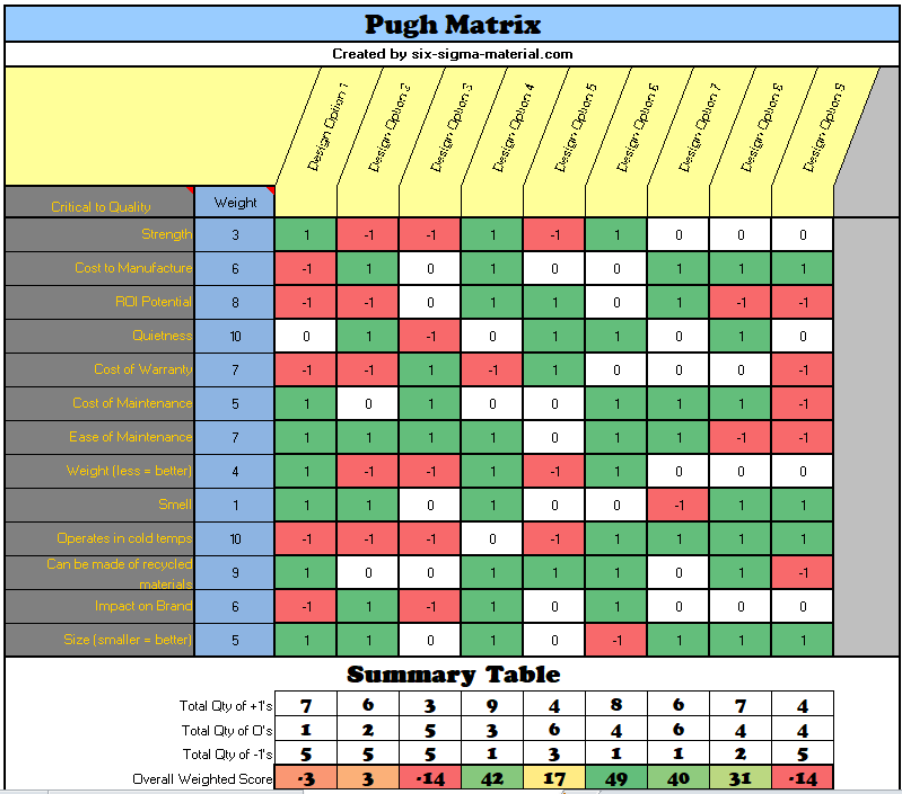
CONCEPT SCORING - KESSELRING MATRIX

	Concepts →		XLRX18X (Reference)		Concept 1		Concept 2		Concept 3		Concept 4		Concept 5		Concept 6	
No	**Criteria ↓**	w	r	ws	r	ws	r	ws	r	ws	r	ws	r	ws	r	ws
1	**Functionality**															
1,1	Holds securely in place	5	3	15		0	5	25	3	15	4	20	3	15	5	25
1,2	Fits older clamps/rods	1	3	3		0	2	2	2	2	2	2	2	2	2	2
1,3	Does not damage the surface in contact under normal use	4	3	12		0	3	12	3	12	3	12	3	12	3	12
1,4	Tamper proofing	4	3	12		0	5	20	4	16	4	16	3	12	5	20
2	**Ease of use**															
2,1	Quick to mount	5	3	15		0	4	20	4	20	5	25	4	20	5	25
2,2	Mountable by one person	5	3	15		0	5	25	5	25	5	25	5	25	5	25
2,3	Implement mistake proofing	4	3	12		0	1	4	2	8	2	8	2	8	2	8
2,4	Easy to adjust	5	3	15		0	5	25	4	20	4	20	4	20	4	20
2,5	No tools required	4	3	12		0	5	20	5	20	5	20	5	20	5	20
3	**Ease of manufacture**															
3,1	Low component cost	3	3	9		0	2	6	3	9	1	3	5	15	4	12
3,2	Low complexity of parts	3	3	9		0	1	3	2	6	1	3	4	12	2	6
3,3	Time-to-market	4	3	12		0	1	4	1	4	3	12	4	16	3	12
4	**Design & Aesthetics**															
4,1	Does not accumulate dirt particles	2	3	6		0	4	8	4	8	2	4	3	6	2	4
4,2	Resistant to UV and other destructive elements	5	3	15		0	3	15	3	15	3	15	3	15	3	15
4,3	Flexlink/ QuickGuide design language	3	3	9		0	3	9	3	9	1	3	2	6	4	12
4,4	Aesthetic appeal when mounted	3	3	9		0	5	15	5	15	1	3	3	9	4	12
5	**Environment**															
5,1	Recyclable	2	3	6		0	5	10	5	10	3	6	5	10	3	6
	Total score			186		0		223		214		197		223		236
	Ranking							2		3		4		2		1
Date:																

Pugh matrix

Decision matrix that encourages self-reflection with minimal bias. Criteria is weighted and rated on each solution as (+) or (-) compared to baseline. Click this link for a template: TO BE FINISHED

Example:



Pugh Matrix

Created by six-sigma-material.com

Critical to Quality	Weight	Design Option 1	Design Option 2	Design Option 3	Design Option 4	Design Option 5	Design Option 6	Design Option 7	Design Option 8	Design Option 9
Strength	3	1	-1	-1	1	-1	1	0	0	0
Cost to Manufacture	6	-1	1	0	1	0	0	1	1	1
ROI Potential	8	-1	-1	0	1	1	0	1	-1	-1
Quietness	10	0	1	-1	0	1	1	0	1	0
Cost of Warranty	7	-1	-1	1	-1	1	0	0	0	-1
Cost of Maintenance	5	1	0	1	0	0	1	1	1	-1
Ease of Maintenance	7	1	1	1	1	0	1	1	-1	-1
Weight (less = better)	4	1	-1	-1	1	-1	1	0	0	0
Smell	1	1	1	0	1	0	0	-1	1	1
Operates in cold temps	10	-1	-1	-1	0	-1	1	1	1	1
Can be made of recycled materials	9	1	0	0	1	1	1	0	1	-1
Impact on Brand	6	-1	1	-1	1	0	1	0	0	0
Size (smaller = better)	5	1	1	0	1	0	-1	1	1	1

Summary Table

Total Qty of +1's	7	6	3	9	4	8	6	7	4
Total Qty of 0's	1	2	5	3	6	4	6	4	4
Total Qty of -1's	5	5	5	1	3	1	1	2	5
Overall Weighted Score	-3	3	-14	42	17	49	40	31	-14

5. Test concepts

TO BE FINISHED

- Define the purpose of the concept test.
- Choose a survey population.
- Choose a survey format.
- Communicate the concept.
- Measure customer response.
- Interpret the results.
- Reflect on the results and the process.