

Creating a Pairwise Comparison Chart

Prioritizing Design Objectives

Taken from *engineering design: a project-based introduction* by dym & little

A Pairwise Comparison Chart allows for a relative ranking of the major design objectives.

- Identify the top 4-7 design objectives.
- If working for a client, have the client complete the PCC based on what they feel is most important.
- Use the results of the PCC to determine what objectives have the highest priority.

The process involves comparing each objective to the others, one at a time.

- Place each of the key objectives in a row across the top of the chart and in a column down the left-hand side.
- For each row, compare the row objective to each column objective.
- If the row objective is more important than the column objective, place a "1" in the cell.
- If the column objective is more important than the row objective, place a "0" in the cell.
- Add up the value in each row to determine the total score for that row objective. The higher the total, the higher priority that objective has.

Developing a PCC for a ladder design.

- First row**
 - Cost is less important than portability → 0
 - Cost is less important than usefulness → 0
 - Cost is more important than durability → 1
 - The total score for cost → 1

Goals	Cost	Portability	Usefulness	Durability	Score
Cost	----	0	0	1	1
Portability	1	----	1	1	3
Usefulness	1	1	----	1	3
Durability	0	0	0	----	0

Developing a PCC for a ladder design.

- Second row**
 - Portability is more important than cost → 1
 - Portability is more important than usefulness → 1
 - Portability is more important than durability → 1
 - The total score for portability is 3.

Goals	Cost	Portability	Usefulness	Durability	Score
Cost	----	0	0	1	1
Portability	1	----	1	1	3
Usefulness	1	1	----	1	3
Durability	0	0	0	----	0

Developing a PCC for a ladder design.

- Third row**
 - Usefulness is more important than cost → 1
 - Usefulness is less important than portability → 0
 - Usefulness is more important than durability → 1
 - The total score for usefulness is 2.

Goals	Cost	Portability	Usefulness	Durability	Score
Cost	----	0	0	1	1
Portability	1	----	1	1	3
Usefulness	1	0	----	1	2
Durability	0	0	0	----	0

Developing a PCC for a ladder design.

- Fourth row**
 - Durability is less important than cost → 0
 - Durability is less important than portability → 0
 - Durability is less important than usefulness → 0
 - The total score for durability is 0.

Goals	Cost	Portability	Usefulness	Durability	Score
Cost	----	0	0	1	1
Portability	1	----	1	1	3
Usefulness	1	0	----	1	2
Durability	0	0	0	----	0

The results of the PCC yield a prioritized list of design objectives.

- Of the objectives listed, the prioritized list is
 - Portability
 - Usefulness
 - Cost
 - Durability
- The fact that durability scored a "0" on the PCC does not mean that we can drop durability from the list of objectives. It just means that of the four objectives listed, durability is the least important.

Here is a Pairwise Comparison Chart for a BEST Robot.

Objectives	Speed	Drive Power	Lift Power	Degrees-of-freedom	Simple Controls	Score
Speed	----	1	1	1	1	4
Drive Power	0	----	1	0	0	1
Lift Power	0	0	----	1	0	1
Degrees-of-freedom	0	1	0	----	1	1
Simple Controls	0	1	1	1	----	3