

Assigning Weights to Criteria

- Pair-wise comparisons
- Assign relative weights
- Share a certain number of points
- Using objective tree for distributing weights

Comparison using Datum Design Concept (Pugh Matrix)

- Procedure
 - Identify a datum alternative
 - Rank every other alternative as better/same/worst/ for each criterion . -1 for worse, 0 for same, 1 for better.
 - Sum and ranks for an overall evaluation of each configuration.
- If a final results has an alternative ranked at +3, it means the alternative is better than the base point by a net of 3 criteria.
- The result should not be used as an overall rank, but rather as an indicator of what to do next in the selection process.
- More useful for improving conceptual designs.

Interval Scales

- A numerical scale reflecting *how much* better or worse one design is compared to the others.
- Constructed for criteria that have no identifiable units of measure
- Need to have reference designs (x_0 - base point and x_1 - metric alternative) at two ends of performance for a particular criteria
- Constructed for a single criterion but not a design
- Often used when only qualitative information is available (safety, reliability, simplicity).

Ratio Scale

- Often used for physically meaningful (quantitative) criterion (cost, power, speed)
- Normalized based on best possible and worst possible design options.

Normalization and Merit Function

- Normalized Rating
 - larger indicates preference $R = (r - r_{\min}) / (r_{\max} - r_{\min})$
 - smaller indicates preference $R = 1 - (r - r_{\min}) / (r_{\max} - r_{\min})$
- Merit Function
 - $M = \sum W_i R_i$