Normalization methods		Formula	Description	Comments
Linear scale	**Min-max**	$N_{ia} = \frac{x_{ic} - \min(x_i)}{\max(x_i) - \min(x_i)}$	It applies a linear transformation to rescale the data in a specified range (typically 0-1).	Most common normalization method used. The order and proximity of the data points are maintained. Outliers can have a significant impact on the transformation. Loss of information: it compresses the range of the original data.
	Standardization (z-score)	$N_{ia} = \frac{x_{ia} - x_{ia=\bar{a}}}{\sigma_{ia=\bar{a}}}$	It applies a linear transformation with mean of 0 and standard deviation of 1.	The order and proximity of the data points are maintained. The standardized data is not bounded. High values have a great impact on the result, which is desirable if the wish is to reward exceptional behaviour. It preserves the shape and distribution of the original data. Loss of information: none.
Ratio scale	**Target**	$N_{ia} = \frac{x_{ia}}{\max(x_i)}$	It normalizes the upper limit to 1.	The order and proximity of the data points are maintained. No fixed range. Sensitive to outliers. It can be useful when the maximum value is of particular interest or importance in the analysis. Loss of information: it can reduce the relative differences between values, potentially compressing the data.
Ordinal	**Rank**	$N_{ia} = rank(x_{ia})$	The data points are ranked based on their relative values.	The order and proximity of the data points are maintained. It does not impose a fixed range on the transformed data. It eliminates magnitude differences. It can be useful when the exact values are not important, but rather the relative positions or comparisons between values. Robust to outliers.

Legend

N_{ia}: the normalized value of indicator *i* for alternative *a*.
x_{ia}: the value of indicator i for alternative *a*.
$x_{ia=\bar{a}}$the average value of indicator *i* across all alternatives.
$\sigma_{ia=\bar{a}}$: the standard deviation of indicator *i* across all alternatives.
$min(x_i)$: the minimum value of indicator *i* across all alternatives.
$max(x_i)$: the maximum value of indicator *i* across all alternatives.