Weighted average vs TOPSIS: a comparison of aggregation methodologies for AHP

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Abstract

The goal of this paper is to provide a structured and computational comparison of two of the most popular methodologies employed in combination with the Analytic Hierarchic Process (AHP) in solving supplier selection and similar multi-criteria decision making problems: the Weighted Average (WAS) and TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution). Both these methods, indeed, are often utilised as aggregation modes for multi-criteria decision-making frameworks, in which AHP (or ANP) is utilised in order to derive weights of involved criteria (Saaty,1980).

Keywords: TOPSIS, Weighted average, AHP, MADM distances.

Methodology

In particular, we compare the performance of these two aggregation methodologies on the basis of a set of randomly generated numerical instances of a hypothetical supplier selection problem. Supplier rankings will be produced using TOPSIS and Weighted Average techniques; concordances and discrepancies of the resulting rankings obtained by using the different methodologies will be evaluated according to appropriate statistical measurements and tests (Zanakis et al. 1998) (Triantaphyllou*, 2000) (*Ceballos et al., 2016) (Çelikbilek et al., 2020). Varying the number of criteria, the number of alternatives, systematically, makes the analysis. In addition, the comparison is enriched with varying the most employed "Minkowski" distances utilized for TOPSIS: the Euclidean distance, The Manhattan distance, the sup distance. A discussion about practical implications of the study will be then developed, along with conclusions and future research perspectives.

Results

Our results show a good degree of correlation between WAS and TOPSIS. Our results seem to be unrelated to the novel developments in TOPSIS methods (Vommi,2017) (Kuo,2017).

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