An investigation to offer conclusive recommendations on suitable benefit/cost criteria-based normalization methods for TOPSIS

ABSTRACT

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is a popular multi-criteria decision-making method that ranks the available alternatives by examining the ideal-positive and ideal-negative solutions for each decision criterion. The first step of using TOPSIS is to normalize the presence of incommensurable data in the decision matrix. There are several normalization methods, and the choice of these methods does affect TOPSIS results. As such, some efforts were made in the past to compare and recommend suitable normalization methods for TOPSIS. However, such studies merely compared a limited collection of normalization methods or used a noncomprehensive procedure to evaluate each method's suitability, leading to equivocal recommendations. This study, therefore, employed an alternate, comprehensive procedure to evaluate and recommend suitable benefit/cost criteria-based normalization methods for TOPSIS (out of ten methods extracted from past literature). The procedure was devised based on three evaluation metrics: the average Spearman's rank correlation, average Pearson correlation, and standard deviation metrics, combined with the Borda count technique. • The first study examined the suitability of ten benefit/cost criteria-based normalization methods over TOPSIS. • Users should combine the sum-based method and vector method into the TOPSIS application for safer decision-making. • The maximum method (version I) or Jüttler's-Körth's method has an identical effect on TOPSIS results.