

A Note on the Incremental Analysis for Multiple Criteria Decision Making

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Abstract

Incremental analysis or marginal analysis is a promising tool for multi-criteria or multi-attribute decision making (MCDM/MADM) for evaluating and ranking alternatives. Through pair-wise marginal comparisons of benefit and cost criteria of alternatives, the analysis can help MCDM identify the best alternative from an alternative set. A truly ranking of these alternatives is then provided.

Because ratio scale is intensively used for performance evaluation of alternatives in various MCDM techniques, the ranking of alternatives by the scale also could not reflex the truly dominance of alternatives, even to be erroneous for the ranking. The study tries to exploit incremental analysis of engineering economy to overcome the drawbacks. In the proposed procedure, multiple criteria of alternatives are first reorganized as two categories: benefits and costs, and normalized decision matrices will be manipulated separately. Then performance of alternatives is evaluated on their incremental benefit-cost ratio, and their rank can be obtained for any MCDM techniques.

In addition, some considerations on benefit/cost ratios and input-output relations are also discussed to understand the essentials of incremental analysis. In the final part, an example of river-crossing (Saaty 1980) is examined to illustrate the suggested model to be both robust.

Keywords: incremental analysis, multi-criteria analysis, benefit/cost ratio, engineering economy, ratio scale.