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ANALYSIS OF MULTI-CRITERIA PROJECT SELECTION TECHNIQUES

The multi-criteria problem consists of multiple criteria/objectives that need to be optimized simultaneously. A lot of economic problem should be solved by multi-criteria methods. And one of such problems is investment selection.

Actually, there are various project selection methods practiced by the modern business organizations. However, the most popular one is a multi-criteria decision making (MCDM) method which is a tool aimed at supporting decision makers who are faced with making numerous and conflicting evaluations.

Most popular and widely used methods to provide milti-criteria investment decisions are monetary based tools and Analytic Hierarchy Process (AHP).

Monetary base techniques are [1]:

– financial analysis: an assessment of the impact of an option on the decision-making organisation's own financial costs and revenues;

– cost-effectiveness analysis: an assessment of the costs of alternative options which all achieve the same objective. The costs need not be restricted to purely financial ones;

– cost-benefit analysis: an assessment of all the costs and benefits of alternative options.

As about finansial analysis, for any significant proposal the relevant department or agency will generally carry out a financial analysis of the impacts on

its own budget, and on public expenditure. This includes Regulatory Impact Assessments (RIAs), which are required whenever proposals for regulations or legislation are published, and are intended to help reach decisions about whether the proposed measures are needed.

Where there are alternative options to achieve a specific objective, but where the objective itself cannot be valued, cost-effectiveness analysis can be used to assess the least-cost way of achieving the objective. Cost-effectiveness analysis should certainly include non-cash opportunity costs, such as the use of assets owned by the spending body, which would otherwise be put to some other use. It may also include external costs, if these are relatively straightforward to value in monetary terms – such as taxpayer costs of compliance with changes in tax legislation, or travel costs of out-patients to different hospitals for treatment [1].

Cost-benefit analysis seeks to value the expected impacts of an option in monetary terms. The valuations are based on the willingness to pay of the potential gainers for the benefits they will receive as a result of the option, and the willingness of potential losers to accept compensation for the losses they will incur. In practice it is hardly ever realistic to value all the costs and benefits of options in monetary terms. Most cost-benefit analyses will incorporate some additional items which it is either not possible to value, or not economic to do so. But where the most important costs and benefits have been valued, the others can be set alongside and included in the decision process.

The most famous tool of the multi-criteria decisions making methods is the Analytic Hierarchy Process (AHP) which is a methodology for supporting complex decisions.

At the core of the Analytic Hierarchy Process (AHP) lies a method for converting subjective assessments of relative importance to a set of overall scores or weights. The method was originally devised by Saaty [2].

AHP algorithm is basically composed of two steps:

1. Determine the relative weights of the decision criteria.

2. Determine the relative rankings (priorities) of alternatives.

The fundamental input to the AHP is the decision maker's results of criteria comparison – all criteria should be ranked due to their importance to goal achievment. These are termed pairwise comparisons. For each pair of criteria, the decision-maker is then required to respond to a pairwise comparison question asking the relative importance of the two. The next step is to estimate the set of weights that are most consistent with the relativities expressed in the matrix. In addition to calculating weights for the criteria in this way, full implementation of the AHP also uses pairwise comparison to establish relative performance scores for each of the options on each criterion [2].

With weights and scores all computed using the pairwise comparison approach just described, options are then evaluated overall using the simple linear additive model used for multi-criteria Decision Analysis (MCDA). All options will record a weighted score, somewhere in the range zero to one. The largest is the preferred option, subject as always to sensitivity testing and other context-specific analysis of the ranking produced by the model.

All these methods are widely used to make investment decisions. A lot of software pachages (SuperDecision, Riskyproject, Exsel applications) support making such class of decisions.

References

1. Multi-criteria analysis: a manual. Department for Communities and Local Government: London 2009. URL : http://eprints.lse.ac.uk/12761/1/Multi-criteria_Analysis.pdf.

2. Saaty T. The Analytical Hierarchy Process John Wiley, New York. 2020.