



## MCDM-AHP METHOD IN DECISION MAKINGS

Nor Filianie Aziz, Shahryar Sorooshian and Fatimah Mahmud

Faculty of Industrial Management, University Malaysia Pahang Kuantan, Pahang, Malaysia

E-Mail: [Sorooshian@gmail.com](mailto:Sorooshian@gmail.com)

### ABSTRACT

Analytic Hierarchy Process (AHP) is among the most popular methods of decision-makings. This article contains the tutorial document composed of a short discussion on AHP presented at the International conference on “Proceedings of Engineering Technology International Conference”. The conference would be held at Bali, Indonesia during August 10-11, 2015. The paper starts with the short review of Multi-criteria Decision Making and AHP. Then it discusses about the techniques and formulae that are used in the AHP decision-making method. Lastly, this paper recommends AHP to future researchers and professionals with highlights of the reasons to use the methodology process when engaged in complex decision-making problems.

**Keywords:** multi-criteria decision-making (MCDM), multi-alternative decision making (MADM), analytic hierarchy process (AHP), and decision techniques.

### 1. INTRODUCTION

Multi-Criteria Decision Making (MCDM) models are suitable for evaluating and making decision for the best alternatives options in order to choose the perfect criteria [1]. This involves a general class of operations research models, which considers problems in decision making in the presences of many decision criteria. There are two types of the MCDM, which are; Multi-Objective Decision Methods (MODM) and Multi-Attribute Decision Methods (MADM) [1]. The Multi-Objective Decision Methods (MODM) is an approach, which uses mathematical optimization technique and mostly involves analysis procedure related to calculation design process. MODM usually involves maximization of mathematical problems involving function that is more objective which need to be simultaneously optimized. Especially MODM was created to solve problems in mathematical programming and design via the best alternatives. However, Multi-Attribute Decision Methods (MADM) is an approach developed for selecting the best criteria or alternative(s). This is used in decision-making problems involving a number of decision-making alternatives. This model is based on the list of criteria chosen, its parameters, variables that one wishes to monitor in decision-making process [2]. The category of MCDM has been used for selecting a minimum number of alternatives. According to Ermatita, *et al.*, [3] two levels are relevant with MADM and these are: (a) Aggregation implementation: The decision that reflects the result equivalent for all areas on each alternative is developed. (b) Alternatives implementation: The alternatives ranking for the aggregation of the result makers. There are many other methods which are used under MADM such as; Analytical Hierarchy Process (AHP); Simple Additive Weighting (SAW); Ordered Weighted Averages (OWA); Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS); Elimination et Choice Translating Reality (ELECTRE); Decision trial and Evaluation Laboratory; Decision Trial and Evaluation Laboratory (DEMATEL); The Simple Multi Attribute Rating

Technique (SMART); and others, for example: [4, 5, 6]. Notwithstanding all these methods AHP method is regarded as the most famous MCDM tool for decision making problems based on literature studies.

### 2. AHP METHOD

According to Triantaphyllou and Mann [7], the nice mathematical properties of AHP have attracted many researchers' interest and AHP input data are easy to obtain. Analytic Hierarchy Process (AHP) that is created under Multi- Criteria Decision Making (MCDM) is composed of techniques are suitable for ranking of critical management problems [8]. The Analytic Hierarchy Process (AHP) was introduced by Saaty [9] since 1970's. The AHP method is ranking process that is used in making group decision and is widely used around the world in a variety of fields such as business, government, industry, education, health, and others. The method also allows for consistency test in judgment making room to check and reduce inconsistencies in opinions or judgments. The scales of ratio and consistency index are derived from the principal Eigen vectors and Eigen value respectively. The method focuses on prioritizing the selection criteria, and distinguishing the more important criteria from the less important ones. Although some researchers argue some disadvantage of AHP [6, 10], AHP is simple method with focus placed on peer to peer comparisons that are suitable to evaluate both qualitative and quantitative design [11]. More also, AHP method uses judgment to analyze the data.

### 3. AHP CONCEPTUAL

Although AHP is a very popular decision making method, authors only find few articles to algorithmically review AHP applications (i.e. [12]). This article tries to fill the need of application tutorials. This paper discusses four main steps of AHP that could be used in decision-making problems and these include; problem modeling, weight valuation, weight aggregation, and sensitivity analysis. The steps start with hierarchy construction where objective