Chapter 7
A Hybrid AHP–ELECTRE I Multicriteria Model for Performance Assessment and Team Selection

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ABSTRACT

Human resources management is essential to any health care system. This paper proposes an assessment model to help the decision maker in the selection of an optimal team. In the proposed model, AHP method is applied to identify the weights of each criterion in the decision model. ELECTRE I method is used to obtain the best team that satisfies most of the decision maker preferences. We test the effectiveness of the model on the real data collected from the 'Habib Bourguiba' Hospital in Tunisia.

INTRODUCTION

Operating theater is a deeply human place where the individual works on an individual and with an individual. These individuals have personalities, logic, interests and specific different viewpoints and sometimes conflicting. They constitute a surgical team where performance and outcomes depend on the degree of coordination the efforts made by everyone; that is, teamwork. Selection teams ensure that the right team is in place and that it will have a capable leader in place.

Successful selection teams are still an open problem in various fields of social, business, and hospital studies. To solve this problem, several methods were proposed such as AHP (Chen et al., 2004), fuzzy-genetic algorithm (Strnad et al., 2010), multi-objective optimization (Ahmed, 2013), and fuzzy logic (Shipley et al., 2013). The main objective of this paper is to propose an evaluation model to help

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the decision maker in the selection of an optimal team among a set of available alternatives. The team selection problem can be assimilated as a MCDM problem where many criteria should be considered in decision-making. Therefore, this model uses two MCDM methods: AHP to determine the importance weights of evaluation criteria and ELECTRE I to obtain the best team that satisfies the decision maker preferences.

The remainder of this paper is organized as follows: Section 1 describes the AHP and the ELECTRE I method. In Section 2, the proposed model for team selection is presented and the stages of the proposed approach are explained in detail. How the proposed model is used on a real world example is explained in Section 3. In Section 4, experimental results and data analysis are discussed. Finally, conclusions of this study are made in section 5.

A DETAILED DESCRIPTION OF AHP

The AHP is a decision approach created to solve complex multiple criteria problems involving qualitative decisions (Saaty, 1994). The purpose of the method is to determine the relative importance of a set of activities in a multi-criteria decision problem. AHP is easy, comprehensive and logical. It can be used in both quantitative and qualitative multi-criteria decision making problems and it is widely accepted by the decision making community, be they the academics or the practitioners (Mamat et al., 2007). AHP permits collection of all relevant elements of a decision problem into one model to work out their interdependencies and their perceived consequences interactively. Its use of pairwise comparisons forces AHP users to articulate the relative importance of criteria and then to decide the relative contributions of the alternatives to the criteria (Carlsson et al., 1995).

The AHP method has been used in various fields to solve complex decision problems. It has widely applied in industrial engineering (Calabrese et al., 2013), the business domain (Kumar & Parashar, 2009), the medical domain (Vidal, Sahin, Matelli, Berhoune, & Bonan, 2010), and other fields.

The AHP is a powerful decision-making methodology in order to determine the priorities among different criteria. It encompasses three main stages (Bouhana et al., 2011):

1. Decomposing the decision problem into hierarchical decision elements.
2. Collection of data to be entered by pairwise comparisons of the decision elements using the chart proposed by Saaty (1982). This allows us to represent the relative importance of criterion compared with the other one by assigning a number between 1 and 9. From the pair-pair comparisons between elements (A1 ... An), a comparison matrix is established. The comparison is always made of the elements of each row to the elements of each column. The comparisons obtained from the matrix A, is designated by a_{ij}, the degree of importance of element i relative to the element j (also $a_{ji} = 1 / a_{ij}$).

$$A = \begin{bmatrix} a_{11} & a_{12} & ..... & a_{1n} \\ a_{21} & a_{22} & ..... & a_{2n} \\ .... & .... & ... & .... \\ a_{n1} & a_{n2} & ... & a_{nn} \end{bmatrix}$$