Chapter 3
An Integrated Fuzzy VIKOR Method for Performance Management in Healthcare

Ehsan Shekarian
University of Malaya, Malaysia

Salwa Hanim Abdul-Rashid
University of Malaya, Malaysia

Ezutah Udoncy Olugu
UCSI University, Malaysia

ABSTRACT

Poor quality control has become a major threat to medical laboratory services, especially in the developing countries. It has become necessary to assess and rank the quality of diagnostic services in medical laboratories using systematic approaches. The main aim of this research is to develop and apply a quantitative method in ranking medical laboratory services. This method is based on a combination of Vlsekriterijumska Optimizacija I Kompromisno Resenje (VIKOR) with fuzzy set theory. VIKOR is a multiple criteria decision making technique which focuses on ranking and selection from a set of alternatives, and determines the compromise solution for a problem with different criteria. This approach aids decision makers to achieve the most acceptable decision amidst numerous alternatives. In the present evaluation method, international standard ISO 15189 (Medical Laboratories Particular Requirements for Quality and Competence) proposed by International Organization for Standardization (ISO) is used as a fundamental source of selected attributes of a medical laboratory. The study compares three medical laboratories to each other and ranks them. This study will be a valuable and effective contribution in enhancing both qualitative and quantitative criteria in the field of medical laboratory services. Finally, some directions for further studies are proposed.

INTRODUCTION

A medical laboratory is an integral part of the health care system in every country, which plays an important role (diagnosis) in the treatment process of patients. It further provides essential public health services, which are required by medical practitioners. Today, medical laboratories are considered as a very important part of the medical diagnosis and treatment process that facilitate the effectiveness and efficiency of physicians. Hence, medical diagnoses provide the fundamentals to medical solutions. Generally, a proper diagnosis is the beginning of a progressive cure, follow up and confirmation of effective treatment is based on regular laboratory testing. However, error rate of 0.1–9.3% in the field of the preanalytical and postanalytical phases of testing has been shown in medical diagnostic laboratories (Kalra, 2004). The quality management systems have partially replaced the requirements for preliminary experiences based on professional self-regulation (Plebani, 2002).

Any error in laboratory results raises the cost of patient care and prolongs the treatment period. Therefore, selecting the best laboratories for patients is a major problem, which may be resolved by ranking the medical laboratories. Thus, the purpose of this study is to provide a suitable ranking solution for medical laboratories using fuzzy set theory. This ranking will ensure redefinition of competition among medical laboratories towards offering better clinical laboratory services. This will in turn boost the quality of health care services in general.

In recent years, the application of multiple criteria decision-making (MCDM) method in the field of health care systems has been gaining a lot of attention. Some of these studies include, groundwater quality assessment (Li et al., 2012), analysis for susceptibility of breast cancer (Xu and Jiang, 2011), and in disease treatment such as chronic plaque psoriasis (Guibal et al., 2009). Other applications are in the areas of improvement of waste reduction (Su et al., 2010), and selection of the appropriate solid waste site (Önüt & Soner, 2008).

Decision making is the process of defining the decision goals, gathering relevant information and selecting the optimal alternative (Hess & Siciliano, 1996). To deal with problems that are characterized by several non-commensurable and competing criteria, MCDM methods are usually employed. In fact, a decision maker (DM) has to choose the best alternative that satisfies the evaluation criteria among a set of possible solutions. According to Tzeng and Huang (2011), MCDM is a technique, which enables multiple criteria consideration at the same time and helps the decision maker to identify the best case by evaluating cases according to the characteristics or criteria of each available case. Since, it is generally difficult to find an alternative that simultaneously meets all the criteria, determining a compromise solution rather than an optimal solution is preferred. In this study, VIKOR method is applied to select the best medical laboratory (alternative) using a compromise solution approach.

In literature, this is the first study that aims to rank the medical laboratories based on the fuzzy-VIKOR method as a powerful operational research method. When a patient who actually is assumed to be a customer for institutional health services seeks among appropriate medical laboratories the level of their quality is a major concern for him. These laboratories are therefore in a competence to satisfy their patients. Medical laboratory managers should enhance their quality to closely meet patients' needs. However, evaluating the service quality of medical laboratories is usually a complicated process. When the ranking of medical laboratories is investigated, it has to be considered many issues such as dealing with many factors, an uncertain environment, and a logical method, just to name a few. In the light of the purpose of this research, we apply MCDM method together with fuzzy set theory in the context of healthcare planning and management. It attempts to bridge the aforementioned gap that exists in the lit-

Related Content

Big Data Analytics and Visualization for Food Health Status Determination Using Bigmart Data
Sumit Arun Hirveand Pradeep Reddy C. H. (2022). *Research Anthology on Big Data Analytics, Architectures, and Applications (pp. 520-539).*
www.irma-international.org/chapter/big-data-analytics-and-visualization-for-food-health-status-determination-using-bigmart-data/290999

Application of Fog Computing in the Retail Industry for Transition to Retail 4.0: An Overview
- Sreekumar, Swati Das, Rema Gopalanand Bikash Ranjan Debata (2023). *Multi-Disciplinary Applications of Fog Computing: Responsiveness in Real-Time (pp. 180-194).*
www.irma-international.org/chapter/application-of-fog-computing-in-the-retail-industry-for-transition-to-retail-40/327890

Attribute Relevance Analysis
(2015). *Developing Churn Models Using Data Mining Techniques and Social Network Analysis (pp. 173-189).*
www.irma-international.org/chapter/attribute-relevance-analysis/114403

Branching Logic in the Design of Online Learning: A Partial Typology
Shalin Hai-Jew (2014). *Packaging Digital Information for Enhanced Learning and Analysis: Data Visualization, Spatialization, and Multidimensionality (pp. 47-69).*
www.irma-international.org/chapter/branching-logic-in-the-design-of-online-learning/80210

Data Mining Problems Classification and Techniques
Nayem Rahman (2018). *International Journal of Big Data and Analytics in Healthcare (pp. 38-57).*
www.irma-international.org/article/data-mining-problems-classification-and-techniques/209740