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Information Sciences

journal homepage: www.elsevier.com/locate/ins

Fuzzy VIKOR method: A case study of the hospital service evaluation in Taiwan



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ARTICLE INFO

Article history:

Received 25 March 2012

Received in revised form 5 June 2013

Accepted 15 February 2014

Available online 25 February 2014

Keywords:

Fuzzy sets theory

Compromise solution

VIKOR

Hospital service quality evaluation

Multi-criteria decision making

Triangular fuzzy number

ABSTRACT

This study proposes a framework based on the concept of fuzzy sets theory and the VIKOR method to provide a rational, scientific and systematic process for evaluating the hospital service quality under a fuzzy environment where the uncertainty, subjectivity and vagueness are addressed with linguistic variables parameterized by triangular fuzzy numbers. This study applies the fuzzy multi-criteria decision making approach to determine the importance weights of evaluation criteria and the VIKOR method is taken to consolidate the service quality performance ratings of the feasible alternatives. An empirical case involving 33 evaluation criteria, 2 public and 3 private medical centres in Taiwan assessed by 18 evaluators from various fields of medical industry is solicited to demonstrate the proposed approach. The analysis result reveals that the service quality of private hospitals is better than public hospitals because the private hospitals are rarely subsidized by governmental agencies. These private hospitals have to fend themselves to retain existing patients or attract new patients to ensue sustainable survival.

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1. Introduction

Delivering, building, understanding and maintaining better service quality are the major concerns of every industry today. Service quality expectation has been used to explain as predictions of service, an ideal standard, an attribute of importance, and customers' evaluation on the service quality [92]. The main purpose of evaluating service quality is to measure service performance, diagnose service problems, manage service delivery, and provide the optimal service for all customers [64]. A considerable number of studies have been conducted to evaluate the service quality of various fields, which include retail [54,88,93], public agency [39], bank [48], web service [14,25,33,45,67,87], airline and airport [19,20,29,56,57,68,69,90], hotel [6,13,43,91,96], traffic and transportation [7,53,72], supermarket [66], hospital and healthcare [1,10,17,46,62,79,81]. Service quality assessment and control in hospital and healthcare date back to the mid-19th century. At the end of 2010, there have been 513 public and private hospitals in Taiwan. Faced with continuous competitive pressure, a growing number of medical providers have realized that being able to provide good healthcare service quality is the most important factor for ensuring the future success [73]. For patients, quality and effectiveness of the hospitals are two major concerns when seeking healthcare services. If the patients are not satisfied with the service quality which the hospital provides, they will seek the healthcare services elsewhere. Hospitals, therefore, have to enhance their

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healthcare quality and efficiency in order to retain their existing patients and attract new ones [16]. To successfully manage the challenges of globalization and intensive competition, hospital managers must pay more attention to the expectation of service quality. Therefore how to closely meet the needs of patients and how to assess the service quality of patients have become critical challenges for hospital administrators [89]. In recent years, we have witnessed an evolution from being primarily manufacturing-based economy to service-based one in several countries [65]. Based on the service industry classification, the hospital is a service industry with the characteristics of contacting with people directly, communicating with people frequently, and providing customized and professional medical services [86]. Hospital service quality includes appropriate equipment, timely treatment, adequate amount of services, and meeting acceptable standards of the medical practices [63]. To operate a hospital successfully, the key objectives have to be established in order to retain and attract as many patients as possible by meeting their potential needs and demands [86]. Hospital service quality, related to admitting, nursing, physicians, meals, rooms, technicians, visitor services, equipments, environment, discharge process and the patient's likelihood to return, has been one of the major issues which concern healthcare providers, employees, employers, and governmental agencies [30]. Although hospital service quality has been in development for several years, evaluating service quality expectation is as vital as to whether the hospitals are well aware of the importance of service quality.

A simple method to measure the hospital service quality is to ask patients or customers to rate the amount and content of the communication they have with the doctors, physicians, nurses, physical therapists, nutritionist, pharmacists and administrative staffs [61]. Andaleeb [5] pointed out that the better patients' appraisal on medical or healthcare service quality, the higher satisfaction grade a hospital receives. As a result, the hospital ought to be aware of the patients' needs and then provides the best medical care service quality to retain the patients. To be successful and even survive in this hostile environment, it is crucial for a hospital to provide healthcare recipients with satisfactory medical service quality that meets or exceeds their expectations [60]. Simultaneously, in order to create or sustain competitive advantage, healthcare providers are supposed to aggregate the traditional medical approach, which emphasizes the effectiveness and efficiency of health service outcomes from the provider's perspective, with a patient-centered principle which takes patients' concerns and interests into consideration [27].

The hospital service quality has a significantly close relationship with the patients' satisfaction expectation. Satisfaction is considered to be the patients' sentiment about the medical care and services they receive [55]. Patients' satisfaction is an important element in measuring the hospital service quality and in predicting the patients' behavioral intentions after they receive the services. If the hospital provides good service quality, the patients will therefore have better satisfaction, speak positively about the hospital to other patients and they are more willing to return back to the same hospital [55]. These behaviors are in the forms of patients' loyalty that many hospitals make effort to achieve. Evaluating hospital and healthcare service quality is complicated and involves multiple criteria, uncertain and qualitative factors that are difficult to measure [10]. Since hospital service quality can be measured according to the different qualitative and quantitative criteria, the Multi-Criteria Decision Making (MCDM) approach is suitable for evaluating the expectation of hospital service quality. There are lots of ways to measure the service quality, such as statistical approaches, Quality Function Deployment (QFD), multi-criteria satisfaction analysis for benchmarking analysis, Analytic Hierarchy Process (AHP), VIKOR (VIsekriterijumska optimizacija i KOmpromisno Resenje), fuzzy AHP, Preference Ranking Organization Method for Enrichment Evaluation (PROMETHEE), and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). Amongst these methodologies, VIKOR is a practical tool in multi-criteria decision making, especially when the decision makers are not aware of how to express preference in the decision making processes [80].

The compromise solution is acceptable for all decision makers because it provides a maximum "group utility of the majority" as well as the minimum "individual regret of the opponent". This approach is not only the compromise foundation stone within mutual communication, negotiation and conflict management, but also a bridge for reaching an agreement amongst decision makers. In addition, multi-dimensional consideration of higher and lower performance ratings of feasible alternatives can help decision makers keep away from making inappropriate decisions [94]. This is the reason why the VIKOR method has been chosen for this study. As the hospital service quality perceptions are derived from different patients' view of linguistic terms and their preferences, as a result, this issue must be conducted in an uncertain and fuzzy environment. Recently, fuzzy-based methodologies have been utilized to deal with the MCDM problems under uncertain environments. In order to solve the issues that the preference information on attributes or alternatives is uncertain and inconsistent, fuzzy sets theory and the VIKOR are utilized to evaluate the hospital service quality because this methodology represents a compromise resolution under an ambiguous, vague and uncertain environment. For this reason, the main objective and contribution of this study is to propose a group fuzzy-based compromise VIKOR method to determine the importance weights of evaluation criteria and finally rank the hospital service quality in an uncertain circumstance where the vagueness is coped with linguistic variables parameterized by positive triangular fuzzy numbers (TFNs). As will be seen later, the next section will introduce the fuzzy sets theory and VIKOR method is introduced in Section 3. Section 4 proposes a framework based on the fuzzy sets theory and VIKOR method to measure the hospital service quality. An empirical case consisting of 2 public and 3 private medical centres measured with 33 evaluation criteria are demonstrated the evaluating processes in Section 5. Finally the discussion, conclusion and suggestion are drawn in Section 6 and Section 7 respectively.

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