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Quality Evaluation of Health Care Establishment Utilizing Fuzzy AHP

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ABSTRACT

Quality evaluation of healthcare establishment (HCE) is a difficult process as it involves multiple components of quality criteria with various factors and sub-factors therein. Further, the quality criteria are not universally standardized. The subjective evaluation in itself is not reliable as a tool so that available HCEs may be investigated for selecting the best among them. Thus, to avoid vagueness and imprecision due to process of human cognition the need to evolve a useful method for evaluation of quality of HCE was essentially required. To achieve such an objective three well established HCEs from northern cities of India have been studied. An Integrated Quality Model designed for HCE (Azam et al., 2012a, 2012b) and specifically tested previously with the AHP study by the authors (Azam et al., 2015) with its components, parameters and factors sub-factors has been utilized to evaluate the quality aspects of HCEs forming subjects of the current study. Further, the standard formula of Fuzzy AHP methodology with the application of fuzzy set theory was applied to the multiple components of the quality criteria with various factors and sub-factors therein pertaining to various HCEs forming the subject of the study. Quality of the HCEs thus could be evaluated empirically avoiding vagueness due to human cognition factors. Utilizing this methodology respective rankings of HCEs could also be assigned among them with practical utility to maintain the required quality of their services. Quality evaluation of Health Care Establishment utilizing Fuzzy AHP along with fuzzy set theory is a unique method which will benefit the client patients to select the best HCE among the available alternatives of HCEs. It also helps the managers to improve the business by allocating scarce resources wherever critically required to improve various quality components criteria factors and sub-factors of their HCEs.

KEYWORDS

Fuzzy Analytic Hierarchy Process (Fuzzy AHP), Health Care Establishment (HCE), India, Quality Model

INTRODUCTION

The multi criteria decision model (MCDM) such as Analytic Hierarchy Process (AHP) is a hierarchy or a set of structure at integrated levels and is empirically constructed for complex problems with criteria and sub-criteria of multiple nature therein to achieve the intended objectives of the organization (Talib et al., 2011a; Talib and Rahman, 2015a; Hassanien et al., 2015). It thus, seeks consistency of judgment with a user-friendly approach. Along with operations research techniques it may also deal with intricate problems to find appropriate solutions (Azam et al., 2015). Multiple criteria thus, can be dealt with relative ease (Dura'n and Aguilo, 2008; Hassanien et al., 2014). AHP however, is

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found to be deficient to deal with the ambiguity creeping in due to conceptual aspects as a result of subjective judgment attributable to the human beings (Talib et al., 2011a). This deficiency resulting vagueness may be rectified through the Fuzzy AHP method. The quality aspects of any Health Care Establishment (HCE) is important both from the point of view of clients as also from the point of view of managers. The judgments in AHP are likely to be faced with human cognitive problems due to subjectivity creeping therein. This problem however, is avoided in Fuzzy AHP method which is combined with Fuzzy set theory as an extension of AHP model.

In recent past studies, a number of approaches have been proposed to assess the performance of service organizations. They can be broadly classified into three fundamental clusters: stated importance methods (SIMs), derived importance methods (DIMs) and the MCDM based approaches (Lupo, 2016). As regards to the above techniques, MCDM methodologies such as AHP, Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Interpretive Structural Modeling (ISM) and others are recognized as favorite development approaches which have ability to evaluate and/or select service alternatives (Lupo, 2016; Saaty, 2008; Li et al., 2014; Chang, 2014; Talib and Rahman, 2017; Kumar and Talib, 2017; Faisal and Talib, 2016a, 2016b; Khanam et al., 2016). Several recent applications of MCDM based approaches especially Fuzzy AHP in the HCEs are described and implemented by researchers. Few of them are as follows. Lupo (2016) applied a fuzzy framework to evaluate service quality in the public healthcare sector based on SERVQUAL disconfirmation paradigm and incorporated the AHP method to draw out reliable estimates of service quality expectations. Aloui and Touzi (2015) developed a new flexible querying approach using fuzzy ontological knowledge based platform. This approach presents fuzzy clustering algorithm (FCA) based methodology for building ontologies from scratch then integrating them intelligently through the fusion of conceptual clustering, fuzzy logic and FCA. Kouah and Saidouni (2015) developed a large dynamic system named as fuzzy labeled transaction refinement tree which provides a formal specification framework for designing multi agent systems among other collection and internal agent's behavior. Salama and Hassanien (2014) proposed a modified fuzzification of Euclidian space calculated for the Fuzzy C-means and support vector machine techniques based on the ranking of features extracted from evaluating the features. Ghallab et al. (2014) studies the analysis, classification, mining and predictions based on fuzzy as an intelligent system called the strictness petroleum prediction system (SPPS). Ho (2012) developed a construct factor evaluation model of health management center selected by customers with fuzzy AHP. He made the weight assessment on evaluation indexes of health management center. Five major perspectives for customer's selection of health management center were used. They are: health management department, personal management department, health examination service department, market department and environment department. Hillerman et al. (2017) presents a model for the analysis of suspicious claims data from healthcare providers with the use of different clustering algorithm and the application of the AHP multicriteria method for prioritizing the identified suspects entitles for subsequent auditing. Handayani et al. (2015) studied the strategic hospital services quality in Indonesia by analyzing the dimensions that are required by the hospital to increase the quality of hospital services to meet the stakeholders needs and expectations. Woldegebriel et al. (2015) proposes a fuzzy logic integrated with AHP to consider the uncertainties to prioritize service quality improvement in the healthcare by considering the SERVQUAL dimensions. Ahmadi et al. (2014) identified, categorized and analyzed meso-level dimensions for the adoption of Electronic Medical Records (EMR) in the healthcare establishments and developed a MCDM framework and adoption of EMR in HCE. Similarly, in the area of healthcare quality evaluation, several research works described by Akdag et al. (2014), Buyukozkan and Cifci, (2012), Cebeci (2009); Lin et al. (2008) are of interest too.

In light of the above studies, a novel evaluation model is herein developed and presented to overcome the know weaknesses with the aim of evaluating the quality in HCEs. In this study, it has been attempted to present Fuzzy AHP method analyzing an integrated quality model for HCE with its components, factors and sub-factors developed earlier by the authors (Azam et al., 2012b).