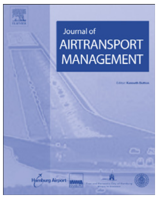
Journal of Air Transport Management 42 (2015) 249–259

Contents lists available at ScienceDirect

Journal of Air Transport Management

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



Fuzzy ServPerf model combined with ELECTRE III to comparatively evaluate service quality of international airports in Sicily

Toni Lupo

Dept. of Chemical, Management, Informatics and Mechanical Engineering, Università degli Studi di Palermo, Viale delle Scienze, 90132 Palermo, Italy

ARTICLE INFO

Article history:
Received 22 May 2014
Received in revised form
13 November 2014
Accepted 17 November 2014

Keywords:
Airport services quality
Service quality benchmarking
ServPerf model
Multi criteria decision making (MCDM)
ELECTRE method
Fuzzy sets theory

ABSTRACT

In this paper a new approach was proposed so as to comparatively evaluate the quality of service alternatives. In particular, a fuzzy extension of the ServPerf service conceptual model was considered to estimate quality scores of fundamental service criteria, whereas the non-compensative multi-criteria decision-making ELECTRE III method was employed to point out the quality ranking of service alternatives on the basis of which the comparative service quality analysis was performed. In order to show the effectiveness of the proposed approach, an empirical study concerning service quality evaluation of the three international airports in Sicily (Italy) was conducted with detailed proposals for passenger service improvement. The results showed that only few key service aspects played a focal role in quality airport service. Moreover, the effects on the evaluation of service quality, arising from customers' uncertainties, were computed, thus demonstrating the effectiveness of the proposed approach.

© 2014 Elsevier Ltd. All rights reserved.

1. Introduction

In today's airports, service quality has become an important corporate strategy to improve competitive advantage (Lin and Hong, 2006; Graham, 2009; Arif et al., 2013; Tudisca et al., 2013; Sgroi et al., 2014a, 2014b; Di Trapani et al., 2014). Airport service quality has a direct impact on the perceived value of an airport, as well as traveler satisfaction (Rendeiro, 2006), which is one of the most significant measures of service effectiveness (Büyüközkan and Çifçi, 2012; Chang and Chang, 2010). Airport service quality can have an indirect impact on tourism and related business activities, because travelers are more likely to use an airport again if they remain satisfied with its service quality and they are more likely to recommend the airport to other potential travelers (Park and Jung, 2011). Consequently, it is important to have an accurate and reliable assessment of passenger service quality. In this paper we developed a new approach to measuring airport service quality that allows for comparisons with other airports. Specifically, we developed a fuzzy extension of the ServPerf service conceptual model (Cronin and Taylor, 1992) to estimate quality scores of fundamental airport service criteria. Furthermore, the multi-criteria decision-making ELECTRE III method[1] (Roy, 1990) was employed to point out the quality ranking of airport service alternatives. We then applied our approach to measure perceived service quality at the three existing international airports in Sicily, such that we were able to compare service quality between them. Our results captured, in comparative manner, the most influential aspects affecting airport service quality. The latter can meaningfully support airport planners and managers in implementing the continuous service quality improvement process.

E-mail address: toni.lupo@unipa.it.

[1] ELECTRE (ELiminiation Et Traduisant la REalite) is a procedure that supports the decision-maker facing a complex problem with multiple, usually conflicting, qualitative and/or quantitative criteria introduced in 1966 (Roy and Susman, 1966). Today, the currently used versions are ELECTRE II (Roy and Bertier, 1973), ELECTRE III (Roy, 1978) ELECTRE IV (Roy and Hugonnard, 1982) and ELECTRE TRI (Yu, 1992). ELECTRE III is a multi-criteria decision-making method that reflects the respondents' preferences and it can be applied when a set of alternatives must be ranked according to a set of qualitative/quantitative criteria reflecting the decision maker's preferences. ELECTRE has been widely used in the literature in a wide range of research fields (Wang and Triantaphyllou, 2008; Papadopoulos and Karagiannidis, 2008; Sevkli, 2010; Certa et al., 2013; Rouyendegh and Erkan, 2013).

http://dx.doi.org/10.1016/j.jairtraman.2014.11.006
0969-6997/© 2014 Elsevier Ltd. All rights reserved.

1.1. Existing methodologies for measuring service quality

Measurement of airport service quality represents a crucial activity relative to various aspects. First of all, to assess stakeholders' expectations and perceptions relative to fundamental service criteria and, secondarily, to identify management criticalities regarding service. In addition, service quality measures can be used as monitoring tools for on-going control of service quality[2] also permitting to compare performance levels over time and/or across space (De Borger et al., 2002).

Over time, different approaches to evaluate airport service quality have been developed in the literature. Such approaches can be basically classified into three main categories: stated importance methods (SIMs); derived importance methods (DIMs) and, more recently, those taking advantage of multi-criteria decision-making (MCDM) approaches. Considering SIMs, passengers are directly asked to rate perceptions and expectations on linguistic-numerical Likert type scales. On the contrary, for DIMs expectations of service aspects are statistically derived considering relationships among performance according to service criteria, sub-criteria and items, on the one hand, with overall passenger satisfaction, on the other. Although SIMs are more intuitive and simple to use, they require a significant increase in the length of the survey and can sometimes yield insufficient differentiation among expectation ratings of service aspects. For these reasons, DIMs have been widely considered in the recent past. Several recent applications of DIMs, based on passenger surveys are described in: Humphreys and Francis (2000); Adler and Berechman (2001); Humphreys and Francis (2002); Barros and Diseke (2007); Correia et al. (2008); Chaudha et al. (2011); Lubbe et al. (2011).

Recently, many Authors have focused on the heterogeneity of passenger perceptions on various service aspects (Cirillo et al., 2011; Marcucci and Gatta, 2012). In particular, such heterogeneity, mainly relating to the social and economic characteristics of passengers and the different perspectives on service aspects (De Battisti et al., 2005; De Battisti et al., 2010), can represent a serious problem for both derived and stated importance methods (Eboli and Mazzulla, 2011). In addition, judgments provided by passengers via linguistic-numerical evaluation scales can be affected by possible uncertainties deriving from incompleteness due to partial ignorance, subjective lack of precision and even vagueness (Lupo, 2013a) and, consequently, the results using these methods can prove imprecise or even unreliable (Chou et al., 2011).

In general, according to Fishbein's attitude model (Fishbein and Ajzen, 1975), the attitude of a customer towards a given service is based on the assessment of service criteria weighted by the importance assigned to these criteria. The concept coincides with Multi-Attribute Decision-Making (MCDM) models based on multi-criteria value or utility theory (Dyer and Sarin, 1979; Keeney and Raiffa, 1993), as considered by more recent works (Kuo and Liang, 2011). Such an assumption allows for the employment of MCDM methods for evaluating and/or selecting service alternatives, such as: AHP (Saaty, 2008); TOPSIS (Hwang and Yoon, 1981); VIKOR (Opricovic, 1998; Opricovic and Tzeng, 2004); PROMETHEE (Brans and Vincke, 1985), etc. In particular, in the field of airport service quality evaluation, some studies have focused on the deterministic nature of the multi-criteria decision process (Chen and Tzeng, 2004; Correia et al., 2008; Liou et al., 2011); while others have taken into account uncertainty and the imprecise numeric values of decision data (Liang, 1999; Chen, 2000; Ding and Liang, 2005; Iraj et al., 2008; Wang et al., 2009).

In our approach to the problem, the fuzzy extension of the ServPerf service conceptual model was considered in order to deal with passengers' vagueness, imprecision and subjectivity in service quality evaluation so as to obtain more reliable results, while the ELECTRE III method was employed to comparatively evaluate quality of airport service alternatives. The ELECTRE III method, in contrast to other MCDM procedures employed for service quality evaluations, is a non-compensative method[3] and such a feature makes it the more appropriate one for the aims of the present work, since users tend to discard a service alternative when it proves very poor compared to another, if only for a single service criterion (Ghobadian et al., 1994).

The remainder of the present paper is organized as follows: in Section 2, we develop the theoretical basis for our methodology. In Section 3 we report on an application of our approach in a comparative service quality analysis of the international airports in Sicily. Finally, we offer conclusions and outline some directions for future research in Section 4.

2. A novel approach for comparative measures of service quality

The proposed approach requires performing the following main steps: service quality structure description; evaluation of quality scores and importance weights of service criteria, quality ranking of service alternatives and, finally, comparative service quality analysis, as summarized in Fig. 1.

In the next Section a brief overview of Fuzzy Set Theory (FST) and its theoretical principles useful for the aims of the present work are given. Subsequently, the main steps required by the proposed approach are described.

2.1. Fuzzy Set Theory and linguistic-fuzzy evaluation scales

Service quality evaluation very often articulates stakeholder judgments and knowledge in terms of linguistic variables. In many practical cases, the linguistic assessment of human perception and expectation can be incomplete, inconsistent, vague and even imprecise, such that representing it by means of an exact numerical value may prove unrealistic. On the contrary, it would be preferable to give interval judgments rather than fixed value judgments (Chan and Kumar, 2007). In addition, evaluation of service quality presents intrinsic complexity aspects related to the nature of services. In such a situation, FST (Zadeh, 1965) represents an effective approach to handle uncertainty of human preferences (Ferdous et al., 2012). In particular, FST permits mathematical representations of uncertain knowledge and provides formalized tools for dealing with intrinsic imprecision of real-life problems: it is particularly useful in the quantification of linguistic categories since it maps the conceptual frames of varying “membership degrees” (Negoita, 1985; Zadeh, 1975, 1996).

By considering FST, concepts of linguistic expressions can be quantified by fuzzy numbers using suitable membership functions (Ayyub et al., 2006; Kaufmann and Gupta, 2008; Klir, 1999). In our approach, linguistic variables were considered to represent stakeholders' assessments and positive triangular fuzzy numbers (TFNs) were used to quantify such linguistic variables. A TFN $\tilde{M}$ denoted as

---

[2] Typically, suitable statistical tools, such as “for variable” (Lupo, 2014a, 2014b) and/or “for attribute” (Inghilleri et al., 2013; Lupo, 2014c, 2014d) control chart schemes, are considered.

[3] This peculiarity of the ELECTRE III method implies that a very low quality score, albeit in a single service criterion, is not compensated for even by high scores in other service criteria.

Download English Version:

https://daneshyari.com/en/article/1030829

Download Persian Version:

https://daneshyari.com/article/1030829

Daneshyari.com