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Evaluating the service quality of airports in Thailand using fuzzy multi-criteria decision making method

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1. Introduction

Increasing wealth is driving the growth of demand of air travel both globally and regionally. However this growth has created its own challenges especially to the passenger experience, which has suffered because of uneven growth parity between infrastructure and number of passenger. This infrastructure bottleneck often compromises the values that airport delivers to its passengers and airlines. The growth of air travel has also increased the demand for airport services and mandated for more efficient process of service deliveries to its customer. It has also catalyzed the competition among airport operators to improve value proposition to its customer. The airlines seek to make their operations hub at the airport operating efficiently in order to reduce their costs and increase the quality of services rendered to their passengers (Oum et al., 2003). Efficiency and service quality are key performance indicators for the operation of airport, which needs to be trade off to optimize the performance.

Efficiency evaluation of airport is widely used and applied in management of airport, which are mostly based on comparative analysis of airport's economic or operational performance, employing Data Envelopment Analysis (DEA) and Total Factor Productivity (TFP) (ATRS, 2004; Park, 2003). Although the efficiency evaluation of airport indicates the improvement areas however it fails to give managers, a quality perspective on the services provided, which may compromise sustainable development (Fernandes and Pacheco, 2002; Pacheco and Fernandes, 2003).

With the advent of commercialization, marketization and competition in airport business arena, the philosophy of airport management is undergoing transformation where customer service quality and customer delight are emphasized. For instance, in 2015, 300 airports across 80 countries participated in Airport Service Quality (ASQ) survey organized by Airport Council International (ACI) (Airport Council International, 2016). Hence evaluating and improving the quality of service are main concerns of modern airport business. Many studies are conducted on evaluation of the quality of airline services but only few literature in this context are available for airport. Hence the changing nature of airport business has necessitated for research in this context.

Most of the researches conducted on airport service quality are based on SERVQUAL method. However the SERVQUAL model is based on assumption that all the criteria used to gauge the quality are rated equally important (Chou, 2009a). In order to address this limitation (Chou, 2009c) proposed a Multi Criteria Decision Making (MCDM) method to gauge the service quality of airlines. Later Chou, 2009b proposed fuzzy weighted SERVQUAL method for the evaluation of airline service quality. As Tsaur et al. (2002) observed it is difficult explain and measure the service quality of airlines due to heterogeneity, intangibility and inseparability. Hence it is not easy for passengers to express their satisfaction and importance of criteria using an exact numerical value, therefore it is more realistic to use linguistic terms to describe the perception value and importance of evaluation criteria (Chien-Chang, 2012).

This article attempts to evaluate the service quality of the two busiest airports operated by Airport of Thailand and identify the scope of improvement keeping in view the changing consumer needs. The service quality of airport was investigated using the Fuzzy Multi Criteria Decision Making Analysis (MCDM). It also employs Improvement Performance Analysis using fuzzy expert system to explore the enhancement of services at the airports.

2. Literature review

2.1. Need of measuring airport service quality

Service is an experience and strictly associated with customer satisfaction (Bezerra and Gomes, 2015). Service quality can be

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defined as the whole of the explicit and tacit components on which complete satisfaction of customer needs depends (Laura and Gabriella, 2009). Customer satisfaction is a measure of company performances as per the specific need of customer (Hill et al., 2003). The measure of customer satisfaction provides the service quality measure (Laura and Gabriella, 2009). As the perceived level of quality is an antecedent of customer satisfaction, hence the measuring of airport service quality may guide the organization's effort to address the specific needs of customer (Cronin et al., 2000; Falk et al., 2010; Wilson et al., 2012). The key measure of effective airport management is the opinion of passengers to airport services (Lubbe et al., 2011).

Many research has been conducted related to Airport service quality (ASQ). In 1980's few studies related to ASQ sought to examine the level of service in the passenger terminal (e.g. Bennets et al., 1975; Mumayiz and Ashford, 1986; Omer and Khan, 1988; Tosic and Babic, 1984). In 1990s few research were conducted on exploring the passengers' needs and their perception towards services and facilities provided in airport terminals. (e.g. Hackett and Foxall, 1997; Lemer, 1992; Muller and Gosling, 1991; Mumayiz, 1991; Park, 1999; Seneviratne and Martel, 1991, 1994; Yen, 1995).

With the increasing traffic volume, the airport has to optimize the existing infrastructure while adopting a customer oriented service performance (Fodness and Murray, 2007; Halpren and Graham, 2013). Airports are expected to operate as self-sufficient service organizations providing efficient and high quality services to a variety of customers (Bezerra and Gomes, 2016). Apart from it, large international hub airports are in intense competition to maximize their share in the increasing non aeronautical revenues, which has mandated them to enhance their respective perceived service quality and customer satisfaction to lure their customers and maintain competitive advantage (Merkert and George, 2015; Pantouvakis and Renzi, 2016). Thus it presents the need for airports to measure their service quality and to continuously improve their service performance in constantly changing business environment.

2.2. Existing methodologies to measure airport service quality

Due to complexity of the airport service environment, an effective process of measuring and analyzing passenger perceptions of ASQ is not easily achieved (Bezerra and Gomes, 2016). Overtime varied methodologies has been developed to measure and evaluate ASQ. Broadly these methodologies can be segregated in three categories: Stated Importance Methods (SIMs); Derived Importance Method (DIMs) and Multi-Criteria Decision-Making Method (MCDM). In SIMs the perception and expectation of passenger is measured on liguistic-numerical likert type scales, which is simple to apply however it requires a significant increase in length of survey and can sometimes give insufficient difference in rating of the service dimensions (Lupo, 2015). Because of these reason DIMs is widely applied in recent past where expectation rating on service dimensions are statistically derived keeping in view the relationships among performance on service aspects and overall passenger satisfaction (Humphreys and Francis, 2000, 2002; Adler and Berechman, 2001; Barros and Diseke, 2007; Correia et al., 2008; Chaudha et al., 2011; Lubbe et al., 2011; Lupo, 2015).

Both SIMs and DIMs are based on liguistic numerical likert type scale rating which can give imprecise result as judgement provided by linguistic numerical evaluation scales are subject to uncertainties deriving from incompleteness due to partial ignorance (Lupo, 2015; Chou et al., 2011). To overcome the stated weakness, MCDM method was later utilized by many researcher to gauge the passenger's perception about the service quality expectations and

performance. The MCDM was employed to assess service quality as the assumption of Fishbein's attitude model and Multi criteria value model coincide which states the attitude of a customer towards a given service is based on the assessment of service criteria weighted by importance assigned to these criteria. It resulted in utilization of varied MCDM methods such as AHP (Saaty, 2008); TOPSIS (Hwang and Yoon, 1981a); VIKOR (Opricovic, 1998; Opricovic and Tzeng, 2004) PROMTHEE (Brans and Vincke, 1985) etc. Specifically in area of measurement of ASQ some studies utilized deterministic MCDM process (Chen and Tzeng, 2004; Correia et al., 2008; Liou et al., 2011). While other have taken into account the imprecise numeric values of decision data (Liang, 1999; Chen, 2000); (Ding and Liang, 2005; Iraj et al., 2008; Wang et al., 2009).

Since the subjective evaluation of service quality is difficult to be expressed in number, there is existence of uncertainty (fuzziness) (Chien-Chang, 2012). Hence the use of Fuzzy MCDM model can be more realistic in assessing service quality as perception of passengers can be expressed in linguistic term. Fernandes and Pacheco (2010) evaluated the ASQ using Fuzzy multi-criteria analysis and alpha cut concept. The author applied these methods on six airports in Brazil and rendered strategic framework for management of airport. Lupo (2015) utilized ELECTRE III method to comparatively evaluate quality of airport service alternative, however the outranking approach of ELECTRE method is not able to directly gauge and verify the strength and weaknesses of alternatives (Velasquez and Hester, 2013; Konidari and Mavrakis, 2007). Also the process and outcomes of ELECTRE method is complex to employ (Velasquez and Hester, 2013). Chien-Chang (2012) also employed Fuzzy MCDM method to gauge the service quality of two airports in Taiwan and gave strategic solution to improve the service quality performance of airport by employing fuzzy expert system in which the service quality performance is fuzzified using graded mean integration approach and defuzzified using Inverse Arithmetic representation method; while Importance Performance Analysis is conducted on the principle of approximate reasoning by employing fuzzy IF-THEN Rule based expert system which is relatively easy and reliable to gauge airport service quality. In line with Chien-Chang (2012), this research attempts to fill the methodological gap in literature by employing Fuzzy MCDM to measure the service quality of the airports.

2.3. Scale for measurement of airport service quality

As airport has complex setting, hence generic scales for gauging the service quality may omit the specific features pertaining to services and facilities (George et al., 2013; Pantouvakis, 2010). The functional aspect of airport terminal consists of three major areas: access interface, processing area and flight interface (Horonjeff et al., 2010). The processing area refers to all areas where the passenger are processed such as ticketing, check-in, security inspection, boarding etc. (Bezerra and Gomes, 2015). Pantouvakis and Renzi (2016) identifies four major dimensions in measuring ASQ namely Servicescape, Signage, Service and Image. Servicescape refers to airport facilities, circulation planning attributes, cleanliness, lighting, and congestion; the second dimension signage refers to level and quality of Information and guidance available at the airport; service refers to experience of passenger while actually utilizing the facilities and provisions of the airport and image refers to holistic way the airport is depicted in customers mind (Pantouvakis and Renzi, 2016).

There are two main categories of functions performed at airport terminal, passenger process activities and discretionary activities (Popovic et al., 2009; Caves and Pickard, 2000). Process activities refer to passenger flow from check-in to security screening till boarding where as discretionary activities refers to what