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Assessment of airport service quality: A complementary approach to measure perceived service quality based on Google reviews

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ABSTRACT

The purpose of this paper is to demonstrate that user-generated online contents can be used as an alternative data source for assessing airport service quality, which effectively complements and cross-validates the conventional service quality surveys. We apply sentiment analysis and topic modeling technique to 42,137 reviews collected from Google Maps. The results are compared to the well-publicized ASQ ratings conducted by Airport Council International. The sentiment scores computed from the textual Google reviews are very good predictors of the associated Google star ratings, with $r_s(96) = 0.89$, $p < .01$ in 2016. The correlation could be further improved ($r_s(96) = 0.90$) by customizing the sentiment lexicon leveraging the information gained from the previous year's analysis. Also, both the sentiment scores and Google star ratings are found to have a reasonably strong association with the ASQ ratings, with $r_s(78) = 0.63$, $p < .01$ and $r_s(78) = 0.64$, $p < .01$, respectively, in 2016, excluding outliers. These results indicate that the online reviews provide a good proxy for airport service quality ratings and an effective means to cross-validate the conventional industry standard survey results. Further, the study extracts 25 latent topics from the Google reviews through a topic modeling analysis. The 25 topics show good correspondence with the ASQ service attributes, suggesting that the ASQ program effectively covers all the service quality attributes of airport users. Also, further analysis indicates that the relative importance of service attributes varies depending on the size of the airports and that some ASQ service attributes may not be relevant anymore for most passengers.

1. Introduction

Airports are in the service industry; thus service quality is essential to airport operation and management. Airports strive to meet the needs of their customers including passengers, shippers, and airlines. Passenger's perception of service quality and their level of satisfaction have become important indicators of airports' performance, and are measured through surveys conducted either internally or externally. One of the most publicized passenger satisfaction surveys is Airports Council International's (ACI) Airport Service Quality program (hereinafter ASQ), which was initiated in 2006. At present, 320 airports across 80 countries[1] participate in the ASQ survey. The ACI-ASQ program conducts quarterly in-person questionnaire surveys of sample passengers at participating airports and requires a minimum of 350 onsite survey participants per quarter (1400 per year) at each airport. Following a strict plan developed by ACI, the staff at participating airports or third-party companies conduct surveys at the airports with a standardized questionnaire. Regular audits are undertaken by ACI to ensure compliance. The survey rates airport performance by 34 service attributes in eight categories including access, check-in, passport control, security, navigation, facilities, environment, and arrival. ACI recognizes the best airports by size and by region in the annual ASQ awards based on the survey results. The awards are extensively cited by the winning airports for promotional purpose. However, access to the survey results are limited to the participating airports,[2] and the general public and non-participating airports can only see the list of winners in various award categories (by size and region).

With the growing popularity of web-based opinion platforms, passengers increasingly offer voluntary reviews of airport services on various platforms, such as Skytrax (www.airlinequality.com), TripAdvisor, and Google reviews. These platforms let travelers leave a star-rating along with reviews about various aspects of airport services. These ratings and reviews are great sources of information for both travelers and service providers. However, past reviews are quickly

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[1] http://www.aci.aero/Customer-Experience-ASQ/ASQ-Awards, accessed on August 15, 2017.

[2] According to private communications with managers at a participating airport, each participating airport pays a roughly $16,000 to $20,000 annual fee, and spends additional $50,000 to $100,000 to carry out the survey.

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buried in a massive amount of newer reviews, and the single consolidated rating scores depicting each airport reflects all ratings accumulated over the years without distinguishing service attributes or explicating changes over time. That is, travelers and service providers would not be able to fully utilize the rich and valuable information embedded in these ratings and reviews in their raw format.

The recent development in data mining (i.e., techniques of discovering patterns and trends from a large data set) (Larose, 2005) and text mining (i.e., a subset of data mining that aims at extracting information from texts) (Zhong et al., 2012) provides various means to analyze these rating and reviews. These analyses can offer complementary indicators to cross-validate the ASQ's survey results and to extract the key attributes of service quality perceived by passengers that can be compared to those from ASQ surveys, and to expand the coverage of analysis beyond the 320 participating airports in the ASQ program.

Although airports have been among the leaders in applying social media, mobile and digital technology in delivering services and communicating with customers, there has been limited research in the field of airport management that investigate the growing contents on the aforementioned platforms. This paper is intended as a prefatory step to fill this gap.

The objective of this paper is to demonstrate a complementary assessment approach that can be used: 1) to evaluate passengers' perception of airport service quality, 2) to cross-validate ASQ's survey results, and 3) to examine the degree to which ASQ's service attributes match the service attributes expressed in Google reviews. To achieve the objective, the study performs pairwise comparisons between Sentiment Scores extracted from Google reviews, Google star ratings, and ASQ ratings. Next, the study extracts major topics from the textual reviews and compares them with the ASQ's survey attributes. The paper shows that Google reviews provide a rich source of data to develop airport service quality indicators that complement and extend ASQ surveys.

The rest of the paper is organized as follows: Section 2 reviews literature in airport service quality and provides an overview of studies that use text mining in airport management and related fields; Section 3 describes our methodology for selecting a platform, collecting reviews, and extracting metrics to be used for comparison with ASQ's ratings and survey attributes; Section 4 analyzes the data and discusses the results; Section 5 discusses some specific issues related to using Google Maps as data source; Section 6 summarizes the main findings and offers concluding remarks.

2. Literature review

2.1. Service quality as a construct

Service quality is considered one of the most debated topics in the service marketing literature. Yet, there is one thing the researchers appear to agree on: perceptions of service quality are based on multiple dimensions, even though there is no general agreement as to the nature or content of the dimensions (Brady and Cronin, 2001). Inherently, airport service quality is a multi-dimensional construct that represents a broad range of passenger experiences. As Pantouvakis and Renzi (2016) pointed out that there are two general tracks of airport service quality literature: (1) to identify the different dimensions or attributes of airport service quality through conceptual or empirical modeling; (2) to identify quality drivers that lead to customers' satisfaction.

Rhoades et al. (2000) used factor analysis to identify four dimensions that contain twelve attributes, including passenger service (food and beverage, restrooms, retail and duty free, special services), airport access (parking, rental car, ground transportation), airline-airport interface (gate boarding areas, baggage claim, information display), and the inter-terminal transportation as a single attribute dimension. The study surveyed 150 airport directors and consultants through a mail questionnaire. Yeh and Kuo (2003) identified six “manageable” service attributes (Comfort, Processing time, Convenience, Courtesy of staff, Information visibility, and Security) through a panel of experts, then applied a fuzzy multi-attribute decision making (MADM) model to generate a service quality index to evaluate the comparative level of passenger service performance among 14 Asia Pacific airports. The study is limited to the attributes that are “manageable by the airport” rather than “all” service attributes experienced by passengers.

Emphasizing the importance of passengers' perspective, Fodness and Murray (2007) proposed that passengers' expectation of airport service quality has three key dimensions with five subdimensions including function (effectiveness, efficiency), interaction, and diversion (maintenance, productivity, decor). They conducted an empirical test of the model based on 700 responses collected through a mail survey. Using factor analysis (Bezerra and Gomes, 2015), extracted seven dimensions of airport service quality as perceived by the passengers, and then examined how each of these dimensions affects passengers' overall satisfaction. Excluding one of the extracted dimensions (i.e., Price), Bezerra and Gomes (2016) estimated a six-factor model to measure airport service quality (Check-in, Security, Mobility, Ambience, Basic facilities, and Convenience). Both studies were based on on-site survey data collected at one Brazilian airport. Their results may not be generalizable to all airports as the perceived service quality is subjective and context-dependent (Brady and Cronin, 2001). This notion of context dependency was further examined by Pantouvakis and Renzi (2016). Pantouvakis and Renzi (2016) collected 922 usable responses through in-terminal personal interviews at Rome Fiumicino Airport over a two month period in 2014. They identified three “distinct, independent and invariant” service quality dimensions, namely, “Servicescape and Image,” “Signage” and “Service.” Further, their empirical results provided some evidence that passengers' satisfaction or dissatisfaction perception of airport service quality vary according to their nationalities. In other words, the perception of airport service quality is context dependent.

There have been efforts to identify various drivers that influence passengers' perception of airport service quality. Suárez-Alemán and Jiménez (2016) investigated whether passengers' perception of airport quality is influenced by airport management schemes and characteristics that are not directly observable. Their results indicate that airport ownership, the degree of regulation, level of GDP per capita are among the drivers of airport service quality. Brida et al. (2016) examined the effects of information and communication technologies on passengers' perception of airport service quality. Based on a survey conducted by Chilean Aviation Authority at Santiago International Airport (SCL) in 2013, the study found that factors related to flights and airport information have an important impact on the passengers' perception of airport services.

As the discussions above attest, there is no established consensus on the dimensions and attributes of airport service quality. Further, as shown by the previous studies, the airport service quality is a context-dependent construct. These suggest that examining the consistency between ASQ's service quality attributes and the collective perception of service quality is an empirical question. The present study extends the service quality literature, not by proposing yet another set of service dimensions but by empirically comparing ASQ ratings against the ratings from a large number of online reviews, and comparing ASQ service attributes against the topics extracted from those reviews that reflect passengers' collective experiences.

2.2. Text mining and sentiment analysis in airport management and related fields

The ever-increasing volume of comments and reviews on the Internet offers new opportunities to capture passengers' perceptions and expectations of airport service quality on a global scale. Recent research in text mining and data science makes this possible through various

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