



Comparisons of service quality perceptions between full service carriers and low cost carriers in airline travel

Juhwan Lim & Hyun Cheol Lee

To cite this article: Juhwan Lim & Hyun Cheol Lee (2020) Comparisons of service quality perceptions between full service carriers and low cost carriers in airline travel, Current Issues in Tourism, 23:10, 1261-1276, DOI: [10.1080/13683500.2019.1604638](https://doi.org/10.1080/13683500.2019.1604638)

To link to this article: <https://doi.org/10.1080/13683500.2019.1604638>



View supplementary material [↗](#)



Published online: 18 Apr 2019.



Submit your article to this journal [↗](#)



Article views: 4021



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 24 View citing articles [↗](#)



Comparisons of service quality perceptions between full service carriers and low cost carriers in airline travel

Juhwan Lim ^a and Hyun Cheol Lee ^b

^aSchool of Business and Technology Management, KAIST, Daejeon, South Korea; ^bSchool of Business, Korea Aerospace University, Goyang, South Korea

ABSTRACT

We apply latent Dirichlet allocation topic modeling to a vast number of passenger-authored online reviews for airline services to compare service quality between full service carriers (FSCs) and low cost carriers (LCCs). Representing key features of airline service quality, topics are extracted from the reviews and matched to the five typical dimensions used by the SERVQUAL model. Based on the measure of word frequency statistically distributed to topics, we quantitatively determine the dimensions of service quality that are deemed as most essential by travelers. The results show that the most significant dimensions for FSCs and LCCs are tangibles and reliability, respectively. The least significant dimensions are assurance and empathy, respectively. By comparing extracted features in detail, we discover specific differences in traveler perceptions between FSCs and LCCs. Air carriers should be aware of these differences, as it would help them better differentiate themselves. Moreover, inflight meal services and seats, which have typically been regarded as tangible features, are subdivided into different topics, and the subdivisions are simultaneously matched to multiple dimensions (eg tangibles, empathy, and reliability). This suggests that research needs to reflect the diverse aspects of traveler perceptions for primary service items.

ARTICLE HISTORY

Received 17 July 2018

Accepted 1 April 2019

KEYWORDS

Airline service; airline travelers; latent Dirichlet allocation; online review; service quality feature; text analysis

Introduction

Competition between low cost carriers (LCCs) and full service carriers (FSCs) has intensified in the global air travel market (Han & Hwang, 2017; O'Connell & Williams, 2005). For example, LCCs, relatively recently introduced in Asian and emerging air travel markets, are gradually increasing their market share while concentrating on cost reduction strategies to capture cost-sensitive travelers (Baum & Kua, 2004; Martinez-Garcia & Royo-Vela, 2010; O'Connell & Williams, 2005). To respond to the challenges from LCCs, FSCs are strategically focusing on their hub airports, a strategy that runs counter to the point-to-point strategy used by LCCs. FSCs are also providing higher levels of service quality and strengthening their alliances to retain their loyal customers and avoid customer switching behavior (Dennis, 2007, 2010). In such a competitive environment, increased importance has been placed on acquiring a better understanding of the key differences in perceived service quality between LCC and FSC customers to differentiate service strategies and achieve business sustainability (Koklic, Kukar-Kinney, & Vegelj, 2017; Lee et al., 2018).

To measure service quality, researchers rely mainly on surveys that are designed using the existing literature. Using surveys, many studies have explored customer perceptions regarding

the service quality of airlines and showed significant differences in perceptions between LCCs and FSCs (Ahn & Lee, 2011; Chiou & Chen, 2010; Curras-Perez & Sanchez-Garcia, 2016; Koklic et al., 2017; O'Connell & Williams, 2005; Rajaguru, 2016). Despite the utility of being able to draw upon standardized research designs, circumstances have highlighted typical drawbacks – the amount of time needed to collect complete datasets (Kothari, 2004), the restricted expandability of research (Lee & Bradlow, 2011), sample size limitations (Bartlett, Kotrlik, & Higgins, 2001) and so forth. Online reviews have the exact the opposite disadvantage – the absence of a standardized research process. Compared to survey data, they can serve as objects of exploratory research and reveal new aspects of service quality. Nevertheless, because online reviews are regarded as one of the most critical factors in customer purchase decisions (Archak, Ghose, & Ipeirotis, 2011; Duan, Gu, & Whinston, 2008; Godes & Mayzlin, 2004), they have lately received considerable attention in a number of business research areas for numerous reasons, including the following. First, they have sizable volumes. The inference-derived results can be considered reliable when drawing the results from trusted review sites with very large datasets. Second, online reviews preserve the real-time perceptions held by customers (Dellarocas, Zhang, & Awad, 2007; Duan et al., 2008). They are one of the most immediate measures of service experience. Finally, they show voluntary, unrefined, and direct experience or feedback from customers (Mudambi & Schuff, 2010).

In this study, we apply latent Dirichlet allocation (LDA) topic modeling, a widely-used text analysis technique, to a vast number of passenger-written online reviews for airline services to analyze and compare service quality (Blei & Lafferty, 2007; Blei, Ng, & Jordan, 2003). Representing key features of airline service quality, the topics discerned by the modeling are (with the help of academic researchers) matched to the five traditional dimensions – responsibility, assurance, tangibles, empathy, and responsiveness – employed by the SERVQUAL model to determine experience-based service quality. This enables us to quantitatively determine the dimensions of service quality that travelers deem most essential based on the measure of word frequency statistically distributed across topics. A major incentive to employ the five dimensions is that it is the most widely accepted measure of service quality, and it is thus easy to compare the current results to previous results. To minimize the validity issue with the five dimensions, we thoroughly review varied versions of newly-developed and different dimensions for airline service quality in the following section. This helps us understand how dimensions should be defined and which dimension type is required to incorporate airline service-specific characteristics. Accordingly, it is possible to match topics to the dimensions as appropriately as possible while integrating domain-specific characteristics that varied models have proposed. We also carry out a sentiment analysis to uncover customer emotions or attitudes regarding the quality of airline services (Liu & Zhang, 2012). In summary, the aim of this study is to answer the following research questions (RQs).

RQ1. Can service features of airline service quality be extracted from online reviews and be properly represented in a service quality model?

RQ2. How can the significance of service features be quantified?

RQ3. What are the differences between FSCs and LCCs in terms of SERVQUAL dimensions and features?

RQ4. Compared to previous studies using surveys, what are the new aspects of the customers' perceptions of airline service quality?

RQ5. What are the customers' sentiments about service quality?

By answering these questions, this study offers meaningful insights for air carriers with respect to providing differentiated services to travelers. Likewise, it provides understandings for researchers attempting to determine the types of features that should be considered or added when designing studies on airline service quality.

Literature review

Airline service quality models

Many studies on airline service quality have worked with SERVQUAL, which was postulated by Parasuraman, Zeithaml, and Berry (PZB) (1988), and its variations that reorganize the structure of dimensions to improve model validity by adopting domain-specific characteristics. Fick and Brent Ritchie (1991) and Gourdin and Kloppenborg (1991) studied service quality in the air transport industry using PZB's model. Fick and Brent Ritchie (1991) measured service quality for four kinds of businesses, including airline service, but they could not measure the relative effects of the SERVQUAL items (Young, Cunningham, & Lee, 1994). Using PZB's model of service quality developed in 1985, Gourdin and Kloppenborg (1991) surveyed customers, airline employees, and officials in the US Department of Transportation and the Federal Aviation Agency. While they showed statistical significance in several variables, their approach was not complete in terms of sample representativeness, variable origin, and model reference (Young et al., 1994).

Tsaur, Chang, and Yen (2002) implemented the fuzzy set theory to resolve the briefness issue of the Likert scale for service quality measurement. Using the fuzzy approach, they tried to measure vague human judgements such as customer satisfaction in a more explicit manner. Their study concluded that the most and least important dimensions were tangibles and empathy, respectively, among the five dimensions in PZB's SERVQUAL. Gilbert and Wong (2003) measured airline service quality by modifying SERVQUAL's original form. The tangible dimension was subdivided into facilities, employees, and flight patterns, and the empathy dimension was renamed as customization. Assurance was considered to be most important, whereas customization and facilities were not important. They also found that service expectations varied in different market segments by showing statistical differences depending on ethnic groups, nationalities, and travel purposes. Park, Robertson, and Wu (2005) proposed the application of structural equation modeling to test simultaneous relationships. However, the applicability of their research results was restricted because their data only represented international economy class travelers.

Studies on LCCs have only appeared recently, and there are thus fewer of them than studies on FSCs. Saha and Theingi (2009) found that service quality was still a determinant of customer satisfaction in LCCs, and behavioral intentions such as repurchase intentions and feedback were affected by service quality and customer satisfaction. They also showed that customer satisfaction and feedback were positively correlated. Chiou and Chen (2010) adopted the research frame provided by Park, Robertson, and Wu (2004) to investigate factors that affected the behavioral intentions of travelers between FSCs and LCCs. Their study showed that service perception had a considerable influence on the behavioral intentions of FSC travelers whereas service value had a large influence on those of LCC travelers. These contrasting results suggested that there existed a nontrivial gap between customer perspectives for FSC and LCC airline services. In particular, price might have been much more critical for LCC passengers than for FSC passengers. In Table 1, we summarize selected published results that have used the conventional five dimensions or variations thereof. We retain the meanings of the original or modified dimensions in the selected literature when matching topics to the five dimensions.

Text analysis-based service quality in airline travel

With the growth of mobile web platforms, online reviews have become one of the most popular methods of customer assessment for overall service quality (Lee & Lin, 2005; Mudambi & Schuff, 2010; Palese & Piccoli, 2016). Reviews are mainly composed of comments reflecting direct perceptions of service performance and experience (Guo, Barnes, & Jia, 2017; Humphreys & Wang, 2017; Miguéis & Nóvoa, 2017). Many studies have analyzed reviews for products and service areas such as tourism and hotel businesses (Archak et al., 2011; Berezina, Bilgihan, Cobanoglu, & Okumus,

Table 1. Selected studies for airline service quality. We finally select 13 results from 21 papers with five dimensions or varied dimensions employed among the total of 45 papers reviewed for airline service quality. Due to the lack of space, features of the dimensions are displayed in Appendix A (in Supplementary Material). The dimensions used by Aksoy et al. (2003) are only for domestic airline service. The dimensions for international airline service are included in Appendix A.

Type	Researcher	Dimensions
FSC	Ostrowski et al., (1993)	No dimension suggested
FSC	Young et al., (1994)	Baggage handling, Bumping procedures, Operations and safety, Inflight comfort, Connections
FSC	Tsaur et al., (2002)	Tangibility, Reliability, Responsiveness, Assurance, Empathy
FSC	Chang and Yeh (2002)	On-board comfort, Airline employees, Reliability of service, Convenience of service, Handling of abnormal, Conditions
FSC	Gilbert and Wong (2003)	Reliability, Assurance, Facilities, Employees, Flight patterns, Customization, Responsiveness
FSC	Aksoy et al., (2003)	Cabin features and personnel, Country of origin and promotion, Food and beverage services, In-flight activities, Internet services, Punctuality and speed, Free alcoholic beverages, Price
FSC	Park et al., (2005)	Reliability and customer service, Convenience and accessibility, In-flight service
FSC	Pakdil and Aydin (2007)	Employees, Tangibles, Responsiveness, Reliability and Assurance, Flight Patterns, Availability, Image, Empathy
LCC	Saha and Theingi (2009)	Tangible features, Schedules, Services provided by ground staff, Services provided by flight attendants
LCC	Kim and Lee (2011)	Tangibles, Reliability, Responsiveness, Assurance, Empathy
FSC	Liou et al., (2011)	Booking service, Ticketing service, Check-in, Baggage handling, Boarding process, Cabin service, Baggage claim, Responsiveness
LCC	Jiang (2013)	Ground service, Flight experience, Service reliability, Airfare and schedule
FSC	Hussain et al., (2015)	Reliability, Responsiveness, Assurance, Tangibility, Security and safety, Communication

2016; Mankad, Han, Goh, & Gavirneni, 2016; O’connor, 2010). Recently, several studies in the air travel area have used online text data to investigate customer perceptions (Gitto & Mancuso, 2017, 2019; Lee & Yu, 2018; Martin-Domingo, Martín, & Mandsberg, 2019; Misopoulos, Mitic, Kapoulas, & Karapi-peris, 2014; Yee Liau & Pei Tan, 2014).

Misopoulos et al. (2014) utilized 67,953 Tweets to identify important customer service factors. They produced relevance ratings of Tweet messages based on the similarity coefficient, and they analyzed customer sentiments to investigate opinions regarding airline service. They found that services related to flight delays, lost baggage, and check-in/boarding problems caused negative sentiments, while those related to check-in in mobile applications, reasonable prices, and on-board entertainment generated positive sentiments. However, their study was limited in that they only analyzed 20 keywords in the dataset. Similarly, Yee Liau and Pei Tan (2014) analyzed 10,895 Tweets to study customer opinions about LCCs in Malaysia. They employed a k-means clustering algorithm to group Tweets and spherical k-means clustering to enhance the efficiency of the analysis. The results reported that clusters of customer service, booking management and ticket promotions collected more positive emotions. On the contrary, the flight cancelation cluster acquired more negative sentiments.

Gitto and Mancuso (2017) worked with online reviews collected from five major European airports on the Skytrax website. They analyzed 895 sentences, two third of which were related to non-aviation services and one third of which were aviation services. They found that slightly more than half (55%) of the sentiments were positive in the non-aviation services, while one third (33%) of them were positive in the aviation services. Related to the non-aviation services, the most frequent opinions referred to food and beverages and shop service. On the contrary, check-in and baggage claim services were most frequently addressed in the aviation services. Lee and Yu (2018) investigated Google reviews for the top 100 airports to show that online reviews could be used to measure airport service quality (ASQ). They found that the sentiment scores of reviews adequately predicted Google star ratings. They also demonstrated that sentiment scores and Google star ratings had a sizable relationship with ASQ ratings. Furthermore, they revealed that 25 topics extracted from the LDA analysis were well matched to the ASQ service attributes. They proposed a future study on a relative importance investigation for attributes of different groups such as FSCs versus LCCs, which could be one of the results of the present study.

Gitto and Mancuso (2019) used the Twitter accounts of 118 airports to determine the brand perceptions of airports based on attributes of the airport industry, including environment, disability, and luxury. Using a cluster analysis and social perception scores, they explained the passengers' clustered perceptions of airports. Martin-Domingo, Martín, and Mandsberg (2019) attempted to measure ASQ using sentiment analysis with a dataset of 4,392 Tweets. They determined 23 service attributes composed of 108 keywords and compared them to 34 attributes of ASQ. The research results revealed that passengers frequently mentioned attributes regarding waiting and ground transport, but they mentioned shopping or washrooms (WC) only in 1% of their Tweets. In the sentiment analysis, customers had a positive attitude regarding WiFi, WC, food and beverages, and lounge services, while they showed negative sentiments regarding waiting, parking, arrival, staff, and passport control.

Research model

With respect to analyzing the meaning of the words and content in the documents in the topic model, the topic model assumes that a topic is a probability distribution of words, and a document comprises a mixture of topics (Steyvers & Griffiths, 2007). LDA is the most common topic model (Blei et al., 2003). It generates topics that have been latent in documents based on the Dirichlet distribution. LDA can be easily implemented via software (eg R, Matlab and Python) after model input parameters such as the number of topics ($=k$) are adequately set. (See details of data preprocessing and model parameter setting in Appendix B.) As a result of the LDA modeling, a topic is the probability distribution of words from online reviews that contain customer perceptions on service experience, and it represents a reorganized form that expresses the feature of service quality in the k -dimensional space. That is, a topic suggests a feature of a specific dimension of service quality.

The research model is depicted in Figure 1. First, online reviews are collected via web crawling. Second, the collected reviews are preprocessed to make them suitable as input for the LDA modeling. Data is arranged into a document-term matrix format, ie a matrix of a preprocessed corpus. Third, when extracting topics from the online reviews, the LDA algorithm reduces the uncontrollable dimensional space into a controllable k -dimensional space (30 topics for FSCs and 20 topics for LCCs; see explanations in Appendix B). This makes the data sufficiently manageable in the subsequent stage. Fourth, the extracted topics are named and matched to the dimension regarded as the best fit among the five choices (RQ1). This is achieved with the help of an advisory group. Namely, we perform another dimension reduction (from 30 and 20 to five each for the FSCs and LCCs, respectively) based on the group members' survey and interview. The group is composed of three professors and six graduate students whose specialties cover diverse majors in aviation management, including airline marketing, airport operations, airline service, human resources, finance,

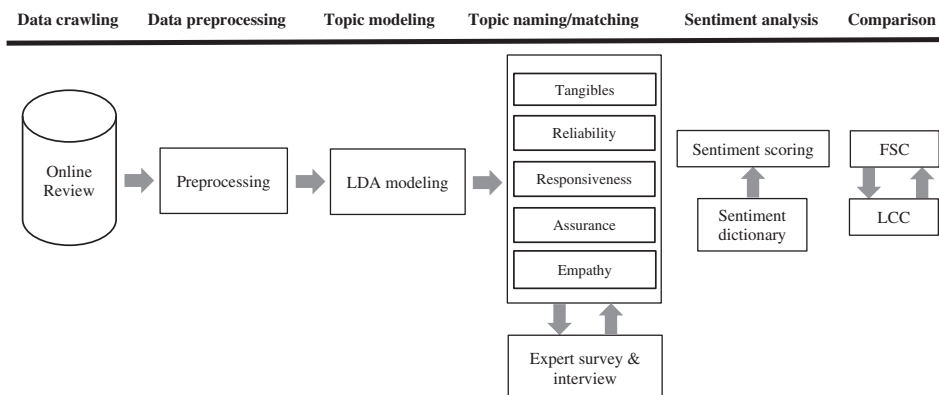


Figure 1. Research model.

MIS, and aviation policy and strategy. Next, we decide which dimension among the five dimensions is the most significant by measuring word frequency (RQ2). All of the stages are repeated twice for both the FSCs and LCCs. Then we compare the differences between the service qualities (RQ3) and explain what aspects of the research in airline service quality should be newly considered (RQ4). Finally, a sentiment analysis is applied to topics and dimensions to investigate customer attitudes based on the widely-used word dictionary (Hu & Liu, 2004) (RQ 5).

Data

We use online reviews from airlinequality.com in which travelers voluntarily and individually write reviews of their service experiences. To compare, we choose the top 10 of the world's top 100 ranked airlines for both categories of service carriers (airlinequality.com/review-pages/top-10-air-lines/). Using a data crawling package in R, we retrieve all of the online reviews of the selected airlines for both LCC and FSC categories at the time of review gathering. Table 2 summarizes the data employed in this study.

We statistically examine whether collected online reviews are representative of the population using the method offered by Aggarwal and Singh (2013). They determined sample representativeness by conducting t-tests for critical variables between sample and population groups. If there was no significant difference in the critical variable between groups, it was concluded that the sample was representative. We consider two critical variables for the LDA algorithm. One is the number of words per review, and the other is the number of occurrences of words per review (Blei et al., 2003; Wei & Croft, 2006). For the first t-test, the average number of words per review is compared. When we collect the online reviews (11,031) for 20 airlines, there are 52,506 reviews for 84 airlines, including 23 LCC carriers. The test results are summarized in Table 3. For the most frequent 1,000 words, which explain 82.6% of the total occurrences of all words, the average number of occurrences per review is compared at the second t-test. Because a larger number of reviews leads to a larger number of word occurrences, we use statistics through dividing word occurrences by the number of reviews in each group for the most frequent 1,000 words. Table 4 displays the test outcomes, which demonstrate that there are no statistically significant differences between the groups in terms of the critical variables in topic modeling.

Topic modeling

Topic naming

The LDA modeling results in Appendix C reveal the extracted features of the customer online reviews (ie topics), and are now composed of probabilistic distributions of words. If we can give an appropriate name to every topic while considering the meaning of words distributed to each topic, the

Table 2. Data summary.

FSC				LCC			
rank	airline	time periods	# of reviews	rank (actual)	airline	time periods	# of reviews
1	EK	2013.12~16.10	1091	1 (23)	AK	2010.08~16.10	406
2	QR	2013.08~16.10	840	2 (25)	VX	2009.10~16.10	261
3	SQ	2013.06~16.10	647	3 (30)	DY	2009.12~16.10	669
4	CX	2013.08~16.10	760	4 (38)	U2	2013.04~16.10	677
5	NH	2009.08~16.10	341	5 (46)	JQ	2012.05~16.10	506
6	EY	2013.06~16.10	784	6 (48)	D7	2010.01~16.10	280
7	TK	2013.08~16.10	895	7 (50)	WS	2013.02~16.10	179
8	BR	2010.10~16.10	376	8 (51)	6E	2009.12~16.10	148
9	QF	2013.09~16.10	848	9 (53)	B6	2010.06~16.10	336
10	LH	2014.01~16.10	880	10 (54)	3K	2009.08~16.10	107
Total			7462				3569

Table 3. t-test for the number of words.

	all airlines (<i>n</i> = 52,506)		selected airlines (<i>n</i> = 11,031)		<i>df</i>	<i>T</i>	Sig.
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
# of words	55.130	32.873	54.750	33.347	15854.604	1.098	0.272

Table 4. t-test for the average number of occurrences of 1,000 words that are the most frequent in each group.

	all airlines (<i>n</i> = 1,000)		selected airlines (<i>n</i> = 1,000)		<i>df</i>	<i>T</i>	Sig.
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
# of occurrences of words/# of reviews	0.045	0.101	0.045	0.099	1997.614	0.037	0.971

contents of all of the reviews will be expressed by interpretable topics. This naming process is carried out in two steps. In the first step, we provide the topic modeling results with a questionnaire form (Appendix C without topic names (second row), topic significance (third row), and highlighting) to members of the advisory group, and they fill in the empty name of each topic independently. This step is designed to collect various interpretations from the modeling results. During this step, we provide the subjects with two explanations. First, we inform them that a word with a larger probability in a topic has more explanatory power than a word with a smaller probability. Second, we ask them to focus on distinguishable words that could represent differences among topics rather than similar words that simultaneously exist in multiple topics. For example, the names for FSC Topic 5 (inflight meal (punctuality)) and FSC Topic 11 (inflight meal (menu variety)) are more likely to be determined by words such as *short*, *quick*, and *prior* for Topic 5 and *choic(e)*, *cours(e)*, and *option* for Topic 11 rather than by words such as *serv(e)*, *breakfast*, and *dinner* that simultaneously exist in both topics. The second step is needed only when there exists an obvious disagreement among the collected names. Opinions from the professors are adjusted until reaching an agreement, and then the agreed upon name is finalized via consensus from the graduate students. If opposition still exists as the students finalize their work, the adjusting process with the professors is repeated until all conditions are satisfied. Figure 2 depicts the process.

Topic matching with five dimensions

After being named, the topics are matched to the five dimensions based on the opinions of the advisory group. The matching process is conducted in a similar manner to the naming process, but only the second step (in Figure 2) is carried out. During the naming process, both broad interpretations as well as precise interpretations are necessary from the experts. However, when matching, precision alone is sufficient. We gather the reliable and valid opinions provided by the professors from the initial process stage and concentrate on the consensus within the advisory group while striving to integrate the airline service-specific characteristics that we have outlined in the broad literature review. The topic matching results with five dimensions are summarized in Table 5. Four of the topics – customer satisfaction, recommendation intention, and model residual for the FSCs; and price for the LCCs – are not assigned. They are excluded because they are not regarded as typical dimensions of service quality. The model residual indicates an uninterpretable topic driven by noisy data and is used to enhance the coherence of the rest of the topics in the topic modeling (DiMaggio, Nag, & Blei, 2013).

We use word frequency to quantify the significance of the topic (Yu, Zha, Wang, & Chua, 2011; Zhang, Narayanan, & Choudhary, 2010). In terms of word frequency, we assume that a topic is mentioned more frequently when it is more significant. Thus, the more frequently that words are mentioned by travelers, the more significant they are, and the more those words are contained in a

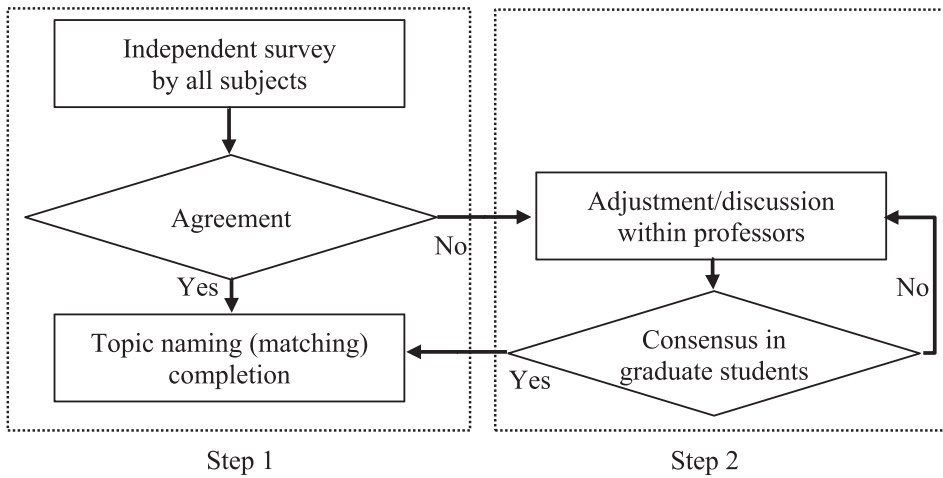


Figure 2. Topic naming and matching process.

particular topic, the more significant the topic is. For example, the words seat, comfortable, and pitch are more probable than the words meal, food, and water in the reviews given by travelers who express that seat comfort is significant. The significance of the k th topic ($k = 1 \dots K$) based on word frequency is calculated as

$$T_k = \sum_{n=1}^N w_{n/k} / \sum_{k=1}^K \sum_{n=1}^N w_{n/k} \quad (1)$$

$w_{n/k}$: the frequency of the n th word in the k th topic ($n = 1 \dots N, k = 1 \dots K$).

Note that the probability of the n th word in the k th topic ($n = 1 \dots N, k = 1 \dots K$) in Appendix C is represented by $p(w_{n/k}) = w_{n/k} / \sum_{n=1}^N w_{n/k}$.

Result comparisons and discussions

Dimension level comparisons

Carrying out comparisons in the dimension level facilitates an overview of the differences in traveler perceptions of service quality between FSCs and LCCs. Tangibles and reliability are the most significant dimensions for FSCs and LCCs, respectively. On the contrary, the least significant dimensions for FSCs and LCCs are assurance and empathy, respectively. As we can see in Table 5, seat-related topics, which have usually been considered as tangible features, are prevalent in FSCs. In addition, they are principle contributors to the significance of tangibles. For LCCs, at almost 50% ($\approx 48\%$), the significance of reliability dominates all other dimensions. This means that LCC customers are particularly critical of how accurately promised services are performed, and they are less focused on the performance of additional services (eg inflight entertainment (IFE), wider seats, and faster staffing). Because of the low price of the service, LCC travelers tend to have lowered levels of confidence in the service quality, and this lowered confidence affects the significance of reliability (Bhadra, 2009; Seo, Moon, & Lee, 2015; Wittman, 2014). Likewise, it can be understood that empathy appears as the least significant dimension for LCCs. Assurance has a relatively small level of significance for both service carriers. This is similar to the results reached by Tsaur et al. (2002) whose study determined that assurance was ranked fourth in terms of importance within the five dimensions for FSCs. Kim and Lee (2011) also showed that assurance, including reliability and empathy, did not significantly affect customer satisfaction for LCCs. These comparisons indicate that there exists a considerable difference in passenger

Table 5. Matching results in order of significance. The percentage value in parenthesis indicates the dimension significance excluding topics not matched. Highlighted topics are unique topics that simultaneously do not belong to either type of air carrier.

FSC				LCC			
Topic	Topic significance	Dimension	Dimension significance	Topic	Topic significance	Dimension	Dimension significance
Seat comfort (space & location) # 2	3.50%	Tangibles	29.16% (32.23%)	Change & cancellation (in reservation service) # 18	5.61%	Reliability	45.31% (47.67%)
Inflight drink service # 7	3.42%			Carry-on baggage # 20	5.31%		
Inflight entertainment # 30	3.40%			Inflight meal purchase # 4	5.26%		
Lounge service # 14	3.30%			Reservation service # 3	5.10%		
Seat comfort (aircraft type) # 18	3.18%			Arrival & departure punctuality # 13	5.07%		
Seat comfort (flight distance) # 9	3.12%			Flight delay # 1	4.91%		
Aircraft condition (interior, age) # 8	3.11%			Paid ancillary service # 8	4.77%		
Seat (overall evaluation) # 22	3.07%			Transfer service # 11	4.68%		
Aircraft (A380) # 24	3.05%			Service consistency over time # 5	4.60%		
Reservation service (including change & cancellation) # 29	3.88%	Reliability	20.68% (22.85%)	Reaction to flight delay # 9	5.61%	Responsive-ness	20.51% (21.58%)
Transit and transfer service # 19	3.65%			Waiting (check-in) # 16	5.35%		
Arrival & departure punctuality # 6	3.57%			Waiting (boarding) # 10	4.81%		
Inflight meal (punctuality) # 5	3.38%			Customer complaint # 2	4.74%		
Service consistency over time # 20	3.17%			Aircraft (B787) # 15	5.07%	Tangibles	14.82% (15.59%)
Service consistency in & outbound flight # 26	3.03%			Seat comfort (space & location) # 6	4.89%		
Inflight meal (menu variety) # 11	3.62%	Empathy	19.84% (21.93%)	Seat comfort (flight distance) # 7	4.86%	Assurance	9.32% (9.81%)
Family seat request # 12	3.37%			Employee's quality (positive perspective) # 17	4.74%		
Sleep comfort # 17	3.35%			Employee's quality (negative perspective) # 14	4.59%	Empathy	5.09% (5.36%)
Service differentiation by class # 28	3.26%			Service differentiation by class # 19	5.09%		
Frequent flyer program # 1	3.16%			Price # 12	4.95%	Not matched	4.95%
Inflight meal (special demand) # 21	3.07%	Responsive-ness	14.38% (15.89%)	Total	100%		100% (100%)
Reaction to flight delay # 4	4.24%						
Waiting (boarding & check-in) # 13	3.51%						
Flight attendant call # 16	3.32%						
Baggage service # 27	3.31%	Assurance	6.42% (7.10%)				
Employee's quality (language skill) # 10	3.22%						
Employee's quality (courtesy) # 3	3.20%	Not matched	9.53%				
Model residual # 25	3.29%						
Customer satisfaction # 15	3.20%						
Recommendation intention # 23	3.04%						
Total	100%		100% (100%)	Total	100%		100% (100%)

perceptions between FSCs and LCCs. This conclusion was also reached by O'Connell and Williams (2005).

Feature level comparisons

We can differentiate the service quality between FSCs and LCCs by examining topics that simultaneously do not belong to either type of air carrier since those topics represent the uniqueness of

each category. When we exclude FSC topics identical or similar to LCC topics, there exist 15 unique topics out of the 27 total topics. The unique topics are highlighted in Table 5. Of note, frequent flyer program (Topic 1), lounge service (Topic 14), and inflight entertainment (Topic 30) are topics exclusive to FSCs. These distinctive services can increase the probability that passengers will choose a particular FSC (Baker, 2013). Topics of employee quality (language skill) (Topic 10), sleep comfort (Topic 17), and inflight entertainment (Topic 30) are also more relevant for FSCs because FSCs are more likely to frequently cover long distances and fly international routes (Fourie & Lubbe, 2006; Gillen & Morrison, 2003; Kappes & Merkert, 2013). The fact that language skill appears for FSCs suggests that FSCs place greater focus on international routes than LCCs (Kappes & Merkert, 2013). Sleep comfort also represents a major feature of FSCs that usually operate long-distance flights (Francis, Dennis, Ison, & Humphreys, 2007). Longer flights lead to longer sleeping times. Therefore, as flight time increases, the need for more attentive service to ensure sleep comfort also increases.

Interestingly, unique FSC topics are distributed in all of the five dimensions of service quality. On the contrary, four of the five unique topics, out of 19 LCC topics, are placed only in the reliability dimension. This indicates that FSCs should not ignore any dimension of service quality, though tangibles is the most critical dimension. On the other hand, LCCs need to focus on service items related to the dimension of reliability for better differentiation. This is because FSC travelers tend to recognize quality in various aspects of airline service (Gillen & Morrison, 2003; Hunter, 2006; Zhang, Lin, & Newman, 2016). They consider the entire range of services from basic to sophisticated, even including the physical appearance of the aircraft (Topic 8). When the most basic and sophisticated services are assumed to be related to reliability and empathy, the unique topics of service consistency (Topic 26) and family seat request (Topic 12) are categorized into each dimension. The rest of the unique FSC topics are related to seats and inflight meal services, which almost match with the tangibles and empathy dimensions. These dimensions are closely related to the lower price sensitivity of FSC customers when compared to LCC customers (O'Connell & Williams, 2005; Wittman, 2014). FSC travelers tolerate higher expenses to obtain greater benefits via various services (Seo et al., 2015).

Of the 19 LCC topics, five of them are unique. Among them, inflight meal purchase (Topic 4), paid ancillary service (Topic 8), and carry-on baggage (Topic 20) are closely related to specific LCC properties. The inflight meal purchase topic aptly reflects the fact that most LCCs charge fees for inflight meals (O'Connell & Warnock-Smith, 2013). Words such as *intern(et)* and *prebook* in this topic reveal a recent trend in the LCC business environment (Baker, 2013; Bigné, Hernández, Ruiz, & Andreu, 2010; Hunter, 2006). The paid ancillary service topic has been stressed as a major business strategy for LCCs and is an important contributing factor for LCC profits (Doganis, 2006; O'Connell & Warnock-Smith, 2013). This service incorporates seat selection, seat upgrades, IFE, WiFi service, and inflight food and beverages, and related words such as *snacks*, *wifi*, *legroom*, and *drinks* appear in the topic. LCCs need to concentrate on services related to these words to achieve better differentiation. The carry-on baggage topic also reflects the business nature of LCCs. Most LCCs try to implement strict policies regarding checked baggage, including the implementation of fees, to reduce related costs (O'Connell & Warnock-Smith, 2013). To save on travel costs, LCC travelers tend to prefer using carry-on baggage (Aldamari & Fagan, 2005).

Further divided features

Also of interest, the inflight meal service and seat topics are subdivided. For FSCs, meal services are divided into four subtopics – inflight meal (punctuality) (Topic 5), inflight drink service (Topic 7), inflight meal (menu variety) (Topic 11), and inflight meal (special demand) (Topic 21). Also for FSCs, seats are divided into five subtopics – seat comfort (space and location) (Topic 2), seat comfort (flight distance) (Topic 9), family seat request (Topic 12), seat comfort (aircraft type) (Topic 18), and seats (overall evaluation) (Topic 22). For LCCs, seats are divided into two subtopics – seat comfort (space and location) (Topic 6) and seat comfort (flight distance) (Topic 7). However, for LCCs, there is only a single subtopic for meal services – inflight meal purchase (Topic 4). The

subdivision is specifically evident for FSCs. Moreover, the subdivided topics do not match single dimensions, but are instead separated into multiple dimensions. In most of the previous studies, features related to inflight meal services and seats have belonged to tangibles. Although they mainly belong to tangibles in this study (five of nine for FSCs and two of three for LCCs), some of the topics match with empathy and reliability. This indicates that diverse aspects of customer perceptions exist with respect to quality, especially for primary service items. As such, they cannot be simply measured as belonging to tangible dimensions as they have been in previous studies. If studies are carried out using surveys, the surveys must be designed in a more sophisticated and nuanced manner to accurately reflect the diverse aspects of traveler perceptions. This is particularly true for meal services and seats. Indeed, food service is a complex mixture of multiple components, including ingredient freshness, menus, drinks, moods, employee courtesy, and so forth. The service is also affected by cultural and social factors (Aksoy, Atilgan, & Akinci, 2003).

Inflight meal services have played an important role in airline service marketing. Good meal services create a positive effect on word of mouth among customers, which serves as important information in airline selection (Heide, Grønhaug, & Engset, 1999). From this, it is reasonable to think that the importance of the meal service leads to the division into four distinctive subtopics in this study. Through words such as *short*, *quick*, *takeoff*, *welcome*, and *prior*, we see that customers recognize the punctuality of meal services. From the word distribution (*chicken*, *fruit*, *salad*, *bread*, *snack*, *beef*, and so forth) for the topic of inflight meal (menu variety), customers recognize which type of menu is served and how that menu varies throughout the service. Aksoy et al. (2003) showed that the punctuality and menu variety of inflight meals were important service measures in both foreign and domestic airline services. Laws (2005) also found that there was a more diverse demand for meals as the flight distance increased.

The inflight meal (special demand) topic differs from the inflight meal (menu variety) topic in terms of the degree of service customization. Offering a variety of items on a menu is indicative of good service, but providing customized meals for individual passengers suggests a higher level of quality. When we look at the word distribution for inflight meal (special demand), words such as *special*, *avail(able)*, *request*, and *vegetarian* appear. This indicates that FSCs should attend to customer requests. Examples include meals for passengers that have specific dietary restrictions, including vegetarians, infants, and religious adherents. Dana (1999) also asserted that airlines should provide special meals that reflect the dietary or religious needs of travelers. The inflight drink service topic seems to be recognized as a separate service by customers rather than as a part of the overall meal service. In fact, words associated with drinks are not present in the other three meal-related topics. This suggests that the importance of drink service cannot be overlooked by FSCs. For the meal-related topics in LCCs, inflight meal purchase is the only topic.

Together with the meal service, seats are another primary service item when evaluating airline service quality. Seat comfort (space and location) (Topic 2 for FSCs and Topic 6 for LCCs) is a service feature dealt with in almost every study on airline service quality (Aksoy et al., 2003; Chang & Yeh, 2002; Gilbert & Wong, 2003; Hussain, Al Nasser, & Hussain, 2015; Jiang, 2013; Ostrowski, O'Brien, & Gordon, 1993; Pakdil & Aydın, 2007; Park et al., 2005; Saha & Theingi, 2009; Tsaour et al., 2002; Young et al., 1994), and it typically has a trade-off relationship with price (Balcombe, Fraser, & Harris, 2009). Based on the measure of seat comfort with seat width and pitch, low values in terms of seat comfort are associated with increased seating capacity. This increased capacity results in lower unit operating costs, but it also reduces the level of service quality onboard (Lee & Luengo-Prado, 2004). On the other hand, LCC strategies generally rely on this idea. Because the same negative word (*uncomfort(able)*) is found in both the carriers, we see that customers are sensitive to this feature of service quality.

Looking at the words associated with the seat comfort (flight distance) topic (Topic 9 for FSCs and Topic 7 for LCCs), we can infer that customer perceptions for seat comfort are dependent on flight distance. Recently, many LCCs have tried to expand their business territories to include long haul markets (Francis et al., 2007). Therefore, LCCs need to pay special attention to seat comfort for

long-distance flights. For example, LCCs might consider the introduction of an upper class service such as premium economy (see Topic 19) to compensate for this weakness (Morrell, 2008).

Sentiment analysis

The sentiment analysis is a useful tool to elicit customer perceptions of service and new perspectives to improve service features based on customer opinions (Misopoulos et al., 2014; Wei, Chen, Yang, & Yang, 2010). An opinion can be a positive, negative, or neutral emotion or attitude from customers towards a service, product, or topic (Liu & Zhang, 2012). We employ a well-established word dictionary made by Hu and Liu (2004) to analyze sentiments. By applying the same stemming method in Appendix B to exactly match our data to the dictionary, we produce the optimal form of the dictionary to the data. To read sentiments in terms of topic level, the sentiment score of the k th topic ($k = 1 \dots K$) is calculated as (Guzman & Maalej, 2014).

$$TS_k = \sum_{n=1}^N w_{n/k} \cdot ws_n / \sum_{n=1}^N w_{n/k}$$

where ws_n has a value of +1 if the n th word in the k th topic matches with the positive word in the dictionary, a value of -1 if the n th word in the k th topic matches with the negative word in the dictionary, and a value of 0 otherwise. $w_{n/k}$ has the same definition as in Equation (1).

Similarly to Hu and Liu (2004), we obtain a sentiment score of the specific dimension by adding up the sentiment scores of topics (TS_k) that belong to the specific dimension. Then we compare the sentiment scores of the FSCs and LCCs. We briefly introduce the comparison results of sentiments within the dimension level. In terms of the total sum of sentiment scores, LCC travelers have slightly lower

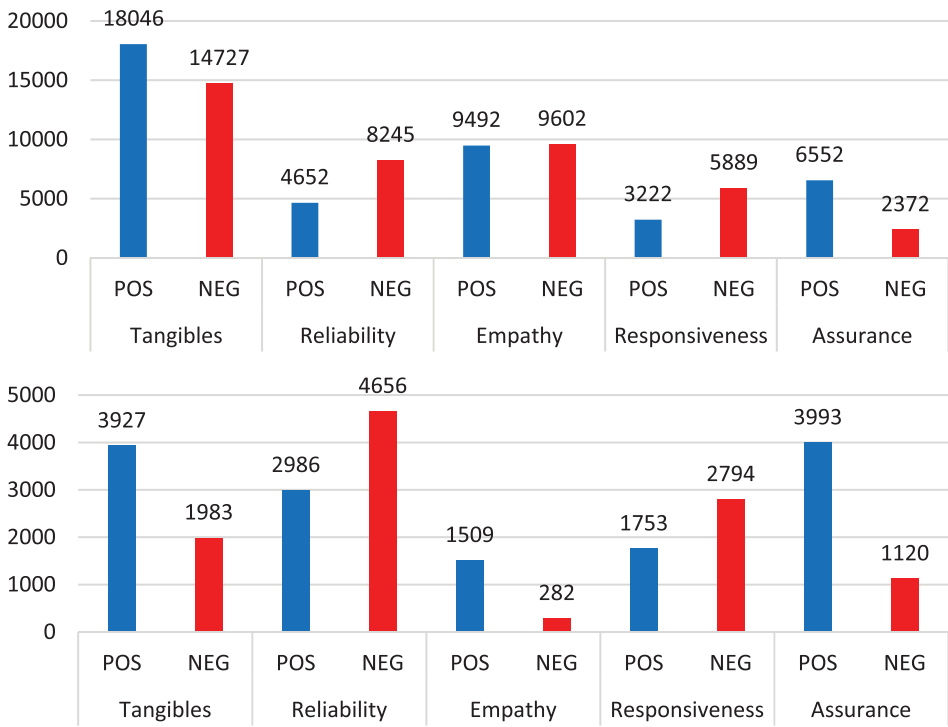


Figure 3. Sentiment score distributions without neutral scores. Top panel is for FSCs and bottom panel is for LCCs. Distributions in the topic level are available upon request from the authors.

negative perceptions of the airline service than FSC travelers. When we observe the sentiment distributions in [Figure 3](#), negative words appear more in the three dimensions of the FSCs, although there is not a large difference in empathy. In a similar vein, LCCs have two negative dimensions. Reliability and responsiveness are negatively perceived for both FSCs and LCCs. While reliability is the most significant dimension of LCCs, the dimension includes features that are likely to cause negative perceptions such as flight delay (Topic 1), punctuality (Topic 13), and change & cancelation (Topic 18). In FSCs, reliability is the second most significant dimension, and it covers negatively perceived features such as punctuality (Topics 5 and 6) and reservation including cancelation (Topic 29). This result is consistent with previous studies (Misopoulos et al., 2014; Yee Liao & Pei Tan, 2014). Such studies showed that Twitter messages regarding flight delay and cancelation received more negative sentiments. Although responsiveness has a smaller significance than reliability, its features are mainly related to waiting situations such as waiting for check-in & boarding, flight delays and employee reactions. Unless the waiting time is almost zero, it is likely to elicit negative sentiments from travelers. In contrast, tangibles and assurance are positively perceived for both FSCs and LCCs. Features regarding seats and aircraft conditions, which principally comprise the tangibles dimension, contribute to obtain positive sentiments for both types of air carriers. Assurance is composed of features of general employee quality, and positive perceptions are dominant for both types of carriers. FSCs should sharpen tangibles features to show more positive sentiments since the dimension is positively perceived and the most significant.

Conclusions

Competition between FSCs and LCCs has intensified. To determine differences in service quality, we investigated customer perceptions of quality based on the LDA topic model. As a result of the LDA modeling, we extracted 27 and 19 features of perceived service quality for FSCs and LCCs, respectively, from passenger-authored online reviews. Also we further reduced the dimensions of service quality by matching them to five dimensions for an overview. Through this, we resolved the RQ1. From the quantified comparisons, we learned that there was a reasonable difference in traveler perceptions between the FSCs and LCCs. In terms of dimension comparisons, the most significant dimensions for the FSCs and LCCs were tangibles and reliability, respectively. On the other hand, the least significant dimensions were assurance and empathy, respectively. To differentiate more specifically between services, we compared the results in terms of unique features. There were a number of unique features (15 of 27 for the FSCs and five of 19 for the LCCs) for service quality that simultaneously did not belong to either type of air carrier. We showed how each type of air carrier should focus on or improve specific features of their service to sharpen service differentiation through discussions of unique features and reviews from the literature. The conclusions were able to provide answers for RQs 2 and 3.

With respect to academic research perspectives, this also suggested that the service features in survey forms used for FSCs and LCCs, which have resembled one another thus far, needed to be modified to incorporate specific features that might be revealed in the unique topics of this study. Moreover, a couple of primary service items (inflight meal services and seats), which have typically been regarded as part of a specific dimension (tangibles), were subdivided and matched to multiple dimensions simultaneously. This finding also needs to be considered for future research designs and covers RQ4.

Using the brief analysis of sentiments to provide an answer for RQ5, we found that LCC customers generally held less negative emotions than FSC customers, although the difference was not significant. Because the reliability was negatively perceived and the most significant, it was concluded that LCCs should hone their features to avoid negative sentiments. On the contrary, FSCs need to sharpen tangibles features with respect to providing more positive sentiments since the dimension is positively perceived and the most significant.

This study is limited in that the LDA modeling itself cannot provide the causes of differentiation between FSCs and LCCs. For example, the results do not explain why such topics occur and how they are specifically related. To do this, additional investigations, including co-occurrence and trend analyses, might be employed. Through such additional analyses, we would be able to expand the knowledge regarding service quality differentiation in the air transport industry.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Juhwan Lim  <http://orcid.org/0000-0003-4110-7528>

Hyun Cheol Lee  <http://orcid.org/0000-0003-4698-065X>

References

- Aggarwal, R., & Singh, H. (2013). Differential influence of blogs across different stages of decision making: The case of venture capitalists. *MIS Quarterly*, 37(4), 1093–1112.
- Ahn, T. H., & Lee, T. J. (2011). Service quality in the airline industry: Comparison between traditional and low-cost airlines. *Tourism Analysis*, 16(5), 535–542.
- Aksoy, S., Atilgan, E., & Akinci, S. (2003). Airline services marketing by domestic and foreign firms: Differences from the customers' viewpoint. *Journal of Air Transport Management*, 9(6), 343–351.
- Aldamari, F., & Fagan, S. (2005). Impact of the adherence to the original low-cost model on the profitability of the low-cost airline. *Transport Reviews*, 25, 377–392.
- Archak, N., Ghose, A., & Ipeirotis, P. G. (2011). Deriving the pricing power of product features by mining consumer reviews. *Management Science*, 57(8), 1485–1509.
- Baker, D. M. A. (2013). Service quality and customer satisfaction in the airline industry: A comparison between legacy airlines and low-cost airlines. *American Journal of Tourism Research*, 2(1), 67–77.
- Balcombe, K., Fraser, I., & Harris, L. (2009). Consumer willingness to pay for in-flight service and comfort levels: A choice experiment. *Journal of Air Transport Management*, 15(5), 221–226.
- Bartlett, J. E., Kotlik, J. W., & Higgins, C. C. (2001). Organizational research: Determining appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal*, 19(1), 43–50.
- Baum, T. G., & Kua, J. (2004). Perspectives on the development of low cost airlines in South East Asia: Evidence from the regional press. *Current Issues in Tourism*, 7(3), 262–276.
- Berezina, K., Bilgihan, A., Cobanoglu, C., & Okumus, F. (2016). Understanding satisfied and dissatisfied hotel customers: Text mining of online hotel reviews. *Journal of Hospitality Marketing & Management*, 25(1), 1–24.
- Bhadra, D. (2009). Race to the bottom or swimming upstream: Performance analysis of US airlines. *Journal of Air Transport Management*, 15(5), 227–235.
- Bigné, E., Hernández, B., Ruiz, C., & Andreu, L. (2010). How motivation, opportunity and ability can drive online airline ticket purchases. *Journal of Air Transport Management*, 16(6), 346–349.
- Blei, D. M., & Lafferty, J. D. (2007). A correlated topic model of science. *Annals of Applied Statistics*, 1(1), 17–35.
- Blei, D. M., Ng, A. Y., & Jordan, M. I. (2003). Latent dirichlet allocation. *Journal of Machine Learning Research*, 3, 993–1022.
- Chang, Y. H., & Yeh, C. H. (2002). A survey analysis of service quality for domestic airlines. *European Journal of Operational Research*, 139(1), 166–177.
- Chiou, Y. C., & Chen, Y. H. (2010). Factors influencing the intentions of passengers regarding full service and low cost carriers: A note. *Journal of Air Transport Management*, 16(4), 226–228.
- Curras-Perez, R., & Sanchez-Garcia, I. (2016). Antecedents and consequences of consumer commitment in traditional and low-cost airlines. *Journal of Travel & Tourism Marketing*, 33(6), 899–911.
- Dana, L. P. (1999). Korean Air Lines. *British Food Journal*, 101(5/6), 365–383.
- Dellarocas, C., Zhang, X. M., & Awad, N. F. (2007). Exploring the value of online product reviews in forecasting sales: The case of motion pictures. *Journal of Interactive Marketing*, 21(4), 23–45.
- Dennis, N. (2007). End of the free lunch? The responses of traditional European airlines to the low-cost carrier threat. *Journal of Air Transport Management*, 13(5), 311–321.
- Dennis, N. (2010, October). *Old conflicts, new rivals? Airline competition in the European market*. Proceedings European transport Conference 2010.
- DiMaggio, P., Nag, M., & Blei, D. (2013). Exploiting affinities between topic modeling and the sociological perspective on culture: Application to newspaper coverage of US government arts funding. *Poetics*, 41(6), 570–606.

- Doganis, R. (2006). *The airline business* (2nd ed.). London: Routledge.
- Duan, W., Gu, B., & Whinston, A. B. (2008). Do online reviews matter?—An empirical investigation of panel data. *Decision Support Systems*, 45(4), 1007–1016.
- Fick, G. R., & Brent Ritchie, J. R. (1991). Measuring service quality in the travel and tourism industry. *Journal of Travel Research*, 30(2), 2–9.
- Fourie, C., & Lubbe, B. (2006). Determinants of selection of full-service airlines and low-cost carriers—A note on business travellers in South Africa. *Journal of Air Transport Management*, 12(2), 98–102.
- Francis, G., Dennis, N., Ison, S., & Humphreys, I. (2007). The transferability of the low-cost model to long-haul airline operations. *Tourism Management*, 28(2), 391–398.
- Gilbert, D., & Wong, R. K. (2003). Passenger expectations and airline services: A Hong Kong based study. *Tourism Management*, 24(5), 519–532.
- Gillen, D., & Morrison, W. (2003). Bundling, integration and the delivered price of air travel—Are low cost carriers full service competitors. *Journal of Air Transport Management*, 9(1), 15–23.
- Gitto, S., & Mancuso, P. (2017). Improving airport services using sentiment analysis of the websites. *Tourism Management Perspectives*, 22, 132–136.
- Gitto, S., & Mancuso, P. (2019). Brand perceptions of airports using social networks. *Journal of Air Transport Management*, 75, 153–163.
- Godes, D., & Mayzlin, D. (2004). Using online conversations to study word-of-mouth communication. *Marketing Science*, 23(4), 545–560.
- Gourdin, K. N., & Kloppenborg, T. J. (1991). Identifying service gaps in commercial air travel: The first step toward quality improvement. *Transportation Journal*, 31(1), 22–30.
- Guo, Y., Barnes, S. J., & Jia, Q. (2017). Mining meaning from online ratings and reviews: Tourist satisfaction analysis using latent dirichlet allocation. *Tourism Management*, 59, 467–483.
- Guzman, E., & Maalej, W. (2014, August). *How do users like this feature? A fine grained sentiment analysis of app reviews*. Proceedings of 2014 IEEE 22nd International Requirements Engineering Conference.
- Han, H., & Hwang, J. (2017). In-flight physical surroundings: Quality, satisfaction, and traveller loyalty in the emerging low-cost flight market. *Current Issues in Tourism*, 20(13), 1336–1354.
- Heide, M., Grønhaug, K., & Engset, M. G. (1999). Industry specific measurement of consumer satisfaction: Experiences from the business travelling industry. *International Journal of Hospitality Management*, 18(2), 201–213.
- Hu, M., & Liu, B. (2004, August). *Mining and summarizing customer reviews*. Proceedings of the 10th ACM SIGKDD international conference on Knowledge Discovery and Data Mining.
- Humphreys, A., & Wang, R. J. H. (2017). Automated text analysis for consumer research. *Journal of Consumer Research*, 44(6), 1274–1306.
- Hunter, L. (2006). Low cost airlines- business model and employment relations. *European Management Journal*, 24(5), 315–321.
- Hussain, R., Al Nasser, A., & Hussain, Y. K. (2015). Service quality and customer satisfaction of a UAE-based airline: An empirical investigation. *Journal of Air Transport Management*, 42, 167–175.
- Jiang, H. (2013). Service quality of low-cost long-haul airlines—The case of Jetstar Airways and AirAsia X. *Journal of Air Transport Management*, 26, 20–24.
- Kappes, J. W., & Merkert, R. (2013). Barriers to entry into European aviation markets revisited: A review and analysis of managerial perceptions. *Transportation Research Part E: Logistics and Transportation Review*, 57, 58–69.
- Kim, Y. K., & Lee, H. R. (2011). Customer satisfaction using low cost carriers. *Tourism Management*, 32(2), 235–243.
- Koklic, M. K., Kukar-Kinney, M., & Vegelj, S. (2017). An investigation of customer satisfaction with low-cost and full-service airline companies. *Journal of Business Research*, 80, 188–196.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques* (2nd ed.). New Delhi: New Age International.
- Laws, E. (2005). Managing passenger satisfaction: Some quality issues in airline meal service. *Journal of Quality Assurance in Hospitality & Tourism*, 6(1–2), 89–113.
- Lee, C. K. M., Ng, K. K. H., Chan, H. K., Choy, K. L., Tai, W. C., & Choi, L. S. (2018). A multi-group analysis of social media engagement and loyalty constructs between full-service and low-cost carriers in Hong Kong. *Journal of Air Transport Management*, 73, 46–57.
- Lee, D., & Luengo-Prado, M. J. (2004). Are passengers willing to pay more for additional legroom? *Journal of Air Transport Management*, 10(6), 377–383.
- Lee, G. G., & Lin, H. F. (2005). Customer perceptions of e-service quality in online shopping. *International Journal of Retail & Distribution Management*, 33(2), 161–176.
- Lee, K., & Yu, C. (2018). Assessment of airport service quality: A complementary approach to measure perceived service quality based on Google reviews. *Journal of Air Transport Management*, 71, 28–44.
- Lee, T. Y., & Bradlow, E. T. (2011). Automated marketing research using online customer reviews. *Journal of Marketing Research*, 48(5), 881–894.
- Liou, J. J., Tsai, C. Y., Lin, R. H., & Tzeng, G. H. (2011). A modified VIKOR multiple-criteria decision method for improving domestic airlines service quality. *Journal of Air Transport Management*, 17(2), 57–61.

- Liu, B., & Zhang, L. (2012). A survey of opinion mining and sentiment analysis. In C. C. Aggarwal & C. Zhai (Eds.), *Mining text data* (pp. 415–463). New York, NY: Springer.
- Mankad, S., Han, H. S., Goh, J., & Gavirneni, S. (2016). Understanding online hotel reviews through automated text analysis. *Service Science*, 8(2), 124–138.
- Martin-Domingo, L., Martín, J. C., & Mandsberg, G. (2019). Social media as a resource for sentiment analysis of Airport Service Quality (ASQ). *Journal of Air Transport Management*. doi:10.1016/j.jairtraman.2019.01.004
- Martinez-Garcia, E., & Royo-Vela, M. (2010). Segmentation of low-cost flights users at secondary airports. *Journal of Air Transport Management*, 16(4), 234–237.
- Meyer, D., Hornik, K., & Feinerer, I. (2008). Text mining infrastructure in R. *Journal of Statistical Software*, 25(5), 1–54.
- Miguéis, V. L., & Nóvoa, H. (2017). Exploring online travel reviews using data analytics: An exploratory study. *Service Science*, 9(4), 315–323.
- Misopoulos, F., Mitic, M., Kapoulas, A., & Karapiperis, C. (2014). Uncovering customer service experiences with Twitter: The case of airline industry. *Management Decision*, 52(4), 705–723.
- Morrell, P. (2008). Can long-haul low-cost airlines be successful? *Research in Transportation Economics*, 24(1), 61–67.
- Mudambi, S. M., & Schuff, D. (2010). What makes a helpful review? A study of customer reviews on Amazon. Com. *MIS Quarterly*, 34(1), 185–200.
- O'Connell, J. F., & Warnock-Smith, D. (2013). An investigation into traveler preferences and acceptance levels of airline ancillary revenues. *Journal of Air Transport Management*, 33, 12–21.
- O'Connell, J. F., & Williams, G. (2005). Passengers' perceptions of low cost airlines and full service carriers: A case study involving Ryanair, Aer Lingus, Air Asia and Malaysia Airlines. *Journal of Air Transport Management*, 11(4), 259–272.
- O'Connor, P. (2010). Managing a hotel's image on tripadvisor. *Journal of Hospitality Marketing & Management*, 19(7), 754–772.
- Ostrowski, P. L., O'Brien, T. V., & Gordon, G. L. (1993). Service quality and customer loyalty in the commercial airline industry. *Journal of Travel Research*, 32(2), 16–24.
- Pakdil, F., & Aydin, Ö. (2007). Expectations and perceptions in airline services: An analysis using weighted SERVQUAL scores. *Journal of Air Transport Management*, 13(4), 229–237.
- Palese, B., & Piccoli, G. (2016). *Online reviews as a measure of service quality*. Proceedings of Pre-ICIS SIGDSA/IFIP WG.
- Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). SERVQUAL: A multiple-item scale for measuring Consumer perceptions of service quality. *Journal of Retailing*, 64(1), 12–40.
- Park, J. W., Robertson, R., & Wu, C. L. (2004). The effect of airline service quality on passengers' behavioural intentions: A Korean case study. *Journal of Air Transport Management*, 10(6), 435–439.
- Park, J. W., Robertson, R., & Wu, C. L. (2005). Investigating the effects of airline service quality on airline image and passengers' future behavioural intentions: Findings from Australian international air passengers. *Journal of Tourism Studies*, 16(1), 2–11.
- Rajaguru, R. (2016). Role of value for money and service quality on behavioural intention: A study of full service and low cost airlines. *Journal of Air Transport Management*, 53, 114–122.
- Saha, G. C., & Theingi. (2009). Service quality, satisfaction, and behavioural intentions: A study of low-cost airline carriers in Thailand. *Managing Service Quality: An International Journal*, 19(3), 350–372.
- Seo, K., Moon, J., & Lee, S. (2015). Synergy of corporate social responsibility and service quality for airlines: The moderating role of carrier type. *Journal of Air Transport Management*, 47, 126–134.
- Steyvers, M., & Griffiths, T. (2007). Probabilistic topic models. In T. K. McNamara, D. S. Dennis, & W. Kintsch (Eds.), *Handbook of latent semantic analysis: A road to meaning* (pp. 424–440). Mahwah, NJ: Lawrence Erlbaum Associates.
- Tsaur, S. H., Chang, T. Y., & Yen, C. H. (2002). The evaluation of airline service quality by fuzzy MCDM. *Tourism Management*, 23(2), 107–115.
- Wei, C. P., Chen, Y. M., Yang, C. S., & Yang, C. C. (2010). Understanding what concerns consumers: A semantic approach to product feature extraction from consumer reviews. *Information Systems and E-Business Management*, 8(2), 149–167.
- Wei, X., & Croft, W. B. (2006, August). *LDA-based document models for ad-hoc retrieval*. Proceedings of the 29th annual international ACM SIGIR conference on Research and Development in Information Retrieval (pp. 178–185). ACM.
- Wittman, M. D. (2014). Are low-cost carrier passengers less likely to complain about service quality? *Journal of Air Transport Management*, 35, 64–71.
- Yee Liao, B., & Pei Tan, P. (2014). Gaining customer knowledge in low cost airlines through text mining. *Industrial Management & Data Systems*, 114(9), 1344–1359.
- Young, C., Cunningham, L., & Lee, M. (1994). Assessing service quality as an effective management tool: The case of the airline industry. *Journal of Marketing Theory and Practice*, 2(2), 76–97.
- Yu, J., Zha, Z. J., Wang, M., & Chua, T. S. (2011, June). *Aspect ranking: Identifying important product aspects from online consumer reviews*. Proceedings of the 49th Annual Meeting of the Association for Computational Linguistics.
- Zhang, C., Lin, Y. H., & Newman, D. G. (2016). Investigating the effectiveness of repositioning strategies: The customers' perspective. *Journal of Travel & Tourism Marketing*, 33(9), 1235–1250.
- Zhang, K., Narayanan, R., & Choudhary, A. (2010). *Voice of the customers: Mining online customer reviews for product feature-based ranking*. Proceedings of the 3rd workshop on Online Social Networks.