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A hierarchical model of service quality in the airline industry

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ABSTRACT

The purpose of this study is to enhance understanding of service quality in the airline industry by developing a conceptual framework and measurement scale. Based on an extensive literature review, qualitative and empirical research, a hierarchical model of service quality for the airline industry is proposed. Analysis of data from 544 passengers indicates that the proposed model fits the data well. Reliability and validity of the measurement scale are established using a pilot test and the substantive survey. This study extends the literature on service quality in the fields of transportation management by providing a comprehensive framework and measurement scale. Theoretical and managerial implications are discussed.

Air travel demand is closely associated with the economic status of a country. For example, due to rapid industrialization in a number of countries throughout the world, air travel demand has recently been growing very rapidly (Jou, Lam, Kuo, & Chen, 2008). According to Chen (2008), to provide passengers with high quality of service is the core competitive advantage for an airline's profitability and sustained development in highly competitive circumstances. This implies that promoting service quality has played a key role in generating profits (Zeithaml, Berry, & Parasuraman, 1996). According to Mustafa, Fong, Lim, and Hamid (2005), the most important factor is the improvement of service quality to their passengers. Therefore, to provide superior service quality has been considered to be the priority for all airlines to remain competitive (Mustafa et al., 2005). Service competition and sophisticated passenger expectations are related to integrated service quality in the airline industry. Likewise, service quality has been increasingly viewed as a competitive marketing strategy revolving around customer focus, innovation, creative service and striving towards service excellence in the airline industry (Andotra, Gupta, & Pooja, 2008). Despite being homogeneous, airline services have been generally characterized by customer segmentation, customized services, guarantees, continuous customer feedback and comprehensive measurement of company performance (Albrecht, 1992) and its variants are being used by suppliers to gain a competitive edge in the market place. Flight scheduling, ticket prices, in-flight services, employees' attitudes, facilities and ticketing procedures have not played key roles in determining airline service quality and influencing passengers' choice of airlines (Andotra et al., 2008).

It is important not only to understand how passengers evaluate the integrated service process, but also to identify the critical primary and sub dimensions with which to measure integrated service quality in the airline industry. To define and measure the quality of service is important to air service providers (Robledo, 2001). Park, Robertson, and Wu (2004) indicate that many airlines have difficulty in using a proper scale to evaluate service quality in order to appropriately assess and improve their service performance. In addition, Park, Robertson, and Wu (2004, 2006) show that few studies focus on the measurement of passengers' perceptions of airline service quality after the literature is reviewed. Therefore, it is necessary to develop a reliable and valid instrument to determine which aspects of a particular service define its quality. The proposed instrument incorporates performance-based measures on the basis of scales developed by Dabholkar, Thorpe, & Rentz's (1996) and Brady and Cronin's (2001) studies.

The purposes of this study are twofold: (a) to propose a conceptual model of service quality in the airline industry, and (b) to test the psychometric properties of the proposed model by developing a scale for measuring service quality in the airline industry. This study may fill the conceptual void existing in the airline industry by offering a comprehensive and industry-specific model of service quality. The accompanying measurement instrument represents a valid and reliable tool for assessing service quality in the

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airline industry. The study thus aids future research by providing a foundation for further investigation regarding perceived service quality and a practical assessment tool for evaluating airline service quality.

1. Literature review

1.1. Measurement of service quality

Service quality has been studied in business management for a long time (Martinez Caro & Martinez Garcia, 2007). Parasuraman, Zeithaml, and Berry (1988) define service quality as a function of the difference between service expectations and customers' perceptions of the actual service delivered. Zeithaml et al. (1996) indicate that a better understanding of what customers expect has been the most crucial step in defining and delivering high service quality. Service quality is therefore an enduring construct that encompasses quality performance in all activities undertaken by management and employees (Prayag, 2007).

SERVQUAL has been identified as a framework of service quality. The SEFVQUAL scale has been widely applied by both academics and practicing managers across industries in different countries. Parasuraman, Zeithaml, and Berry (1985) propose 10 dimensions of service quality: tangibles, reliability, responsiveness, understanding the customers, access, communication, credibility, security, competence and courtesy. Later, Parasuraman et al. (1988) reduce the original 10 dimensions to five (tangibles, reliability, responsiveness, assurance and empathy), resulting in the widely used instrument known as SERVQUAL.

The SERVQUAL scale has been applied to the airline industry (Gilbert & Wong, 2003; Nel, Pitt, & Berthon, 1997; Park et al., 2004). However, this scale has been highly criticized. Several researchers (Bitner, 1990; Bolton & Drew, 1991; Cronin & Taylor, 1992, 1994) consider SERVQUAL to be paradigmatically flawed because of its ill-judged adoption of this disconfirmation model, which is based on the disconfirmation paradigm. Through the disconfirmation paradigm, customers evaluate a service by comparing their perceptions of the service received with their expectations (Robledo, 2001). Park et al. (2006) note that five dimensions and 22 item scales in the measurement of SERVQUAL are difficult to apply to the airline industry because this scale has not addressed other important aspects of airline service quality, such as in-flight meals, seating comfort, seat space and leg room. Fick and Ritchie (1991) use the SERVQUAL scale to measure customers' perceptions of service quality within several service industries including the airline industry. However, they report the mean scores of consumer expectation and perception of service performance measures, and fail to determine the relative impact of various SERVQUAL items on overall service quality and satisfaction. To discover the relative importance of individual SERVQUAL items, they perform further analysis of their data using multivariate statistical techniques.

A performance-based model of service quality (SERVPERF) was developed by Cronin and Taylor (1992). SERVPERF measures service quality based only on customers' perceptions of the performance of a service provider (Cronin & Taylor, 1994). In general, SERVPERF has been proven to be applicable and useful in measuring service quality in the airline industry. However, there are certain limitations in this measure. One limitation, on the basis of Parasuraman et al.'s (1988) study, is that quality is an enduring global attitude towards a service but SERVPERF measures satisfaction related to a specific transaction. Another limitation concerns the generic nature of the SERVPERF scale (Ostrowski, O'Brien, & Gordon, 1993). Although this measure is generic enough to be applied to measure perceived quality of various services, it has failed to capture industry-specific dimensions underlying passengers' perceptions of quality in the airline industry (Cunningham, Young, & Lee, 2004).

According to Robledo (2001), SERVPEX measures disconfirmation in a single questionnaire. Similarly, Ling, Lin, and Lu (2005) identify SERVPEX as the measurement scale to define airline service quality. This measure incorporates expectations and perceptions into a single scale, ranging from much worse than expected to much better than expected. According to Robledo (2001), SERVPEX includes three dimensions: tangibles, reliability and customer care. Lu and Ling (2008) note that this measure is more easily understood by passengers evaluating airline service quality according to their experiences and expectations. In general, SERVPEX performs clearly better than SERVQUAL and SERVPERF in terms of its validity and reliability (Robledo, 2001). This measure provides a more valid explanation of service quality because of its predictive validity. In addition, SERVPEX explains a higher proportion of the variation of the service quality variable than SERVQUAL and SERVPERF (Robledo, 2001). Robledo (2001) concludes that overall SERVPEX provides the most appropriate results for the airline industry. However, no substantive difference exists between SERVPEX and SERVQUAL (Lee, Kim, Hemmington, & Yun, 2004). Alternatively, Dabholkar, Shepherd, and Thorpe (2000) indicate that SERVPEX is superior to SERVQUAL but inferior to SERVPERF, according to their data analysis.

Several studies have identified that the existing measurement of service quality through the SERVQUAL, SERVPERF and SERVPEX scales is insufficiently comprehensive to capture the service quality construct in the air transport sector (Cunningham et al., 2004; Dabholkar et al., 2000; Lee et al., 2004; Park et al., 2006). It is therefore important to re-examine the dimensions of service quality within the air transport sector. Several researchers suggest that service quality should be based on a hierarchical concept (Brady & Cronin, 2001; Clemes, Gan, & Kao, 2007; Clemes, Wu, Hu, & Gan, 2009; Clemes, Brush, & Collins, 2011; Clemes, Gan, & Ren, 2011; Dabholkar et al., 1996; Ko & Pastore, 2005; Wu, Lin, & Hsu, 2011; Wu & Hsu, 2012a, b). Accordingly, in light of the gaps associated with the aforementioned scales, the purpose of this study is to present and empirically test a hierarchical model which incorporates the specific characteristics of the airline industry.

1.2. Proposed factor structure for airline services

To combine our findings from the qualitative research (i.e., focus group interviews) and an extensive literature review on airline services, the hierarchical model of airline service quality is summarized in Fig. 1. Service quality is the overall dimension consisting of four primary dimensions: interaction quality, physical environment quality, outcome quality and access quality. The four primary dimensions are consistent with previous research (Brady & Cronin, 2001; Chen, Lee, Chen, & Huang, 2011; Rust & Oliver, 1994). Each primary dimension has its own sub-dimensions. Following Brady and Cronin (2001), they are conduct, expertise and problem-solving for interaction quality; cleanliness, comfort, tangibles, and safety & security for physical environment quality; valence and waiting time for outcome quality, and information and convenience for access quality. The primary and sub dimensions are now explained.

The first dimension, interaction quality, is referred to as the interpersonal interface between service providers and customers taking place during service delivery (Brady & Cronin, 2001). This dimension mainly reflects the quality of a passenger's interaction with the service providers. Several studies have indicated the importance of the interaction quality dimension in the delivery of services and have identified this dimension as the one that has the most significant effect on service quality perceptions (Bigné,

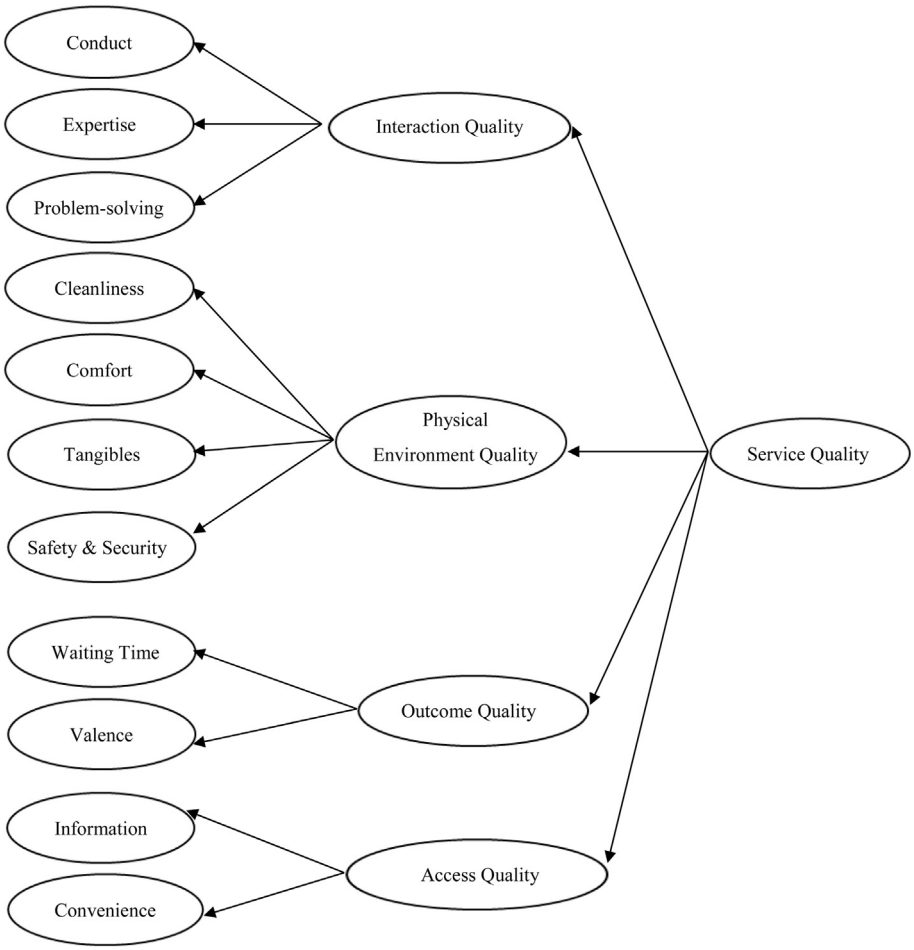

Fig. 1. A proposed hierarchical model of service quality.

Martínez, Miquel, & Belloch, 1996; Grönroos, 1982). Based on the literature review and qualitative analysis of airline services, interaction quality consists of such sub-dimensions as attitude, behavior, expertise and problem-solving. Several sub-dimensions in the proposed model help to define interaction quality: (a) conduct (Martinez Caro & Martinez Garcia, 2007, 2008); (b) expertise (Brady & Cronin, 2001); and (c) problem-solving (Dabholkar et al., 1996). The first sub-dimension, conduct, includes the meanings of attitude and behavior. Attitude is referred to as an individual's feeling of favorableness or unfavorableness through his/her behavioral performance (Lam, Cho, & Qu, 2007). This dimension plays a key role in customer satisfaction because there is a close interaction between customers and employees in the service industry (Martinez Caro & Martinez Garcia, 2008). The second sub-dimension, expertise, has been identified as the degree to which the interaction is affected by the employee's task-oriented skills (Czepiel, Solomon, & Suprenant, 1985). Crosby, Evans, and Cowles (1990) find that expertise has an effect on customers' assessment of service quality. The last sub-dimension, problem-solving, is a dimension identified by Dabholkar et al. (1996). However, this sub-dimension has been regarded as being separable from the personal interaction dimension because "service recovery has been identified as a critical part of good service" (Dabholkar et al., 1996, p. 7).

The second primary dimension of service quality, physical environment quality, has been specifically investigated since the beginning of the 1970s (Kotler, 1973) for its environmental influences on customer behavior. Elliott, Hall, and Stiles (1992) refer to physical environment quality as the physical features of the service production process. Several researchers have found that physical environment quality is one of the most important aspects in customer evaluation of service quality (McDougall & Levesque, 1994; Rust & Oliver, 1994). Physical environment quality has four specific attributes or sub-dimensions: (a) cleanliness (Lockyer, 2002, 2003); (b) comfort (Clemes, Gan, Kao, & Choong, 2008); (c) tangibles (Ostrowski, O'Brien, & Gordon, 1994); and (d) safety & security (Clemes et al., 2008, 2009). The first sub-dimension, cleanliness, has been identified as one of the most important factors and features that airlines can provide to their passengers (Aksoy, Atilgan, & Akinci, 2003). The second sub-dimension, comfort, is one of the most critical elements of physical environment quality in the airline industry (Chang & Yeh, 2002). The third sub-dimension, tangibles, is what customers use as tangible evidence of the service outcome as a proxy for judging performance (Zeithaml, Parasuraman, & Berry, 1985). Parasuraman et al. (1985) indicate that tangible evidence is a factor that service customers consider when forming their perceptions of quality. The last sub-dimension, safety & security, has provoked intense debate over issues as basic as the definition of safety & security quality itself and as complex as the relationship between safety and financial performance in the airline industry (Rhoades, Reynolds, Waguespack, & Williams, 2005). Bitner (1990) suggests that some passengers consider airline travel threatening and, to those passengers, boarding an airplane is a life-and-death issue. Therefore, safety & security needs have been considered critical.

The third primary dimension, outcome quality, focuses on the outcome of the service act and indicates what customers gain from the service; in other words, whether the outcome quality satisfies customers' needs and wants (McDougall & Levesque, 1994; Rust & Oliver, 1994). Several studies have indicated that the outcome quality component of service quality has been a determinant of the overall service quality assessed by customers, and the addition of outcome quality to the model or measurement scale can improve the predictive validity and explanatory power (Mangold & Babakus, 1991; Powpaka, 1996). In general, important outcome gains can be categorized as: (a) valence (Martinez Caro & Martinez Garcia, 2007); and (b) waiting time (Martinez Caro & Martinez Garcia, 2007). The first sub-dimension, valence, implies customers' post-consumption assessments of whether the service outcome is acceptable (Ko & Pastore, 2005). Regardless of customer evaluations of any other aspects of the experience, valence focuses mainly on the attributes dominating whether customers accept the service outcome or not (Brady & Cronin, 2001). Therefore, several researchers have found that valence is a key determinant of service outcome (Brady & Cronin, 2001; Ko & Pastore, 2005; Martinez Caro & Martinez Garcia, 2007). The last sub-dimension, waiting time, has been identified as an integral part of customers' overall evaluation (Parasuraman et al., 1985). This sub-dimension predicts a positive relationship; more favorable perceptions of waiting time are associated with enhanced perceptions of outcome quality (Brady & Cronin, 2001; Taylor & Claxton, 1994).

The last primary dimension, access quality, refers to the ease and speed with which people reach their desired locations (Shonk & Chelladurai, 2008). Parasuraman et al. (1985) indicate that access quality is one of the important attributes of service quality. Access quality is based on two specific attributes or sub-dimensions: (a) information (Wu et al., 2011); and (b) convenience (Chen et al., 2011). The first sub-dimension, information, is one factor contributing to the quality of public transport (Grotenhuis, Wiegmans, & Rietveld, 2007) and has been identified as a sub-dimension of service quality (Martinez Caro & Martinez Garcia, 2007). Likewise, Howat, Absher, Crilley, and Miline (1996) refer to information as the feasibility of obtaining up-to-date information about service variety. In the transport service, customers hardly visit the physical establishments. Therefore, the only way of easily and comfortably knowing about the variety of the product or service of an organization is applied using the phone or internet (Dabholkar et al., 1996). The second sub-dimension, convenience, is based on something that is intended to save resources (i.e., time, energy) or frustration. Clemes, Gan, et al. (2011) indicate that convenience is one important component of service quality in the airline industry. However, Xie, Peng, and Shen (2010) note that research surrounding convenience remains scant.

2. Methodology

The literature has not identified scales measuring passengers' actual perceptions of service quality in the airline industry. Accordingly, there was no psychometrically sound scale that we could use. It was therefore deemed valuable to develop a measurement instrument, in accordance with the procedure for scale development suggested by Churchill (1979).

2.1. Scale development

In the light of the criticisms of SERVQUAL, SERVPERF and SERVPEX, several studies have identified that those scales can capture passengers' overall evaluations of airline service quality as a separate and multi-item construct (Buttle, 1996; Cunningham et al., 2004; Dabholkar et al., 2000; Park et al., 2006). Using a multi-dimensional model of service quality based on a hierarchical structure may overcome some of the weaknesses of the traditional SERVQUAL, SERVPERF and SERVPEX measures (Cronin & Taylor, 1992), providing a more accurate method for assessing service quality in the airline industry. Thus, we adopted a multi-dimensional and hierarchical model to measure the passengers' perceptions of service quality in the airline industry. Through this model, we can account for the complexity of the progress of the passengers' perceptions better than previous conceptualizations (Brady & Cronin, 2001; Martinez Caro & Martinez Garcia, 2007). In developing the hierarchical scale, the first step in the procedure for developing better measures, involved specifying the domain of the construct. In this step, we needed to follow the widely used scale development procedure.

According to Churchill (1979), the procedure of specifying the domain of the construct should be conducted through a literature search, generation of scale items and scale purification, data collection, assessment of reliability and validity, and norm development. Therefore, we employed the hierarchical method because service quality has been viewed as a higher-order construct composed of four primary dimensions, each with its own sub-dimensions. We obtained the measurement scales of all dimensions through the procedures suggested by Churchill (1979).

2.2. Qualitative research

Chumpitaz and Swaen (2002) indicate that the number and nature of service quality dimensions are in direct relation to the service under analysis. To accomplish this, therefore, qualitative research was applied to identify the factors determining passengers' perceptions of airline service quality. Hoppe, Wells, Morrison, Gilmore, and Wilsdon (1995) indicate that a focus group study can help to develop questions or concepts for questionnaires and interview guides. In addition, a focus group interview is an inexpensive and rapid appraisal approach to providing managers with a wealth of qualitative information on performance of development activities, services, and products, or other issues. According to The U.S. Agency for International Development (1996), each focus group should comprise 7 to 11 people who are allowed to have a smooth flow of conversation. The qualitative research was conducted to provide additional insights into the proposed dimensions. In order to obtain in-depth information, we conducted two focus groups. The first group was composed of 7–11 college students who had used airline services recently. The second group was composed of 7–11 passengers who had different travel experiences and demographic features in terms of seat class, usage frequency, age, sex, and occupation. The members of the second focus group were required to have used airline services during the past 12 months. During the in-depth interviews, participants were encouraged to discuss the subject among themselves by sharing their views and thoughts. The views from the in-depth interviews and focus group interviews resulted in an extensive list of attributes of airline service quality.

Using content analysis, we processed the responses as follows. First, 11 sub-dimensions were identified by examining the responses, coding the sentences based on their frequency, and classifying similar sentences into the same dimension. Second, we identified primary dimensions. As suggested by several researchers (Brady & Cronin, 2001; Martinez Caro & Martinez Garcia, 2007; Wu & Ko, 2013), four independent trained coders were selected to analyze the qualitative data. The sub-dimensions were then categorized into the four primary dimensions according to their meanings. Finally, four primary dimensions and 11 sub-dimensions were identified in the hierarchical model of airline service quality. Like Dabholkar et al. (1996) and Brady and Cronin (2001), we

eliminated price from the list of investigated factors because price is generally seen as a determinant of service value as suggested by Zeithaml, Berry, and Parasuraman (1988) and Chang and Wildt (1994) rather than service quality.

2.3. Generation of scale items and initial scale purification

The items were developed by adopting items from existing scales (e.g., Brady & Cronin, 2001; Dabholkar et al., 1996; Parasuraman et al., 1988; Shonk & Chelladurai, 2008). On the basis of the literature review, we generated an initial pool of 57 items using performance-only measurement scales. These items were indicators of each theoretical sub-dimension. A seven-point Likert-type scale was adopted, ranging from strongly disagree (1) to strongly agree (7).

Purification of the scale was conducted in two steps. The first step consisted of an assessment of content and face validity through a panel of experts and a field test (Ko & Pastore, 2005). The panel members were 10 airline executives and six academics from the department of air transport management in higher education institutions. They assessed the items on the basis of their relevance and clarity of wording. Items endorsed by 16 experts were retained, whereas items deemed to be unclear, irrelevant, or redundant were eliminated. As a result of this panel, 12 items were dropped.

In the second step, we developed a questionnaire using the 45 remaining items. This questionnaire was pilot-tested using a convenience sample of 120 people who had used airline services during the past 12 months. The respondents were required to examine the items for relevance and clarity. The aim of doing this was to study the correlation structure of the items of each sub-dimension. According to Parasuraman et al. (1988), the purification of the instrument begins with the computation of Cronbach's alpha coefficient of reliability, item-to-total correlations and exploratory factor analysis (EFA) for the 11 sub-dimensions. Subsequently, we examined the dimensionality of the scale in order to prove the factor patterns that emerged were independent of one another. Based on the results of the pilot test, eight additional items were dropped or reworded. Following these scale-purification procedures, the final version of the instrument had a total of 37 items representing 11 sub-dimensions of airline service quality (with each sub-dimension having 3–6 items, see Table 1).

3. Data collection

A sample size of at least 382 respondents was considered adequate because this provides a 95% confidence level. This determined sample size exceeded the observation/variable ratio of 10, which reduced the influence of the statistical assumptions associated with ANOVA (Winer, 1962). After the pilot test procedures were conducted, a personalized cover letter explaining the purpose of the study, the voluntary nature of participation, and an assurance about the confidentiality of the responses, the questionnaire was distributed to 600 passengers at Taiwan Taoyuan International Airport between January 15 and March 15, 2012. The data were collected using the convenience sampling method,

Table 1
Standardized factor loadings, average variance extracted (AVE) and composite reliability (CR).

Factor	Items	Standardized factor loadings	AVE	CR
Conduct	1. The employee attitude of airlines demonstrates their willingness to help me.	0.83	0.671	0.924
($\alpha = 0.92$)	2. I can depend on the airline employees being friendly.	0.82		
	3. The employee attitude of airlines shows me that they understand my needs.	0.78		
	4. The employee behavior of airlines allows me to trust their services.	0.88		
	5. The airline employees always provide the best service for me.	0.80		
	6. I can rely on the airline employees taking actions to satisfy my needs.	0.80		
Expertise	7. The airline employees understand that I rely on their professional knowledge to satisfy my needs.	0.92	0.787	0.917
($\alpha = 0.92$)	8. I can count on the airline employees knowing their jobs/responsibilities.	0.87		
	9. The airline employees are competent.	0.87		
Problem-solving	10. When I have a problem, the airline employees show a sincere interest in solving it.	0.86	0.740	0.895
($\alpha = 0.89$)	11. The airline employees understand the importance of resolving my complaints.	0.88		
	12. The airline employees are able to handle my complaints directly and immediately.	0.84		
Cleanliness	13. The toilet in the cabin is clean.	0.79	0.681	0.864
($\alpha = 0.85$)	14. The cabin is clean.	0.90		
	15. The airline check-in and check-out counters are clean.	0.78		
Comfort	16. Flying an airplane is safe and comfortable.	0.77	0.553	0.788
($\alpha = 0.78$)	17. The seat in the cabin is comfortable.	0.75		
	18. I feel comfortable with the actual temperature in the cabin.	0.71		
Tangibles	19. The on-site queuing at the airport is understanding and predictable.	0.70	0.636	0.874
($\alpha = 0.80$)	20. I feel comfortable with the volume of noise in the cabin.	0.78		
	21. The layout of airlines serves my needs.	0.86		
	22. The airline's facility is well designed.	0.84		
Safety & security	23. There are accessible fire exits in the cabin.	0.83	0.591	0.812
($\alpha = 0.68$)	24. There are noticeable sprinkler systems in the cabin.	0.78		
	25. There is a secure safe in the cabin.	0.69		
Valence	26. I believe that the airline tries to give me what I want.	0.76	0.703	0.876
($\alpha = 0.88$)	27. I would say that I feel good about what I receive from airlines.	0.89		
	28. I would evaluate the outcome of airline services favorably.	0.86		
Waiting time	29. The airline tries to minimize my waiting time.	0.85	0.711	0.881
($\alpha = 0.88$)	30. The airline understands that waiting time is important to me.	0.85		
	31. I rarely have to wait long to receive the airline service.	0.83		
Information	32. I can count on the information that the airline provides.	0.81	0.741	0.895
($\alpha = 0.89$)	33. The airline tells me the accurate time on which it provides service.	0.87		
	34. The airline understands the information that passengers need.	0.90		
Convenience	35. The reservation and ticketing systems are convenient.	0.75	0.642	0.843
($\alpha = 0.85$)	36. The airline provides me with convenient flight schedules.	0.85		
	37. I can have a convenient access to the airport by transportation.	0.80		

Note. AVE = Average variance extracted; CR = Composite reliability.

Table 2
Descriptive statistics of the respondents to the survey conducted at Taiwan Taoyuan international airport.

Measure	Option	Frequency	Percentage
Gender	Male	294	54.0
	Female	250	46.0
Age	18–25	169	31.1
	26–35	197	36.2
	36–45	81	14.9
	46–55	55	10.1
	56–65	32	5.9
	66 or over	10	1.8
Marital status	Single	187	34.4
	Married	221	40.6
	Living with a partner	45	8.3
	Divorced	33	6.1
	Widow	40	7.4
	Widower	18	3.3
Educational level	Secondary school or below	23	4.2
	Senior high school	120	22.1
	College/university	260	47.8
	Graduate school or above	141	25.9
Occupation	Student	54	9.9
	Manager	62	11.4
	Government employee	78	14.3
	Professional	121	22.2
	Employee of a company	187	34.4
	Self-employed	11	2.0
	Other	31	5.7
Monthly income	Under TW$10,000	60	11.0
	TW$10,001–TW$30,000	292	53.7
	TW$30,001–TW$50,000	100	18.4
	TW$50,001–TW$70,000	70	12.9
	More than TW$70,000	22	4.0

"convenience sampling is available to the researcher by virtue of its accessibility" (Bryman & Bell, 2003, p. 105). We distributed the questionnaires to passengers who willingly filled them out. Cooper and Emory (1995) and Starmass (2007) indicate that the obvious advantages of adopting convenience sampling are low cost and saved time. A questionnaire, comprising a seven-point Likert-type scale ranging from "1 (strongly disagree)" to "7 (strongly agree)", was distributed to the passengers who had used airline services during the past 12 months and were aged 18 years or older. A period of 12 months was chosen to provide a common time frame as well as to limit the time frame within the recall ability of most respondents, as suggested by Singh (1990). Of the passengers approached, 580 agreed to take part in the survey, and 570 passengers returned the survey. The final sample consisted of 544 responses, because 26 responses were unusable and, therefore, excluded. The usable responses were above the minimum sample size of 382 considered adequate to provide a 95% confidence level, as suggested by Mendenhall, Beaver, and Beaver (1993).

4. Data analysis and results

4.1. Demographic statistics

The descriptive statistics of the sample are summarized in Table 2. There were 294 (54.0%) males and 250 (46.0%) females. The respondents' ages were mainly concentrated between 26 and 35 years old (36.2%); 40.6% of respondents were married and 47.8% of them had graduated from college or university. The respondents mainly worked as the employees of a company (34.4%). Most respondents had a monthly income between TW$10,001 and TW$30,000 (53.7%).

4.2. Exploratory assessment of the measures

EFA was conducted to reduce data dimensionality and create appropriate factors or dimensions for subsequent analysis. Principal component analysis (PCA) is the commonly used method for grouping the variables under a few unrelated factors (Kathiravanaa, Panchanathamaa, & Anushanb, 2010). PCA using the alpha method, with varimax rotation, was performed on the individual items for measuring the 11 sub-dimensions. Factor loading and Cronbach's alpha were used as the criteria for item reduction. According to Hair, Black, Babin, Anderson, and Tatham (2006), factor loadings greater than $\pm$0.30 and $\pm$0.40 are minimally acceptable. Items that have reliability coefficients higher than 0.60 suggested by Churchill (1979), were retained in the item pool. In order to include items with nearly significant factor loadings, items having a factor loading less than $\pm$0.30, items with high loadings on more than one factor, and mis-classifications, were removed from the item pool, as suggested by Hair et al. (2006). We used the eigenvalue (greater than one) as a standard that accounts for a greater amount of variance than had been contributed by one variable. Such a component is therefore accounting for a meaningful amount of variance, and is worthy of being retained (Hair et al., 2006).

4.3. Model testing

The efficacy of the proposed model and the psychometric properties of the scale were analyzed using the Statistical Package for Social Science (SPSS) 15.0 and the Analysis of Moment Structure (AMOS) 18.0. The conceptualization depicted in Fig. 1 can be described as a third-order factor model, which comprises not only the direct primary dimensions, but also the 11 sub-dimensions, defining service quality through the passengers' perceptions of the four primary factors. We then examined the efficacy of the proposed model by testing a measurement model and the overall model.

In the first step, we tested the measurement model using the assessment of the third-order factor model. To establish construct validity, we examined: (a) the relationship between the observable indicators (items) and their latent constructs (11 sub-dimensions), (b) the critical ratio (C.R.) in each item, and (c) correlations among the sub-dimensions. According to Janssens, Wijnen, Pelsmacker, and Kenhove (2008), using a significance level of 0.05 and a critical ratio greater than 1.96 for a two-tail test can be considered statistically significant.

The second step is to test the overall model (see Table 3). The results of the structural model test determine the relationship between 11 sub-dimensions and four primary dimensions and the relationship between four primary dimensions and overall service

Table 3
Results of the measurement and structural model tests.

Model	x^2/df	*P*	RMSEA	SRMR	TLI	CFI	GFI	NFI	AGFI
Measurement model	2.18	0.00	0.061	0.057	0.96	0.96	0.91	0.96	0.86
Structural model – overall model	2.52	0.00	0.060	0.052	0.97	0.97	0.92	0.96	0.87
Recommended value	<3.0	–	<0.08	≤0.08	>0.9	>0.9	>0.9	>0.9	≥0.8

Note. *P* = *P*-value; RMSEA = Root Mean Square of Approximation; SRMR = Standardized Root Mean Residual; TLI = Tucker-Lewis Index; CFI = Comparative Fit Index; GFI = Goodness-of-fit Index; NFI = Normed Fit Index; AGFI = Adjusted Goodness-of-fit Index.

Table 4
Parameter estimates for structural model 2.

Relationships	Parameter estimates	S.E.	C.R.
Interaction quality — Service quality	0.24	0.08	11.64*
Physical environment quality — Service quality	0.19	0.09	10.40*
Outcome quality — Service quality	0.27	0.07	12.88*
Access quality — Service quality	0.15	0.08	9.32*
Conduct — Interaction quality	0.95	0.02	5.18*
Expertise — Interaction quality	0.87	0.03	9.10*
Problem-solving — Interaction quality	0.65	0.05	11.45*
Cleanliness — Physical environment quality	0.69	0.06	9.54*
Comfort — Physical environment quality	0.87	0.04	5.85*
Tangibles — Physical environment quality	0.87	0.05	5.23*
Safety & security — Physical environment quality	0.85	0.06	4.74*
Valence — Outcome quality	0.93	0.03	5.24*
Waiting time — Outcome Quality	0.87	0.03	7.94*
Information — Access quality	0.24	0.06	8.76*
Convenience — Access quality	0.76	0.04	9.24*

Note. S.E. = Standard Error; Parameter estimates were found in standardized regression weight; C.R. = critical ratios were found in unstandardized regression weight.
*$p < 0.05$.

quality. The chi-square/df ratios (2.18) were lower than the threshold of 3.0 as suggested by Carmines and Mclver (1981) and Kline (1998). The root mean square error of approximation (RMSEA) value (0.06) was lower than 0.08, indicating adequate fit (Browne & Cudeck, 1993). The standardized root mean residual (SRMR) value (0.06) was less than the recommended threshold of 0.08 (Hu & Bentler, 1999). In addition, some indices (i.e., TLI, CFI, GFI and NFI estimates) were greater than the recommended 0.90 (Browne & Cudeck, 1993; Kline, 1998). The AGFI (0.86) exceeded the recommended threshold level of 0.8, indicating acceptable fit (Zikmund, 2003).

4.4. Validity and reliability of the scales

The results of the confirmatory factor analysis (CFA) and descriptive statistics are given in Table 1. Cronbach's coefficient alpha estimates for the 11 sub-dimensions of service quality ranged between 0.68 and 0.92, exceeding the minimum value of 0.60 suggested by Churchill (1979).

An examination of the indicators' factor loadings on their respective constructs provides evidence of convergent validity of the scale. More specifically, except for five items (see Table 1), the standardized regression weights for all items were greater than the conservative threshold of 0.70 (Hair et al., 2006; Litwin, 1995). Alternatively, the composite reliability (CR) for each construct is used to verify the convergent reliability. The CR was greater than the recommended value of 0.7 (Hair, Black, Babin, & Anderson, 2010).

The significant relationship between the four primary dimensions (i.e., interaction quality, physical environment quality, outcome quality and access quality) and the overall outcome variable (i.e., service quality) further supported the convergent validity of the scale (Anderson & Gerbing, 1988; see Table 4). The critical ratios for all indicators ranged from 4.74 to 12.88 and each was significant at the 0.05 level (see Table 4). Discriminant validity is established when the estimated correlations between the factors or dimensions are not excessively high (i.e., >0.85; Kline, 1998). The correlation estimates for the 11 sub-dimensions were significant at the 0.05 level (see Table 5). Therefore, the data suggests that strong evidence that construct validity and reliability exists for the Scale of Service Quality in the Airline Industry (SSQAI).

4.5. Results of structural equation analyses

The results of the structural model test are presented in Table 5, indicating an adequate fit to the data (RMSEA = 0.06, SRMR = 0.05, TLI = 0.97, CFI = 0.97, GFI = 0.92, NFI = 0.96, AGFI = 0.87). The chi-square (x^2/df) ratio of 2.52 was lower than the suggested criterion (x^2/df < 3.0).

5. Conclusions

This study proposes and tests a framework of service quality for airline services, developing the SSQAI based on a comprehensive description of possible facets of service quality. The results indicate that the framework and measurement scale is psychometrically sound. The theoretical and conceptual basis for understanding the nature of the passenger perception of service quality in the airline industry is still in the developmental stage. The proposed model seeks to fill the existing gaps in the airline literature by providing a framework for the study of the dynamics in the transport segment. The model has wide application for practitioners as they constantly strive to provide the very best experience for airline passengers.

The results of the analyses indeed demonstrate that the fit of the two structural models is "good." In particular, the statistically significant evidence in the data analysis indicates that the proposed model of service quality in the airline industry is valid. The results provide empirical evidence that there are four dimensions (i.e., interaction quality, physical environment quality, outcome quality and access quality) of service quality, with 11 sub-dimensions. Therefore, the combination of these areas represents the passengers' overall perceptions of service quality in the airline industry. The proposed conceptual framework can be characterized and differentiated from existing models where multiple conceptualizations of service quality were consolidated into a single and comprehensive framework. Therefore, the hierarchical factor structure of the proposed model, as suggested by Dabholkar et al. (1996) and Brady and Cronin (2001), may fill the gap that exists in the conceptualization of service quality in the airline industry.

Table 5
Correlations between the 11 sub-dimensions of the model.

Sub-dimensions	1	2	3	4	5	6	7	8	9	10	11
Conduct	**0.819**										
Expertise	0.779*	**0.887**									
Problem-solving	0.557*	0.480*	**0.860**								
Cleanliness	0.496*	0.472*	0.335*	**0.825**							
Comfort	0.460*	0.419*	0.429*	0.505*	**0.744**						
Tangibles	0.496*	0.499*	0.448*	0.499*	0.630*	**0.797**					
Safety & security	0.456*	0.446*	0.437*	0.503*	0.564*	0.538*	**0.769**				
Valence	0.729*	0.648*	0.709*	0.496*	0.484*	0.538*	0.515*	**0.838**			
Waiting time	0.588*	0.516*	0.937*	0.340*	0.461*	0.483*	0.459*	0.752*	**0.843**		
Information	0.551*	0.508*	0.468*	0.524*	0.577*	0.574*	0.535*	0.524*	0.472*	**0.861**	
Convenience	0.381*	0.461*	0.384*	0.324*	0.351*	0.328*	0.322*	0.435*	0.317*	0.420*	**0.801**

Note. The bold numbers on the diagonal are the square roots of the average variance extracted; Other numbers are the correlation coefficients between latent variables.
*$p < 0.05$.

6. Implications

6.1. Theoretical implications

In terms of the theoretical implications, the findings of this study indicate that the proposed research model adequately describes the concept of service quality in the airline industry. Specifically, the overall fit of the model was good and the hypothesized relationships were confirmed. All factor loadings depicted in the research model were statistically significant. Some of the 11 sub-dimensions identified in this study are similar in content to those factored by other researchers who have focused on airline studies (Archana & Subha, 2012; Gilbert & Wong, 2003; Park, Robertson, and Wu, 2004, 2005, 2006).

The sub-dimensional factor structure supports the view that the dimensionality of the service quality construct depends on the service industry under investigation and adds support to the claims that industry- and culture-specific measures of service quality need to be developed (Brady & Cronin, 2001; Clemes, Ozanne, & Laurensen, 2001; Clemes et al., 2007; Dabholkar et al., 1996; Powpaka, 1996). The significant correlations among dimensions, theoretical interpretability, and good fit of the model support the third-order factor structure of the proposed model. The SSQAI was developed to test the proposed model. The findings of CFA indicate strong evidence of the reliability and convergent validity of the scale.

The results of this study increase support for the use of a hierarchical structure, such as those developed by Dabholkar et al. (1996) and Brady and Cronin (2001), and conceptualize and measure service quality in the context of airline services. However, the four primary dimensions identified in this study may not be general for all service industries outside the airline sector, or for different cultures. The primary dimensions identified in this study should be confirmed for other service industries through the use of appropriate qualitative and quantitative analyses. In addition, the sub-dimensions need to be confirmed using appropriate qualitative and quantitative analyses because they may vary across industries and cultures. It is valuable to compare the derived importance of the four primary dimensions and 11 sub-dimensions of the airline service quality construct identified in this study with the derived importance of these dimensions identified in additional studies. Overall, the findings of this study have expanded the research into service quality by providing a conceptual framework and measurement scale for the airline industry.

6.2. Managerial implications

There are several implications for practitioners in managerial positions. The proposed model allows the analysis of service quality at several levels of abstraction. From a managerial perspective, the hierarchical framework developed for this study provides an improved understanding of how passengers assess service quality in the airline industry. The four generic dimensions (i.e., interaction quality, physical environment quality, outcome quality and access quality) explain common facets of service delivery systems in the airline industry. Therefore, those dimensions can be applied to different airlines in order to increase the quality of service during passengers' flights. In addition, the proposed hierarchical model in this study included 11 sub-dimensions reflecting specific aspects of the service delivery process in the airline industry. Therefore, practitioners can analyze their service operation at both the dimension level (i.e., formulating management strategies) and the sub-dimension level (i.e., framing daily management tactics). This provides a more flexible method of application to various levels of service quality of airlines than existing scales (e.g., SERVQUAL, SERVPERF, and SERVPEX) that have been previously used to examine in the airline industry. Overall, the model provides practitioners with the strategic concepts for the improvement of the daily operation and the tools for performance evaluation.

The hierarchical framework developed for this study enables practitioners to identify the most and the least important dimensions underlying passengers' perceptions of service quality. According to the comparative importance of the dimensions, practitioners can allocate different weights to the dimensions and efficiently use their limited resources (i.e., human and financial resources). For example, the results of this study indicate that passengers perceive the comfort and tangibles sub-dimensions as more important sub-dimensions of outcome quality than the cleanliness sub-dimension in the airline industry. Therefore, practitioners should allocate more resources to improve comfort and tangibles than provide a clean environment for their passengers.

The SSQAI developed in this study provides practitioners with a reliable and valid analytical tool for the measurement of passengers' perceptions of service quality. This can be used as a diagnostic tool that allows airlines to identify different levels of the quality of service and solve problems created in service provision.

The developed measurement scale in this study allows practitioners to apply the concept of service quality in a flexible manner. Based on feedback from passengers, practitioners should reframe their management strategies and tactics to redesign the service delivery system. The efforts made to improve service quality may increase customer satisfaction and their favorable behavioral intentions, and they can provide an opportunity for practitioners to remain competitive in a currently saturated market.

As pointed out by Brady and Cronin (2001), a high level of service quality is associated with several key organizational outcomes, including high market share (Buzzell & Gale, 1987), improved profitability relative to competitors (Kearns & Nadler, 1992), enhanced customer loyalty (Zeithaml et al., 1996), the realization of a competitive price premium (Zeithaml et al., 1996), and an increased probability of purchase (Zeithaml et al., 1996). Furthermore, service quality is positively related to customer satisfaction (Anderson & Sullivan, 1993; Cronin & Taylor, 1992) and corporate image (Clemes et al., 2009; Grönroos, 1984; Wu et al., 2011), though the causal order of these relationships has produced controversy. Therefore, the study of service quality can provide airline companies with a powerful instrument to obtain their strategic goals.

7. Limitations and directions for future research

Although this study provides a number of important contributions to marketing theory and for airline management, organizations and individuals wishing to use the results in relation to specific strategic decisions should note several characteristics of the study that may limit their overall generalizability. First, in spite of the amount of literature on service quality, it has been difficult to offer a full description of the nature of the service quality construct in the airline industry. Despite this difficulty, this study conducted in-depth focus group interviews to identify and examine all dimensions of the service quality construct for the airline industry, because focus group interviews are believed to be more useful than relying on only a literature review. However, there may be some other dimensions of service quality that have not been identified in the conceptual framework of this study. Future researchers should seek to identify additional factors that significantly impact on the passengers' perceptions of airline service quality that have not been identified in this study. Second, the data were collected at Taiwan Taoyuan International Airport. This may limit the ability to generalize the results to airlines in other regions or countries. Future studies should attempt to examine service quality across different

international or domestic airports of other regions or countries. This may provide an opportunity to compare the quality of service based on different ratings of the quality of service based on passengers' perceptions in different regions or countries.

Conflict of interest

None declared.

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