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# Beyond the Quality of Service: Exploring the Evaluation Criteria of Airlines

**Ray Wang***
Department of Hospitality Management, Hung Kung University, Taichung City, Taiwan

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**ABSTRACT**

With the progress and prosperity of commerce and industry, time and money increasingly form an equal partnership. Using air carriers to shorten the round-trip time has become an important choice for many people in the tourism process. Faced with increasing competition within the aviation service environment, airline evaluation criteria and the requirements of customers are gradually dominating the evaluation mechanism for air transport service quality. Over the past few years, attention on the transport quality of service has been primarily focused more on land-based transport, and less on the relevant evaluation criteria of airlines. Many studies have shown that quality of service will directly affect customer satisfaction, resulting in the fact that good quality aviation services have become increasingly important. Therefore, in practical industrial operations with limited resources, there is an urgent need to delve into the assessment guidelines that have an impact on customers when they choose an airline, which can be used as a basis for improving customer satisfaction. Through a literature review and a reliability and validity analysis, this study summarized 19 evaluation criteria, using the purposive sampling method and the decision laboratory method (DEMATEL). In addition, this study viewed the causal relationship between the evaluation criteria and the degree of association as a continuing project for airlines. This study selected appropriate empirical samples from two domestic airlines. The conclusions may provide recommendations for all airlines.

Keywords: Quality of Service, Evaluation Criteria, Decision-Making Trail and Evaluation Laboratory (DEMATEL)

* Corresponding Author, E-mail: ketr501215@sunrise.hk.edu.tw

## 1. INTRODUCTION

With the development of Taiwan industry and commerce, more and more importance is attributed to time and efficiency, and the aviation industry enjoys the characteristics of fast and comfortable service (Nagar, 2013), which can resolve the deficiencies of road transport in this respect. In addition, as a result of a highly developed economy, per capita income levels are rising, and national sightseeing is increasingly prevalent, resulting in saturated domestic land transport. Air carrying capacity has also experienced rapid growth. In recent years, the Taiwan government has become more active in promoting Taiwan as an Asian regional operation center. Many new airlines have been established, making Taiwan an increasingly competitive aviation market. For these airlines, airline service quality not only affects the prestige and loyalty of their consumers, but it is also a key factor in deciding airline operating costs, profitability, and its sustainability (Bamber *et al*., 2009; Okeudo and Chikwendu, 2013; Chen, 2013; Torres and Kline, 2013). Therefore, each airline needs to strengthen and improve its service quality to remain relatively competitive. However, there is no agreement on how to assess airline service quality by specific evaluation criteria (Correia *et al*., 2008; Jeon and Kim**,** 2012), and the causal relationship and the degree of association between each criterion need to be clarified as well (Correia *et al*., 2008; Jeon and Kim, 2012; Torres and Kline, 2013; Wang *et al*., 2011).

Mostly based on Parasuraman, Zeithaml, and Berry proposed the PZB quality of service (QOS) model (Berry *et al*., 1985; Parasuraman *et al*., 1985), and the PZB service quality extended model (Zeithaml *et al*., 1988), or the QOS assessment SERVQUAL scale (Parasuraman *et al*., 1988). The research on airline service quality is aimed at the service quality gap. Research can be broadly divided into two categories. The first is based on the expansion model of PZB service quality, aimed at understanding the determinants of service quality and evaluation dimensions (Chen, 2013; Steven *et al*., 2012). Alternatively, it is aimed at the reasons and factors which form the service quality perception gap so as to confirm the quality of the service assessment decision factors and the set dimensions (Prentice, 2013; Chen, 2013). The second category is to measure the QOS performance. This mostly uses the SERVQUAL scale assessment of the QOS, and adopts a statistical significance test to assess the QOS (Chen, 2013; Prentice, 2013; Han *et al*., 2012; Liou *et al*., 2007). Recommendations and suggestions are then proposed. In addition, a further analysis for assessing the dimension of QOS is put forward in order to provide a reference to improve the quality of airline services.

The above methods offered some of the hints regarding the QOS in the aviation industry. However, they have failed to fully understand and grasp the ranking of the various factors that affect the quality of airline services, or to assess the QOS performance with a view to the overall structure of the airline industry. Therefore, it is difficult to provide specific and complete proposals for the measures derived from the quality of decision-making factors. However, the decision-making trial and evaluation laboratory (DEMATEL) has such advantages.

The decision laboratory method (i.e., DEMATEL) is mainly used to analyze the relevance of social science issues in relation to various factors, and to explore the causal relationship between them. This method was first used by the Battelle Institute in Geneva in 1971 to investigate world problems for the United Nations so as to solve the problems of hunger, race issues, human rights issues, epidemics, violence and terrorism, and other issues. The DEMATEL method is different from the intuitive method of nonlinear systems; it can be used to calculate and quantify complex issues in order to conclude the direct and indirect relational degree (Tseng *et al*, 2008; Wang, 2011). The main advantage of this method is to integrate the indirect relationship into a cause and effect diagram, and it is an effective method to analyze the overall structure and correlation of the various criteria in the system. Meanwhile, DEMATEL can order the criteria based on different role relationships and the degree of influence. Greater weight can be given according to the interactional degree of one criteria with another, which is called cause criteria; the criteria with the greater effect is considered non-effective, known as the affected criteria (effect criteria) (Seyed-Hosseini *et al.*, 2006; Wang, 2011). Based on the foregoing advantages and limitations of this study, the study gives an accurate description of each evaluation criteria using the fuzzy DEMATEL method combining the semantic approach for human decision-making processes in order to explore the implications of the ideal QOS and the causal relationship and correlation between evaluation criteria.

Based on the above motivations, this paper aims to propose a solution framework with a fuzzy DEMATEL approach which can explore the key factors affecting aviation's service quality. The core logic of the proposed solution framework is to treat a visible cause–effect diagram that can be developed to help make better decisions. To demonstrate the applicability of the proposed criteria framework, a case study is conducted. The rest of this paper is organized as follows. In Section 2, the proposed solution framework is elaborated. In Section 3, a case study is conducted. Based on the findings, some managerial implications are discussed in Section 4. Finally, conclusions, limitations and suggestions for future studies are addressed.

## 2. LITERATURE REVIEW

With regards to the research on airline service quality, domestic and foreign scholars place the emphasis on the PZB QOS model (or the PZB QOS extended model) and SERVQUAL service quality decision factors, conducting empirical research on the service quality gaps. Among these, most focus has been placed on assessing the cognitive QOS (Han *et al*., 2012), or on exploring the causes for the significant gap between expectations and the actual service experience of passengers. However, these methods cannot judge the importance of the evaluation criteria from the perspective of profit and loss of quality, nor can they further confirm the relative degree of impact that the evaluation criterion for service quality has on operating costs. Another key issue of concern is that scholars have different research methods to measure the quality of airline services. These include the PZB concept of architecture; using Importance-Performance Analysis to measure the QOS (Chen, 2013); using the gap between perceived service and expected services; using a fuzzy semantic evaluation questionnaire to assess the quality of the service attributes for each airline (Liou *et al*., 2007); and using factor analysis to summarize the dimensions for assessing service quality (Wittman and Swelbar, 2013). As for the use and setting of the evaluation criteria of service quality, academics hold different views (Correia *et al*., 2008; Liou *et al*., 2007) and their studies have contributed to the QOS of the aviation industry. However, it is not easy to point out a clear focus on operation and management practices. With limited resources, it is not easy to quickly and effectively grasp how to improve items.

This study compiled the academic literature in order to draw out the evaluation criteria for 22 airlines. With the pre-test collected data and a validity and reli-

**Table 1.** Airlines quality of service evaluation criteria

| Option | Quality assessment decision factor |
|---|---|
| A1. Safety | C1. Aviation safety |
| | C2. Flights taking off and landing on time |
| A2. Comfort | C3. Flight time shift arrangements |
| | C4. Cabin interior layout and cleanliness |
| | C5. Comfort of cabin seat |
| | C6. Books or entertainment on board |
| A3. Service | C7. Convenience of carrying baggage |
| | C8. Offer catering on board |
| | C9. Professionalism of the staff |
| | C10. Uniform and grooming of the service personnel |
| | C11. Attitude of the counter personnel (ticket reservation) |
| A4. Reactivity | C12. Actively and quickly responding to the requirements of passengers |
| | C13. Correctness of the job |
| | C14. Initiative to provide passenger services |
| | C15. Handling passenger complaints |
| | C16. Service personnel take the initiative when taking care of the passengers |
| A5. Reliability | C17. Providing the promised services |
| | C18. Simple seat order and ticketing process |
| | C19. Fare rationality |

ability analysis, the deletion of three evaluation criteria (C3, C10, and C21), a total of 19 evaluation criteria (Table 1) were drawn, which can help customers to evaluate service quality and can be used as evaluation criteria in this study to measure the quality of airline services.

## 3. RESEARCH DESIGN

The study concluded the aforementioned literature review and project analysis, the reliability and validity testing, and factor analysis. The researchers then designed an 'airline service quality attributes scale', and established airlines' QOS evaluation criteria. The calculation process is based on the concept of fuzzy and performance values of criteria so as to obtain the degree of direct/indirect impact on the service quality of the evaluative criteria and thus identify the correlation level between each index.

### 3.1 Fuzzy Linguistic Method

Comparative assessment of each of the decision factors regarding the performance and weight of each attribute must be carried out. The traditional practice is that the assessor, according to the data combined with experience, is given a certain value. However, because humans' thinking behavior is conveyed through semantic (linguistic) communication, such words as good and very good, for instance, are of no value. Therefore, when the evaluators were asked to give a certain value for a decision attribute, they may bear great mental influence and pressure, which may prevent them from giving an appropriate semantic value. The fuzzy data can be the semantic variables, indicating a systematic linguistic variable value converted into a relevant fuzzy number. Chen (2001) proposed eight semantic scales, with triangular and trapezoidal fuzzy numbers, representing the semantic items for two to eleven different semantics, respectively. Such items provide fuzzy numbers and a semantic item matching method. Linguistic variables were proposed by Zadeh (1975). The so-called linguistic variables are based on sentences or phrases in natural language as variable values, rather than based on the number of variable values. The fuzzy semantic method has gained attention and adoption in various fields. Liu and Song (2001) proposed semantic proximity, and considered it to be the basic concept of fuzzy association for the degree of evaluation. Matarazzo and Munda (2001) limited the use of triangle fuzzy numbers in view of the traditional semantic decisions, and then proposed an integral method to calculate the size of a fuzzy number. Based on the ratings of each alternative and the weight of each criterion, Chen (2001) developed a multiple criteria decision-making process, with a final assessment value to determine the location of the distribution center. Cho and Pan (2014) based on the deficiencies and potential risks of the network's existing defense technology, establish an improvement over the traditional single-technology model that addresses the inadequacies.

**Table 2.** Linguistic scales for the importance weight of criteria

| Linguistic variable | Corresponding triangular fuzzy number |
|---|---|
| Strongly disagree | (0.0, 0.1, 0.3) |
| Disagree | (0.1, 0.3, 0.5) |
| Slight agree | (0.3, 0.5, 0.7) |
| Agree | (0.5, 0.7, 0.9) |
| Strongly agree | (0.7, 0.9, 1.0) |

Adapted from Chen (2001).

Therefore, this study concludes that the aforementioned scholars used fuzzy linguistics to indicate the performance weights of the decision factors (detailed in Table 2).

This study established selection criteria by using expert questionnaires, with five-point semantic variables in Table 2 (strongly disagree, disagree, somewhat agree, agree, strongly agree), in order that the importance of the selection criteria can be calculated. This assessment scale is regarded as the basis for the 'importance of the criteria.'

### 3.2 Decision-Making Trial and Evaluation Laboratory (DEMATEL)

Originating from the Battelle Association of the Geneva Research Center in 1971, DEMATEL is used for research and for dealing with complex and difficult world issues, such as race, hunger, environmental protection, energy, and other issues (Fontela and Gabus, 1976). In recent years, this method has been greatly welcomed in Japan as the DEMATEL method can effectively help in understanding the complex structure of a causal relationship, can examine the impact of the extent of two elements, and can use matrices and related mathematical theories to calculate the causal relationship and the impact degree between elements. Related applications include business planning and decision-making, urban planning and design, geographical environmental assessments, analysis of global issues, etc. For instance, Liou *et al.* (2007) used DEMATEL to analyze the airline security measure model, and finally got a causal relationship for the security guidelines. Tseng (2010) explored the firm environmental knowledge management capacities using the DEMATEL method. Wang (2011) used DEMATEL to analyze the service quality evaluation criteria of portal sites. Wang *et al*. (2011) used DEMATEL to design and assess the airline service quality in uncertainty. Tseng and Chiu (2013) also used the same method to analyze the ability of green supply chain management and construct a causal relationship model for competency criteria and group decision-making. In short, DEMATEL is approved in the social sciences and even for scholars, and has produced research results. Therefore, this study intends to use DEMATEL to investigate the causal relationship between the airline QOS evaluation criteria, so as to understand the direct/indirect impact on the relationship between them, and as a follow-up reference for researchers.

### 3.3 Questionnaire Design

The survey tool of this study refers to the DEMATEL questionnaire, whose purpose is to investigate the degree of direct/indirect influence on the airline service quality evaluation criteria, using DEMATEL to identify correlational degrees between indices. The questionnaire was developed during an expert meeting to confirm the content validity of the airline QOS evaluation criteria. Professionals are experts in their various fields and possess sufficient knowledge, skills and practical experience (Khameneh and Motamedi, 2014). Through the nominal group technique, the key qualities of the service evaluation criteria of airlines can be determined and the implication for each indicator can be defined in detail. Following this, the items not applicable to the questions were deleted based on the pilot test results. Finally, airlines were selected to conduct the QOS evaluation criteria. The DEMATEL questionnaire first described the definition of each indicator, and asked the respondents to complete the questionnaires on one indicator's influence on another indicator by comparison between the two (completing four levels 0–3); 0 as 'not affected', 1 as 'slightly affected', 2 as 'has an impact', 3 as 'has a greater impact', and the degree of mutual influence between the indicators is shown according to these numbers. The format of the questionnaire is shown in Table 3.

The questionnaire development process includes confirming the research items, collecting data and analyzing it for reliability and validity. The study takes these steps to ensure the quality of the research tools. After pilot test conducted, the indicator items of questionnaires including *C1 Aviation safety*, *C2 Flights taking off and landing on time*, *C3 Flight time shift arrangements*, *C4 Cabin interior layout and cleanliness*, *C5 Comfort of cabin seat*, *C6 Books or entertainment on board*, *C7 Convenience of carrying baggage*, *C8 Offers catering on board*, *C9 Professionalism of the staff*, *C10 Uniform and grooming of the service personnel*, *C11 Attitude of the counter personnel (ticket reservation)*, *C12*

**Table 3.** Example of the DEMATEL questionnaire

| | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 | C16 | C17 | C18 | C19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C1. Aviation safety | N | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

N: not applicable.

*Actively and quickly responding to the requirements of passengers*, *C13 Correctness of the job*, *C14 Initiative to provide passenger services*, C15 *Handling passenger complaints*, *C16 Service personnel take the initiative when taking care of passengers*, *C17 Provide the promised services*, *C18 Simple seat ordering and ticketing process*, and *C19 Fare rationality*. The following are the instructions for the development of the questionnaire.

**3.3.1 Confirming the research items**

After summarizing the literature, six college teachers from departments related to the management of leisure activities were invited to discuss the questions, and another three teachers were asked to complete the questionnaire.

**3.3.2 Collecting the data**

To ensure the reliability and validity of the questionnaire, the pilot test was conducted after the completion of the questionnaire; the pilot test process is based on the consumers of two domestic airlines as targets, and a total of 500 questionnaires were issued (250 copies for each airline). Fifty-seven valid copies were returned by airline A (effective rate of 22.8%), and 86 valid copies were returned by airline B (effective rate of 34.4%). The total number of returned valid copies was 143, with an average effective rate of 28.6%.

After receiving the samples from the two airline companies, the effective samples were randomly selected and the data was recorded and analyzed. In addition, in order to maintain consideration of whether there were any differences in the passengers' recognition of the service quality of the two airline companies, a *t*-test was done to test the differences. The results ($p = 0.682$) showed that there were no differences ($p < 0.05$).

**3.3.3 Reliability analysis**

Reliability is the consistency or stability of measurements (Cooper and Emory, 1995). This study used the Cronbach's α scale to measure safety, comfort, service, responsiveness and reliability, etc. An analysis of the survey results shows that the α coefficient was 0.897, and as each coefficient was higher than 0.7, it meant the scale has high internal consistency (Nunnally, 1978).

**3.3.4 Validity analysis**

Validity scales refer to the proper representation of the characteristics and functions of the measurement, which is able to achieve an effective level for the measurement objectives. This study used factor analysis to ascertain the scale factor structure matrix of each project, and then used the matrix of the factor loadings to determine the construct validity applicability. Items with a load number greater than 0.3 (Nunnally, 1978) were kept as the judgment item questions in order to confirm the validity of the scale.

**3.3.5 Formal test**

This study deleted questions after the data collection in the pilot test, and finally concluded 19 items to develop a DEMATEL questionnaire. The deadline was between March 1, 2012 and May 31, 2012. Airline passengers from two airports were selected as the target objects, one in the Taoyuan airport in the north and the other from central Qingyuangang. A total number of 86 valid samples were collected.

## 4. RESEARCH FINDINGS

In this study, the sum of each row and the sum of the rows were added to obtain D+R (centrality). D+R (centrality) was larger, meaning that the evaluation criterion was of a higher degree of importance in the overall evaluation factors. In addition, the researchers selected the D+R value, which was greater than the overall average (0.4131), meaning that this evaluation criterion has a more critical impact on the quality of airline service. The results take nine evaluation criteria into account, with the importance in the following order: *C4 Cabin interior layout and cleanliness*, *C5 Comfort of the cabin seating*; *C8 Provide catering on board*, *C10 Uniform and grooming of service personnel*, *C1 Aviation safety*, *C6 Books or entertainment on board*, *C19 Fare rationality*, *C3 Flight time shift arrangements*, and *C2 Flights landing and departing on time* (See Table 4).

The study findings are consistent with many other scholars. Chen (2013) emphasized attitude; Okeudo and Chikwendu (2013) emphasized Aviation safety and flight punctuality; Bamber *et al.* (2009) emphasized the rationality of the fares; and Correia *et al.* (2008) emphasized the catering, Aviation safety, order (zone) of operating procedures, taking off and landing on time, staff appearance, and seating comfort. Whilst it is not the same as Liou *et al.* (2007), who advocated consumers' higher emphasis on safety rather than on comfort, the customers' order of importance is more concerned with the cabin interior layout and cleanliness, seat comfort, the grooming of the service personnel, and the food. The airline, however, is more concerned about Aviation safety and is willing to focus on improvements. These results indicate that the availability of services is more preferred by customers when making a choice between airlines, while the impact on the security level is the choice of the airline. If customers choose to take an airline, Aviation safety immediately becomes uncontrolled after the customers book tickets, and it is most likely to directly affect other evaluation criteria projects.

### 4.1 The Reasons for the Degree (D–R)

The sum of each row is subtracted from the sum of the line; the value of D–R (reasons degrees) is obtained. When the positive value of D–R (reasons degrees) is larger, it means this item can easily influence other factors.

**Table 4.** Total effect-relation summary of service quality of airline companies

| Rows' sum D | | Columns' sum R | | D+R | | D–R | |
|---|---|---|---|---|---|---|---|
| Item | Value | Item | Value | Item | Value | Item | Value |
| C4 | 2.4942 | C1 | 1.6890 | C4 | 2.0717* | C1 | 1.0382 |
| C5 | 2.3229 | C4 | 1.5934 | C5 | 1.7506* | C6 | 0.9241 |
| C8 | 2.2457 | C5 | 1.8474 | C8 | 1.6428* | C4 | 0.9167 |
| C1 | 2.2272 | C3 | 2.0775 | C10 | 1.4250* | C5 | 0.8951 |
| C6 | 2.1291 | C8 | 1.9277 | C1 | 1.4163* | C8 | 0.8487 |
| C10 | 2.0062 | C2 | 1.7050 | C6 | 1.3341* | C16 | 0.6776 |
| C19 | 1.9488 | C6 | 1.2406 | C19 | 1.2489* | C19 | 0.6487 |
| C3 | 1.7933 | C10 | 1.8971 | C3 | 1.1407* | C9 | 0.6216 |
| C9 | 1.4508 | C13 | 1.3292 | C2 | 0.4593* | C10 | 0.5874 |
| C2 | 1.3660 | C9 | 1.9188 | C9 | 0.2799 | C12 | 0.5357 |
| C16 | 1.2159 | C17 | 0.7597 | C13 | -0.0441 | C3 | 0.4459 |
| C13 | 1.1698 | C12 | 0.9850 | C17 | -0.1930 | C15 | 0.4022 |
| C17 | 1.0594 | C7 | 1.2862 | C16 | -0.2459 | C14 | 0.3919 |
| C14 | 1.0358 | C15 | 1.1438 | C14 | -0.3204 | C13 | 0.3836 |
| C12 | 1.0207 | C14 | 1.1015 | C15 | -0.3947 | C17 | 0.3119 |
| C15 | 1.0037 | C16 | 1.0382 | C12 | -0.4944 | C2 | 0.2726 |
| C7 | 0.7587 | C19 | 1.2476 | C7 | -0.5007 | C7 | 0.0182 |
| C18 | 0.2929 | C18 | 1.0862 | C18 | -1.1209 | C11 | -0.1267 |
| C11 | 0.1331 | C11 | 1.8001 | C11 | -1.6072 | C18 | -0.2934 |

* represents mean value greater than total mean 0.4131.

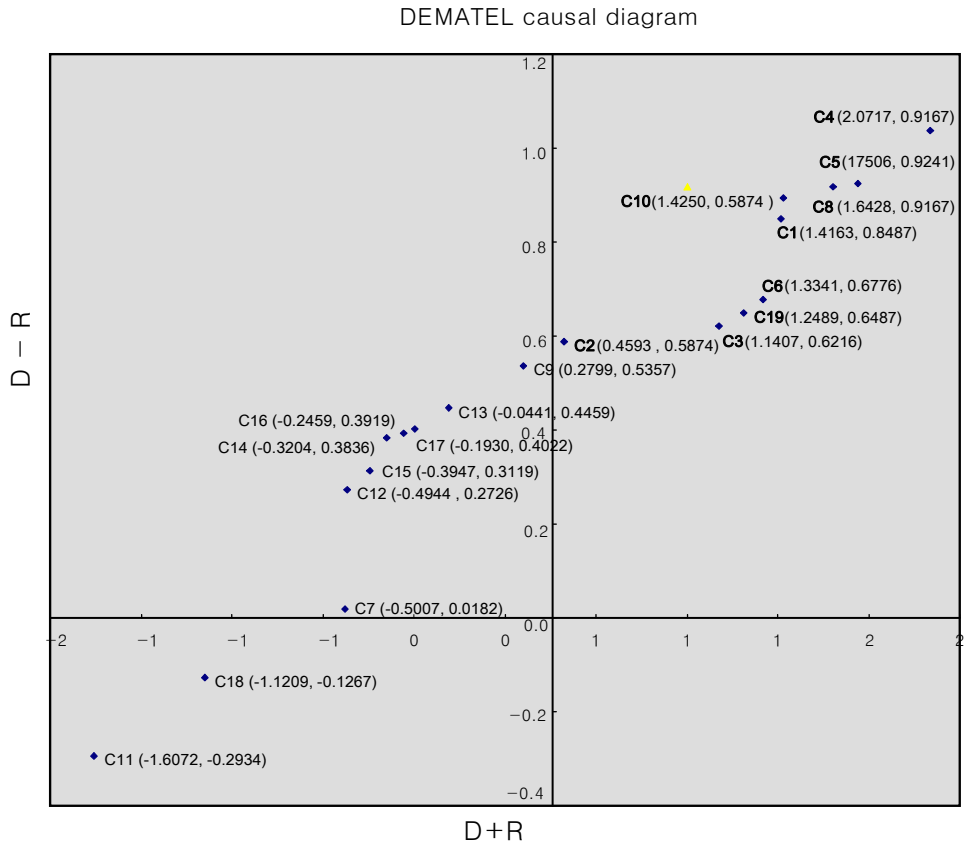


**Figure 1.** Casual diagram of the service quality evaluation criteria of airlines.

The importance of the airline's accreditation standards is higher, i.e., the airline company has more willingness to improve; when the negative value of D–R (reasons degrees) is larger, which means that this item is more easily affected by other factors, the importance of the airline's accreditation standards is lower, and airlines have no room for improvement. The D–R indicates that *C1 Aviation safety*, *C6 Books or entertainment on board*, *C4 Cabin interior layout and cleanliness*, *C5 Cabin seat comfort,* etc., are significant items that affect other factors (evaluation criteria). Meanwhile *C18 Simple ticketing procedure*, *C11 Counter staff attitude (ticket reservation)*, and *C7 Convenience of carrying baggage* are items that are influenced by other evaluation criteria (see Table 4).

### 4.2 The Center Value (D+R)

When D+R (central value) is larger, does it mean that the question item (evaluation criteria) is more significant in an overall assessment of the factors? A D+R value was selected which was greater than the overall average (0.4131) for each question item, with a total of 9 items; these data show that the focus of customers' standards is the comfort aboard a flight. Through the airline's total impact on the service quality relationship matrix, based on the relationship between the evaluation criteria, the diagram for airline service quality is drawn out (detailed in Figure 1).

In the structure of the factor for assessment that impacts the airline company, the top three D+R (central value) are *C4 Cabin interior layout and cleanliness*, *C5 Cabin seat comfort*, and *C8 Provide catering on board*, indicating that these three evaluation criteria are the most important for customers when taking a plane. In other words, as people's living standards are rising, air transport has replaced sea transport as the top priority when travelling for the majority of people. In addition, long-distance travel is increasingly common, and comfort has become one of the evaluation criteria that customers value most. This finding is roughly consistent with Prentice (2013). However, the importance of *C6 Books or entertainment on board* is slightly different from Prentice's (2013) study results. In addition, the relationship diagram found that the last three items were *C11 Counter personnel attitude (ticket reservation)*, *C18 Simple ordering (designated) spaces and ticketing process*, and *C7 Convenience of carrying baggage* (Table 4), indicating that these three factors have a weaker influence degree than other factors, so airlines can find measures to promote service quality from other factors.

## 5. CONCLUSIONS AND IMPLICATONS

With a D+R value greater than the overall average (0.4131), the results of this study show that these evaluation criteria have an important impact on airline service quality. The importance is in order: *C4 Cabin interior layout and cleanliness*, *C5 Cabin seat comfort*, *C8 Providing catering on board*, *C10 Uniform and grooming of service personnel*, *C1 Aviation safety*, *C6 Books or entertainment on board*, *C19 Fare rationality*, *C3 Flight time shift arrangements*, and *C2 Flights landing and departing on time*. In comparison, *C11 Counter personnel attitude (ticket reservation)*, *C18 Simple ordering (designated) spaces and ticketing process*, and *C7 Convenience of carrying baggage* have no influence. In other words, using an aviation carrier as a tourist or as a means of transport for customers is becoming more acceptable. Therefore, airlines must provide comfortable and quality service, Aviation safety, shift arrangements, and provide a more comfortable and convenient quality flight service so as to meet the service quality requirements for customers.

### 5.1 Conclusions

This study analyzed the literature review, and summarized 19 items of airline QOS evaluation criteria. Through fuzzy DEMETAL analysis, it was ascertained that nine evaluation criteria of D+R values are greater than the overall average (0.4131), meaning that these evaluation criteria have an important impact on airline service quality. Their order of importance is *C4 Cabin interior layout and cleanliness*, *C5 Cabin seat comfort*, *C8 Providing catering on board*, *C10 Uniform and grooming of service personnel*, *C1 Aviation safety*, *C6 Books or entertainment on board*, *C19 Fare rationality*, *C3 Flight time shift arrangements*, and *C2 Flights landing and departing on time*. Meanwhile, *C11 Counter personnel attitude (ticket reservation)*, *C18 Simple seat order and ticketing process*, and *C7 Convenience of carrying baggage* are ranked as the last three items, indicating that more appropriate measures should be in place for these three, as the evaluation criteria to improve airline quality.

All of these evaluation criteria, *C1 Aviation safety*, *C6 Books or entertainment on board*, *C4 Cabin interior layout and cleanliness*, *C5 Cabin seat comfort*, *C8 Providing catering on board*, *C16 Service personnel take the initiative when taking care of the passengers*, *C19 Fare rationality*, *C9 Service personnel professionalism*, *C10 Uniform and grooming of service personnel*, and *C12 Actively and quickly respond to passenger demands*. Meanwhile, *C18 Simple ordering (designated) spaces and ticketing process*, *C11 Counter personnel attitude (ticket reservation)*, *C7 Convenience of carrying baggage*, *C2 Flights landing and departing on time*, *C17 Providing the promised services*, *C13 Correctness of the job*, *C14 Initiative to provide the necessary services to passengers*, *C15 Passengers' complaint treatment*, and *C3 Flight time shift arrangements* belong to the evaluative criteria of causal relationship. The above data show that, in addition to Aviation safety, consumers' feelings of comfort during the flight process have become the

most important evaluation criteria that affect the quality of airline services.

PZB QOS model was used to examine the airline service quality. The study revealed that 'comfort' and 'service' have greater impacts on customers' perception toward airline service quality, and the key criterion 'safety' is likely to influence other criteria during the evaluation process. Among many of the airlines working plans aiming to improve service quality and customer satisfaction with the evaluation criteria, we suggest that a safety image be established as the first priority, then 'comfort' and 'service' of the evaluation criteria be used to boost the company value.

## 5.2 Implications

Most of the previous studies used the PZB QOS model or SERVQUAL service quality as an empirical research assessment basis for airline service quality, in which Han *et al.'s* (2012) study evaluated the cognitive QOS in terms of SERVQUAL measures; Jeon and Kim (2012) studied passengers' cognitive feelings toward domestic airline QOS assessment factors. However, little has been discussed regarding the casual relationship of evaluation criteria for airline service quality, making it difficult to assess exactly how the interaction works between the various evaluation criteria, or how to effectively grasp the root of the problem.

The results show a causal relationship between the evaluation criteria, where *C1 Aviation safety* is the most important cause, and *C4 Cabin interior layout and cleanliness* and *C5 Comfortable cabin seats* are the most important results. In other words, the customer is always most concerned about Aviation safety, and this result exposes passengers' concerns about Aviation safety. However, before customers decide to take an airline flight, they can only take the airline safety records or impressions as a reference. Therefore, the brand image of a company's Aviation safety records represents a pivotal position (Okeudo and Chikwendu, 2013). Once customers buy a ticket or wish to have a safe landing, their requirements towards clean, comfortable and good service become important indicators for customers to determine the service quality of airlines.

This part contains three managerial implications: 1) The image shaping of Aviation safety is still the main reason whether customers choose to take a plane or not, while the airline company needs to add other competitive services after a flight so as to enhance the degree of customer satisfaction. In the evaluation indicators, specific and tangible services are still an important indicator for customers to evaluate the QOS. In recent years, with the current low-cost flights, specific and tangible services are still an important basis for airlines to enjoy a competitive advantage (Nagar, 2013). 2) In addition to paying special attention to Aviation safety, airline companies also need to use empathy to understand the real needs of their customers, meanwhile taking the initiative to provide the services required for passengers. Therefore, in terms of the management of the aviation industry, the ticketing service and waiting procedures should be simplified. Airline companies should always put themselves in the position of the customer when providing a service. In the face of a complaint, prompt measures should be taken to deal with complaints and commitments should be made. However, it should be emphasized that these measures are just the basic services, which are not competitive and cannot help effectively improve the QOS in customers' minds. However, if these basic services are ignored or cancelled, such as the results of this study *C8 Providing catering on board*, *C11 Counter personnel attitude (ticket reservation)*, and *C7 Convenience of carrying baggage*, an airline may be stricken by customer complaints. Therefore, these services are preserved by all airlines, and the focus should be put on how to leave a deep impression with customers. This is the true meaning of service quality. 3) In terms of subtle services, resources for maintenance still need to be invested in order to ensure an effective operation, and the cost involved in this process will eventually be reflected in the final ticket price. Therefore, it is really worth pondering about how to maintain a low-cost and competitive service for an airline. The quality of the personnel is still the basis of service quality that can ensure competitiveness (Wittman and Swelbar, 2013). Therefore, ways to maintain customer satisfaction include the selection and appointment of the right people and giving them professional training, encouraging staff to maintain a cordial smile and to show empathy. Additionally, finding the right people can reduce recruitment costs and mobility, and improve employees' job satisfaction and performance (Bamber *et al*., 2009). These methods are worth using as a reference by the management staff of the aviation industry.

This paper attempted to contribute to the development of a holistic framework that effectively investigates the causal relationship and the degree of association between each criterion. The causal diagram produced from our study provides assessment criteria for aviation industries to fulfill service quality of the customers. The findings of this study, moreover, provide a foundation for further research, with the goal of more deeply investigating issues surrounding the quality of aviation service solutions. The findings also offer a meaningful base for airlines managers to deepen their understanding with regard to airlines service quality.

However, some limitations remained in the study. The sample size is small and is, therefore, of somewhat limited statistical significance. A larger sample size is suggested in future research. We did not distinguish domestic and international respondents and those with other travel purposes, bias might have occurred from the recruitment.

Suggestions for further research include that the sampling group to be expanded in order to understand the differences between domestic tourists and interna-

tional tourists, and the differences in airline QOS evaluation standards when they employ different prices for the cabin classes. According to this research, more thoughts can be devoted to exploring the feasibility of transforming and assessing low-cost airlines. For example, the resources devoted by the aviation industry are not consistent with the cost-effectiveness output after reaching satisfaction to meet customer demands. In addition, this study found that the service quality does not directly affect the main evaluation criteria of the customer's later flight selection. In other words, the aviation industry must invest resource costs to maintain service quality because this truly influences customer satisfaction, and customer satisfaction may further affect the willingness to take the next flight. The result of this speculation still needs to be verified. We recommend follow-up studies on customer satisfaction, lower ticket prices, more appropriate flight schedules, and better brand image (Steven *et al*., 2012), exploring whether these elements influence customers' willingness on airlines selection. Therefore, future research may apply the KANO two-dimensional quality model (Kano *et al*., 1984) or the three-factor theory of customer satisfaction (Fuller and Matzler, 2008) to mutually authenticate and compare the differences of this study.

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