Enhancing Airport Service Quality: A Case Study of Kaohsiung International Airport

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Abstract: Passenger traffic at Kaohsiung International Airport in Taiwan has seen a steady decline in the past few years due to several effects, including the establishment of the Taiwan High Speed Rail, and industry moving abroad. Because economic conditions have improved to some degree, and the Taiwanese government has permitted Chinese tourists to visit Taiwan and has allowed cross-strait direct flights, passengers are increasing. Therefore, the airport's priority should be promoting its service quality and environment. This study analyzed the importance and satisfaction of domestic and international tourists using questionnaires, and further applied an importance-performance analysis (IPA) to assess priority services that need improvement and to provide appropriate advice. The results showed that the priority services that must be improved comprise ground transportation, complaint handling, health center, speed of baggage claim, and comfort of the terminal.

Keywords: International Airport, Service Quality, Satisfaction, Importance-Performance Analysis

1. INTRODUCTION

Passenger satisfaction is a key performance indicator for airport operations. International airports located in different regions or countries by and large do not compete with one another. Passengers often do not have a choice between airports, regardless of price and quality levels of airport services. In other words, passenger demand for airport services is likely to be relatively inelastic (Doganis, 1992). This is particularly the case for international airports in the Asia-Pacific region, where only one major gateway airport is available for international travelers in some countries. However, international travelers' impressions of a particular country are frequently affected by their first and last encounters at the gateway airport. Thus,

the evaluation of passenger satisfaction levels on airport services has become an important issue in airport management.

Kaohsiung International Airport (KIA) is the transport hub for Southern Taiwan and has the geographical advantages of being near Kaohsiung City, Kaohsiung Harbor, and Southeast Asia. To promote tourism, the Taiwanese government has recently permitted direct flights between Taiwan and China, as well as permitting Chinese tourists to visit Taiwan. This has contributed to the development of KIA by bringing passengers and boosting cultural tourism and the formation of several industrial clusters in the South Taiwan Economic Park (e.g., an export processing zone, multifunctional commerce park, Kaohsiung Software Technology Park, and Kaohsiung Science Park). Thus, it is worth investigating how to utilize this opportunity and how to expand the scope of services to ensure KIA's competitive advantages. Given the increasing passenger demand, it is critical to prepare the terminals at KIA for meeting various passengers' needs. The airport, however, has experienced little growth in the number of domestic passengers. Therefore, the airport should focus on enhancing its service quality and services that passengers are not satisfied with to increase passenger satisfaction and attract passengers and more flights from airlines.

Earlier studies of airport service levels focused on operational standards defined by queuing time, service lead time, space, physical facilities, and so on. However, there is a move towards a more passenger-orientated mindset, which is a welcome change for today's highly competitive air transport market. The overall airport experience perceived and recollected by international travelers may have a significant impact by either promoting or discouraging the further development of international tourism and business activities in the corresponding country. Stronger consumer awareness means that passengers pay more attention to the details of services. They tend to have a negative view of an airport if it fails to perform well or makes a mistake. The fact that they do not hesitate to complain to the media is harmful to the airport's reputation. Therefore, airport operators must constantly evaluate their facilities and service processes to better meet passenger needs.

This study makes suggestions for effective improvements in operations management at KIA based on analyses to enhance operational performance and business revenues. This study focuses on evaluating the service quality at KIA to determine its weaknesses and generate suggestions for improvement. Surveys were conducted on domestic and international passengers through questionnaires concerning their satisfaction and perceived level of importance regarding the quality of the airport's services. The questionnaire provided information on passengers' needs and the gap between their expectations and the airport's performance. An importance-performance analysis (IPA) was conducted to determine which service attributes were in the "concentrate here" and "low priority" categories and were in need of improvement.

2. KAOHSIUNG INTERNATIONAL AIRPORT AND LITERATURE REVIEW

2.1 KIA's Historical Background and Development

KIA is an air transportation hub in Southern Taiwan. It was initially established during the Japanese colonial era, and after retrocession in 1945, it became a training base for the Air Force. In 1965, the Civil Aeronautics Administration took control and began offering domestic air transportation services to the public, and international airfreight services were launched in 1969. In 1972, the Domestic Terminal was completed and international passenger service began as well. But it was the opening of the International Terminal in January 1997 that marked the completion of the airport's core infrastructure.

KIA covers an area of 244 hectares, approximately a one-fifth the size of Taoyuan International Airport (TIA), and includes one domestic terminal and one international terminal. Its current facilities and capacity are shown in Table 1. Because Northern Taiwan is a larger air passenger market, TIA remains Taiwan's predominant airport and caters to cross-continent flights, whereas KIA is positioned as the key airport for Southern Taiwan, handling cross-strait flights and supporting TIA. Therefore, KIA pursues exquisite services and moderate size rather than facility maximization. Until 2011, five airlines, TransAsia Airways, Uni Air, Mandarin Airlines, Far Eastern Air Transport, and Daily Air, operated domestic flights at KIA and accounted for nearly 60 flights and 3,000 passengers per day. There are 11 international airlines at KIA, including China Airlines, EVA Air, TransAsia Airways, Mandarin Airlines, Uni Air, Japan Airlines, Dragon Air, Vietnam Airlines, Air Macau, Malaysia Airlines, and Xiamen Air. These mainly operate short and medium-haul flights and account for approximately 57 flights and 8,000 passengers per day.

KIA experienced drastically reduced numbers of domestic and international passengers between 2003 and 2009 because of the 2003 SARS epidemic, the 2007-2009 financial crisis, and the 2007 establishment of the Taiwan High Speed Rail, which particularly affected the number of domestic passengers. Airlines only operate domestic charter flights to Taiwan's offshore islands, including Kinmen and Penghu, after the introduction of High speed Rail in 2007. On average, there are 60 flights and 3,000 passengers per day. The number of passengers began to show a gradual increase in 2011 following the economic recovery and the increasing numbers of cross-strait flights and flight destinations. The numbers of international and domestic inbound and outbound passengers in 2011 were 2,882,354 and 1,168,059, respectively, and increased by 285,245 (10.98%) and 104,145 (9.79%) compared to 2009 (as shown in Fig. 1). Overall, KIA's total number of passengers plummeted from its peak of 12,128,704 in 1997 to merely 3,661,023 in 2009, a total decline of 70%, and although this trend has begun to reverse since 2010.
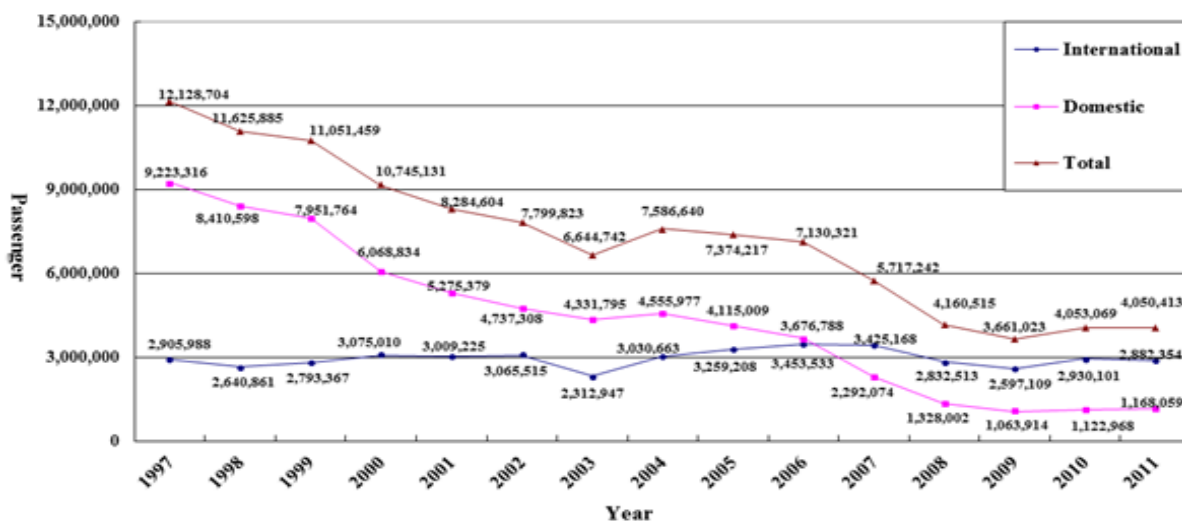
Figure 1. Trend in the number of passengers at KIA between 1997 and 2011

Table 1. KIA's facilities and capacity

Facility	Capacity	
Runway	Length	3,150 m
	Width	60 m
	Capacity for Takeoff and Landing	34/hr
	Type of Aircraft for Takeoff and Landing	B747
Apron	Area	414,835 m^2
	Parking bays	45
Domestic Terminal	Area	17,500m^2
	Capacity of passengers/year	5,400,000
	Gate	8
	Check-in counter	2
International Terminal	Area	70,985m^2
	Capacity of passengers/year	6,300,000
	Boarding gates and bridges	12/16
	Check-in counter	80
Cargo Terminal	Area	16,813 m^2
	Capacity of cargoes per year	21,000 tons
Maintenance Hangar	Kaohsiung International Airport	7,056 m2
	UNI AIR	2,372 m2
Parking Lots	Bus	25
	Sedan	994
	Handicapped Vehicle	33
	VIP	20

Source: Kaohsiung International Airport, 2012.

In 2011, the airport served 2.8 million passengers on international flights, showing a decrease of 47,747 passengers from 2010, down 1.6%. However, domestic flights had 1.1 million passengers, indicating an increase of 45,091 passengers from 2010, up 4.0%.

2.2 Airport Service Quality

Service quality as perceived by customers is a comparison between expectations and performance (Parasuraman, Zeithaml, & Berry, 1985). Grönroos (1990) stated that the overall perception of service quality is the gap between customers' expectations and actual experiences. Service quality is perceived as being good when a customer's experience equals their expectation. In summary, service quality is a comparison between customer expectations and experiences and is measured by the performance of service delivery.

SERQUAL, a service quality framework developed by Parasuraman, Zeithaml, and Berry (1988), is measured by five aspects of service quality and remains widely used because of its good reliability and validity and low repetition. These five aspects are tangibles, reliability, responsiveness, assurance, and empathy. Tangibles refer to visible modern facilities and equipment as well as the appealing, neat, and clean appearance of buildings, decorations and staff. Reliability means the ability to provide reliable and accurate services as promised. Responsiveness refers to staff's willingness to help customers and provide services with quick responses. Assurance indicates that staff have the professional knowledge of services and behave kindly and courteously to win customers' trust and confidence. Empathy means that the staff pays attention to, and takes care of, individual customers.

Martilla and James (1977) first introduced Importance-performance analysis (IPA) to investigate the service quality of an automobile dealer based on the importance and performance of its facilities. Easingwood and Arnott (1991) suggested that by substituting suitable measures, the IPA technique can be used to investigate the relationship between customers' perceived importance and a firm's current level of performance. Tam and Lam (2004) employed the IPA technique to investigate the relationship between the weights and visibility indexes of terminal facilities, and to identify facilities requiring wayfinding improvements.

Yeh and Kuo (2003) presented a fuzzy multi-attribute decision making approach for evaluating passenger service quality at 14 major Asia-Pacific international airports via surveys. The approach provided an effective alternative to performance evaluation of airport services involving subjective assessments of qualitative attributes. Fodness and Murray (2007) developed a self-report scale to measure passenger expectations of airport service quality, to test dimensionality and to evaluate scale reliability and validity. The results showed that passenger expectations of airport service quality were a multidimensional, hierarchical construct that included three key dimensions: function, interaction and diversion. Park (2007)

investigated air passengers' perceptions of 11 factors that may influence their buying behavior. Analysis of variance and an independent sample t-test were applied to data collected from Korean and Australian international air passengers. The results revealed that passenger perceptions are significantly different across airlines, seat classes, and usage frequencies.

The development of level of service (LOS) measures for airport passenger terminals has been a major issue for airport operators in the last decades. Thorough reviews of past research on LOS included those of the Airports Council International (2000), Yen *et al*. (2001), Correia and Wirasinghe (2007), and Correia *et al*. (2008). The analysis of the surveys developed by these papers suggested application of the following variables at the overall level: waiting time, processing time, walking time, walking distance, level changes, orientation/information, space availability for passengers, space availability for cars at the curbside, and number of seats. It is possible to measure some of these criteria (e.g., waiting time, walking distance, punctuality). However, the measurement of subjective criteria (e.g., overall attitude of staff, airport security, etc.) is complex. Conversely, the application of a multi-attribute model to evaluate the overall LOS demands the selection of the most crucial attributes. It is not feasible to employ too many variables because the data needs must be extremely high to validate such a model with a high level of significance.

Airport service quality that meets customer needs and expectations is key to successful business operations. Quality customer service entails positive perceptions, thereby increasing non-aeronautical revenues and reducing the percentage of aviation charge. The Airports Council International (ACI) initiated its Airport Service Quality Program (ASQ) in 2006 to assist airports in establishing standards and indices for evaluating service quality and to stimulate their continuous development. The ACI's ASQ questionnaire (2011) is shown in Table 2. These service attributes are the activities that passengers may encounter during the process of arriving and leaving an airport. The ASQ analysis can examine each part of the service process and the gaps between service performance and passenger satisfaction, which helps construct strategies for improvement and problem shooting.

Skytrax (2011) divides airport service quality evaluations into six dimensions: website design, ground transport, security and immigration service, passenger arrivals, departure and transit, terminal comfort and terminal facilities, and shopping, food and beverage. The "The Guide to Sleeping in Airports" website offers an online open-ended questionnaire (2012) for airport passengers and includes questions such as "What is the best (worst) airport in Asia?," "What makes this the best (worst) airport?," and "How could your best (worst) nominee improve?" For instance, the winner of the 2011 survey was Singapore's Changi Airport. In addition to the items in its general evaluation, the website lists comments from its users and the special features of this airport, such as the Airport Lounge, Airport Hotel, and entertainment facilities.

Table 2. ACI'S ASQ questionnaire

Categories	Items
Access	1.Ground transportation to/ from airport 2.Parking facilities 3.Value for money of parking facilities 4.Availability of baggage carts/ trolleys
Check-in	1.Waiting time in check-in queue/ line 2.Efficiency of check-in staff 3.Courtesy and helpfulness of check-in staff
Passport/ personal ID control	1.Waiting time at passport/ personal ID inspection 2.Courtesy and helpfulness of inspection staff
Security	1.Courtesy and helpfulness of security staff 2.Thoroughness of security inspection 3.Waiting time at security inspection 4.Feeling of being safe and secure
Finding your way	1.Ease of finding your way through airport 2.Flight information screens 3.Walking distance inside the terminal 4.Ease of making connections with other flights
Airport facilities	1.Courtesy and helpfulness of airport staff (excluding check-in, passport control and security) 2.Restaurant/ eating facilities 3.Value for money of shopping facilities 4.Availability of bank/ ATM facilities/ money changers 5.Shopping facilities 6.Value for money of restaurant/ eating facilities 7.Internet access/ Wi-Fi 8.Business/ executive lounges 9.Availability of washroom/ toilets 10.Cleanliness of washroom/ toilets 11.Comfort of waiting/ gate areas
Airport environment	1.Cleanliness of airport terminal 2.Ambience of the airport

Source: Airport Council International, 2011.

Because passengers are airports' main customers and their first impressions of airport facilities and services may influence their feelings toward and evaluations of airports, it is essential for airports to provide services with safety, comfort, and convenience in an economic manner (Martin-Cejas, 2006). For instance, Incheon International Airport and Changi Airport, the frequent top rankers in the ASQ survey by ACI, both provide the best facilities and services from customers' and airlines' perspectives, feature enhanced staff training, and make necessary equipment and resources available to their staff.
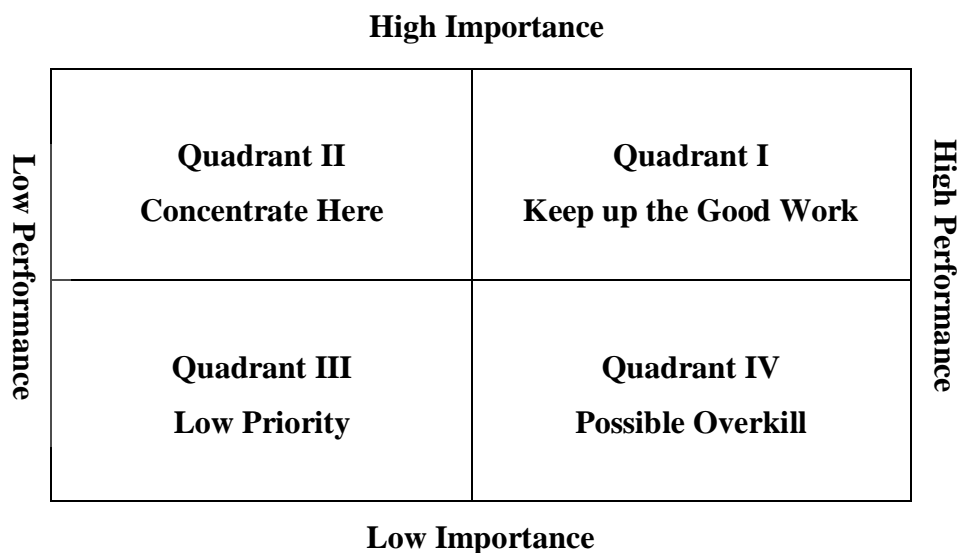
3. METHODOLOGY

3.1 Questionnaire Design

This study conducted a questionnaire survey on domestic and international passengers. The questionnaire was divided into two primary parts. The first part asked passengers for their background information, and the second part asked them to rate the importance of, and their satisfaction with, each service attribute. The six service dimensions in the questionnaire were designed according to the service dimensions and attributes in the ASQ questionnaire and the actual services in KIA's domestic and international terminals and included *ground transportation*, *check-in services*, *departure security inspection*, *signs and information*, *airport services and facilities*, and *arrival services*. These were selected in accordance with the service attributes provided by several organizations that evaluate and rank the service quality of international airports, such as ACI and Skytrax. These six dimensions comprised 42 service attributes in the questionnaire for the international terminal. The questionnaire for the domestic terminal was modified by excluding the dimension *arrival services* because it differed from the international terminal because it has both arrival and departure services on the same floor. Thus, the questionnaire modified for the domestic terminal contained five dimensions and comprised 38 service attributes.

A 5-point Likert scale was applied to the questionnaire to investigate passengers' perceptions of the airport's services. For importance ratings, 1 and 5 represented extremely unimportant and extremely important, respectively. On a scale of 1 to 5 for satisfaction ratings, 1 and 5 represented extremely dissatisfied and extremely satisfied, respectively.

3.2 Importance-Performance Analysis

This study used the IPA to prioritize the list of services that needed improvement. IPA is a multi-attribute evaluation method that arranges the attributes of service quality on the Y and X axes according to their importance and performance (in this case, passenger satisfaction) perceived by customers and divides them into quadrants. Quadrant I represents "keep up the good work," which identifies attributes that are rated high in both importance and satisfaction and to which the airport management should maintain the same level of attention. Attributes in Quadrant II, termed "concentrate here," have high importance but low performance ratings and are problem areas that should be addressed as high priorities. Attributes rated low in both importance and low satisfaction appear in Quadrant III are "low priority." These attributes should be improved as well, but are of a lower priority than those in the "concentrate here" quadrant. Quadrant IV represents "possible overkill," where attributes have low importance but high performance ratings, indicating possible unnecessary concern by airport officials

(See the Figure 2). IPA is used to determine the service attributes that passengers perceive as being important but are dissatisfied with. The results determine the priority of each attribute that is in need of improvement.

High Importance

Quadrant II **Concentrate Here**	**Quadrant I** **Keep up the Good Work**
Quadrant III **Low Priority**	**Quadrant IV** **Possible Overkill**

(Left axis: **Low Performance** — Right axis: **High Performance**)

Low Importance

Source: Martilla and James (1977)

Figure 2. Importance-performance analysis framework

4. RESULTS AND DISCISSION

4.1 Questionnaire Analysis

The questionnaire survey was conducted between October 27 and November 10, 2011. The survey was timed to coincide with the opening hours of Kaohsiung International Airport. The sample distribution reflects that the samples were taken proportionally to airline passenger volume in order that the sampling results represent all passengers. Target respondents were air passengers waiting at their boarding gates. As it took on average 5 minutes to complete the questionnaire, seated passengers were selected for the interview, allowing their completion of the questionnaire in a comfortable way. Since air passengers should be at their boarding gates at least 20 minutes before the scheduled departure times, the selected passengers should have had sufficient time to complete the questionnaire. This sampling method ensured that the respondents had already completed the departure procedures, and had adequate time to provide feedback on the departure aids that they had used on the way from the terminal entrance to their boarding gates. Among the 200 and 500 questionnaires randomly distributed to domestic and international passengers, 153 and 405 valid questionnaires were collected, respectively. The background information that each respondent was asked to provide included gender, age, education, occupation, monthly income, and purpose and frequency of air travel

(see Table 3).

Table 3. Respondent data of domestic and international flight passengers

Categories		Domestic passengers		International passengers	
		No. of respondents	Ratio (%)	No. of respondents	Ratio (%)
Gender	Male	76	50.0	241	60.1
	Female	76	50.0	160	39.9
Age	Under 20	10	6.7	8	2.0
	21-40	72	48.0	202	50.4
	41-60	61	40.7	160	39.9
	Above 61	7	4.6	31	7.7
Education	Senior high or under	60	40.3	110	27.4
	Bachelor	76	51.0	229	57.1
	Master/Doctor	13	8.7	54	13.5
Monthly	Under 30,000	51	35.9	102	26.3
Income (NT)	30,001-50,000	47	33.1	115	29.6
	50,001-70,000	24	16.9	86	22.2
	Above 70,001	20	14.1	85	21.9
Purpose	Home	40	26.3	29	7.2
	Travel	46	30.3	234	57.9
	Business	26	17.1	124	30.7
	Commute/Study	13	8.6	0	0.0
	Others	27	17.7	17	4.2
Frequency	Once	32	21.2	138	34.6
(per year)	2-3 times	57	37.8	132	33.1
	4-5 times	18	11.9	49	12.2
	More than 6 times	44	29.1	80	20.1

4.2 Importance and Satisfaction Analysis

4.2.1 Domestic passengers

The questionnaire for domestic passengers contained five dimensions regarding pre- and post-boarding services, including *ground transportation*, *check-in services*, *departure security inspection*, *signs and information*, and *airport services and facilities*, which were further divided into 38 attributes.

The three attributes rated highest in importance by the respondents were cleanliness of the terminal, cleanliness of the restrooms, and accuracy of flight information. The result

showed that the respondents were more concerned with *signs and information*, and *airport services and facilities*. In contrast, the three lowest rated attributes were massage services, parking rates, and taxi services. Because the waiting time for boarding is short for domestic passengers, massage services were of lower importance.

The attributes that were rated high in satisfaction by the respondents, as shown in Table 4, were, in descending order, waiting time at passport/ID inspection, cleanliness of the terminal, and courtesy and helpfulness of the check-in staff. The results showed that the respondents found security inspection and cleanliness in the domestic terminal satisfactory.

Table 4. Importance and satisfaction ratings of services by passengers

No.	Services Dimensions/Attributes	International		Domestic	
		I-Mean	S-Mean	I-Mean	S-Mean
I1	**Ground transportation**	**4.02(6)**	**3.55(6)**	**4.07(5)**	**3.53(5)**
1	Convenience of ground transportation to/from the airport	4.37(12)	3.72(32)	4.34(10)	3.81(21)
2	Parking availability	4.07(32)	3.61(37)	4.14(25)	3.65(28)
3	Parking charges	3.74(41)	3.26(40)	3.84(37)	3.21(35)
4	Taxi services	3.90(40)	3.62(35)	3.94(36)	3.46(32)
I2	**Check-in services**	**4.34(2)**	**3.99(1)**	**4.38(1)**	**3.94(2)**
5	Check-in queuing time	4.27(23)	3.94(15)	4.33(14)	3.87(14)
6	Efficiency of check-in staff	4.34(15)	3.99(9)	4.38(8)	3.95(7)
7	Courtesy and Helpfulness of check-in staff	4.42(6)	4.06(4)	4.43(6)	3.99(3)
I3	**Departure security inspection**	**4.33(3)**	**3.98(2)**	**4.26(2)**	**3.95(1)**
8	Waiting time at passport/ID inspection	4.26(24)	3.98(11)	4.22(21)	4.04(1)
9	Waiting time at security inspection	4.28(21)	4.05(5)	4.20(22)	3.98(4)
10	Attitude of inspection staff	4.31(16)	3.97(12)	4.25(20)	3.86(16)
11	Thoroughness of security inspection	4.42(7)	3.93(18)	4.34(11)	3.93(8)
12	Feeling of safety and security during security inspection	4.40(10)	3.96(13)	4.28(19)	3.92(10)
I4	**Signs and information**	**4.22(4)**	**3.86(4)**	**4.25(3)**	**3.79(3)**
13	Clearness and accuracy of signs	4.44(5)	3.94(16)	4.45(4)	3.84(18)
14	Attractiveness of signs	4.01(36)	3.77(28)	4.03(34)	3.63(30)
15	Accuracy of flight information	4.49(2)	4.04(6)	4.46(3)	3.93(9)
16	Walking distance to the waiting lounge	4.01(37)	3.84(24)	4.07(28)	3.80(23)
17	Clear broadcasting of boarding and flight information	4.35(13)	3.89(20)	4.38(9)	3.91(11)
18	Provision of tourism information	3.99(38)	3.67(34)	4.12(26)	3.66(26)
I5	**Airport services and facilities**	**4.17(5)**	**3.77(5)**	**4.20(4)**	**3.64(4)**
19	Quality and prices of food and beverages	4.04(35)	3.24(41)	4.07(29)	2.95(36)
20	Attitude of food and beverage service staff	4.11(30)	3.57(38)	4.07(30)	3.31(33)
21	Availability and variety of food and beverage	3.98(39)	3.24(42)	4.04(33)	2.93(37)

22	Variety of shops and prices	4.06(33)	3.34(39)	4.05(32)	2.88(38)
23	Attitude of shop staff	4.16(28)	3.77(29)	4.10(27)	3.31(34)
24	Availability of banking, ATM, and money changing services	4.22(25)	3.84(25)	4.30(16)	3.84(19)
25	Availability and comfort of seats	4.12(29)	3.90(19)	4.17(24)	3.87(15)
26	Massage services	3.29(42)	3.62(36)	3.53(38)	3.65(29)
27	Wi-Fi access	4.22(26)	3.75(31)	4.00(35)	3.70(25)
28	Availability and convenience of restrooms	4.40(11)	4.03(7)	4.45(5)	3.96(6)
29	Cleanliness of restrooms	4.50(1)	4.07(2)	4.50(2)	3.98(5)
30	Cleanliness of the terminal	4.47(3)	4.08(1)	4.52(1)	4.00(2)
31	Services for disabled passengers	4.30(17)	3.84(26)	4.33(15)	3.90(12)
32	Availability and convenience of trolleys	4.29(19)	3.99(10)	4.41(7)	3.85(17)
33	Nursery room	4.10(31)	3.86(22)	4.19(23)	3.83(20)
34	Health center	4.19(27)	3.85(23)	4.29(18)	3.80(24)
35	Information desks	4.28(22)	3.96(14)	4.34(12)	3.88(13)
36	Cell phone charging facilities	4.05(34)	3.70(33)	4.07(31)	3.66(27)
37	Comfort of the terminal	4.29(20)	3.88(21)	4.30(17)	3.81(22)
38	The efficiency of complaint handling	4.30(18)	3.81(27)	4.34(13)	3.59(31)
I6	**Arrival services**	**4.40(1)**	**3.94(3)**		
39	Passport/ID inspection upon arrival	4.45(4)	4.07(3)		
40	Attitude of inspection staff upon arrival	4.41(8)	4.00(8)		
41	Speed of baggage claim	4.35(14)	3.76(30)		
42	Customs inspection	4.41(9)	3.94(17)		

Note: I-Mean and S-mean stand for importance-mean and satisfaction-mean. Mean scores were calculated according to a 5-point scale (1 = very unimportant /unsatisfactory to 5 = very important/satisfactory)

In contrast, the three attributes rated lowest in satisfaction were variety of shops and prices, availability and variety of food and beverages, and quality and prices of food and beverage. These results reveal that the respondents were less satisfied with the airport's food and beverage services, as well as the prices and product variety in the shops.

4.2.2 International passengers

The questionnaire for international passengers contained six dimensions regarding pre- and post-boarding services, *ground transportation*, *check-in services*, *departure security inspection*, *signs and information*, *airport services and facilities*, and *arrival services*, which were further divided into 42 attributes. As shown in Table 4, the three services rated most important by the respondents were the cleanliness of restrooms, accuracy of flight information, and cleanliness of the terminal, which had a means value of more than 4.4. These results

indicate that the respondents considered environment cleanliness and the accuracy of flight information to be more important. In contrast, what they considered least important were massage services, parking charges, and taxi services.

The respondents were most satisfied with the cleanliness of the terminal, cleanliness of restrooms, and passport/ID inspection upon arrival. Those they were least satisfied comprised the availability and variety of food and beverages, quality and prices of food and beverage, and parking charges. These results show that the respondents were less satisfied with the airport's food and beverage services as well the prices and staff's attitude in shops. They were especially dissatisfied with the speed at which the airport handled and responded to complaints. Therefore, the airport should pay more attention to the efficiency of complaint handling.

4.2.3 Comparison of importance of and satisfaction with airport services perceived by domestic and international travel respondents

Among all of the service dimensions, the domestic travel respondents considered *check-in service* to be most important and *departure security inspection* to be most satisfactory, and *ground transportation* to be least important and least satisfactory. Their international counterparts found *arrival service* most important and *check-in service* most satisfactory, and shared the same view of *ground transportation*.

Among all of the attributes, the three attributes that both the domestic and international travel respondents considered most important were cleanliness of restrooms, accuracy of flight information, and cleanliness of the terminal. This shows that both groups were most concerned with the cleanliness of the airport, the accuracy of flight information and signs inside the airports, and the attitude of check-in staff. In contrast, both groups were less concerned with massage services. In terms of satisfaction, the two groups differed and were satisfied with different services. Both groups were similarly less satisfied with the variety of shops and prices, number and variety of food and beverage services, quality and prices of food and beverage, and parking charges. This clearly indicates that food and beverage services must be enhanced.

4.3 Analysis of Differences in Satisfaction Levels Regarding Various Services for Different Traveler Types

To investigate whether there were significant differences between the satisfaction levels of different traveler types regarding KIA, this study used a t-test and one-way analysis of variance (ANOVA) to conduct differential testing. When a satisfaction measurement dimension for different traveler types reached a significant difference ($P<.05$), a Scheffe post

hoc test was used to determine the differences between varying traveler types. The following description focuses on the differences.

For domestic passengers, there were no significant differences regarding satisfaction level toward KIA in regards to gender, age, and monthly income. Only the purpose and frequency of air travel categories reached the significant difference threshold. Regarding purpose, there were significant differences in service satisfaction levels regarding ground transportation, check-in service, and airport service and facilities, among which, passengers who flew for travel purposes demonstrated higher values than those who flew for business purposes." For the frequency of air travel category, those who reported flying two to five times per year had a significantly higher satisfaction level regarding check-in service and airport service and facilities than those who reported flying 6 or more times per year. The results are shown in Table 5.

For passengers on international flights, there were significant differences in satisfaction level for gender in regards to check-in service, as shown in Table 5. Male passengers'' average satisfaction level was 4.05, greater than female travelers' 3.90. In the age category, different age groups had significantly different satisfaction levels toward ground transport, airport service and facilities, and arrival service. In the arrival service dimensions, passengers below the age of 30 had a significantly higher satisfaction level than did travelers 51 years or older. For different income group travelers, there were significant differences regarding ground transportation satisfaction level. Those who had a monthly income below 30K NTD showed a significantly higher satisfaction level than those who had a monthly income between 30 and 60K, as well as those above 60K NTD.

Additionally, passengers with different purposes for flying showed a significant difference in satisfaction level regarding ground transportation and airport services and facilities. Travelers with "other" purposes for flying demonstrated a significantly higher satisfaction level than did business travelers. Finally, passengers with different frequencies of air travel had significantly different satisfaction levels regarding airport service and facilities and arrival service. Passengers who reported flying once a year showed a significantly higher satisfaction level toward airport services and facilities than did those who reported flying two to five times a year, or more than six times per year. In the arrival service dimension, passengers who reported flying once a year showed a significantly higher satisfaction level than did those who reported flying two to five times a year. These analysis results can be provided to airport managers, who should first develop an understanding of what types of travelers had lower satisfaction levels in which services and their recommendations for improvement, and then make improvements by focusing on travelers' needs to achieve more optimal results.

Table 5. ANOVA analysis of satisfaction in service dimensions among the different traveler types

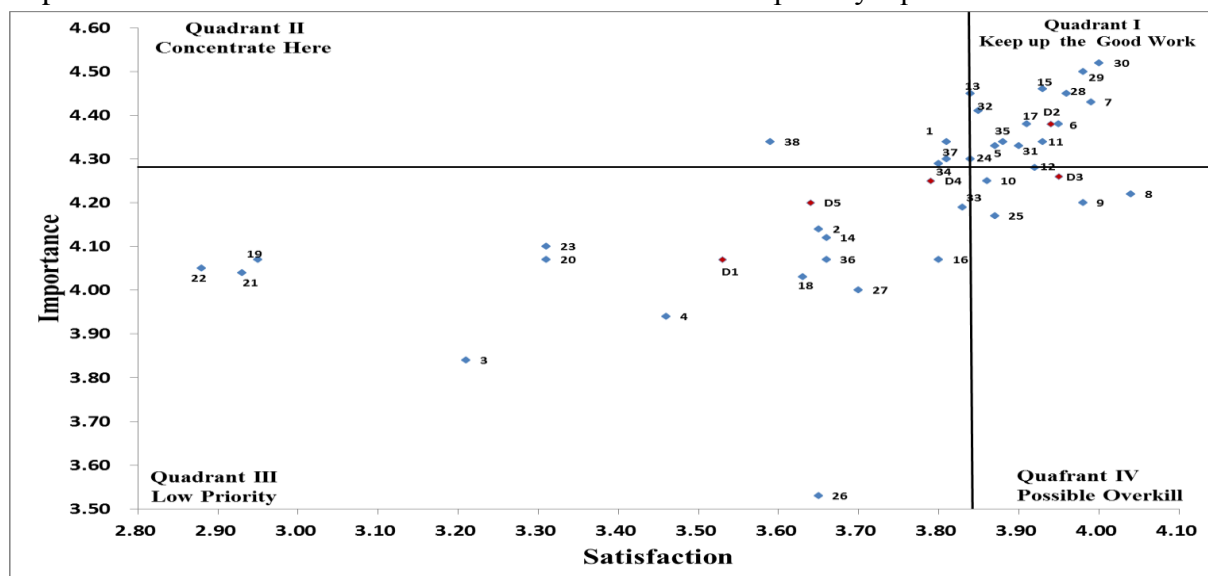| Categories	International passengers						Domestic passengers				
	I1	I2	I3	I4	I5	I6	D1	D2	D3	D4	D5
Gender											
Male(1)	3.53	4.05	4.00	3.84	3.78	3.95	3.53	3.97	3.97	3.80	3.70
Female(2)	3.58	3.90	3.94	3.87	3.74	3.93	3.54	3.91	3.91	3.79	3.58
T value	-0.995	2.66	1.026	-0.59	0.82	0.26	-0.13	0.53	0.59	0.19	1.46
P value	0.32	**0.01***	0.31	0.56	0.42	0.80	0.90	0.60	0.56	0.85	0.15
Age											
Under 30(1)	3.64	4.01	3.97	3.92	3.83	4.06	3.57	3.97	3.98	3.82	3.69
31-50(2)	3.49	3.99	3.97	3.82	3.71	3.89	3.51	3.88	3.93	3.79	3.57
Above 51(3)	3.62	3.99	3.99	3.87	3.83	3.96	3.54	3.98	3.95	3.80	3.66
F value	4.02	0.07	0.05	0.95	4.52	3.20	0.14	0.36	0.07	0.05	0.80
P value	**0.02***	0.93	0.95	0.39	**0.01***	**0.04***	0.87	0.70	0.93	0.95	0.45
Scheffe						1>2					
Monthly income (NT$)											
Under 30,000(1)	3.68	4.05	4.01	3.94	3.85	4.05	3.56	4.04	3.96	3.78	3.68
30,001-60,000(2)	3.52	3.98	3.99	3.82	3.75	3.93	3.51	3.85	3.95	3.81	3.62
Above 60,001(3)	3.50	4.01	3.98	3.86	3.74	3.88	3.45	3.89	3.92	3.67	3.53
F value	4.69	0.55	0.11	1.46	2.52	2.70	0.34	0.99	0.06	0.66	0.75
P value	**0.01***	0.58	0.90	0.23	0.08	0.07	0.72	0.38	0.95	0.52	0.48
Scheffe	**1>2,3**										
Purpose											
Travel(1)	3.57	3.97	3.96	3.86	3.77	3.94	3.68	4.10	4.10	3.92	3.76
Business(2)	3.45	4.00	3.96	3.80	3.70	3.91	3.30	3.67	3.72	3.64	3.45
Other(Home/study)(3)	3.74	4.09	4.12	3.97	3.90	4.03	3.52	3.94	3.93	3.76	3.63
F value	5.77	0.80	1.74	1.75	4.10	0.74	3.84	3.24	2.91	2.21	3.09
P value	**0.00****	0.45	0.18	0.18	**0.02***	0.48	**0.02***	**0.04***	0.06	0.11	**0.05***
Scheffe	3>2				3>2		1>2	1>2			1>2
Frequency											
Once(1)	3.60	4.05	3.99	3.91	3.87	4.06	3.63	3.97	4.02	3.81	3.63
2-5 times(2)	3.55	3.97	3.97	3.81	3.72	3.88	3.60	4.05	4.00	3.84	3.71
More than 6 times(3)	3.50	3.96	4.00	3.87	3.77	3.91	3.36	3.70	3.78	3.68	3.47
F value	1.07	0.86	0.10	1.28	6.17	4.39	3.10	3.50	2.14	1.18	3.33
P value	0.34	0.42	0.90	0.28	**0.00****	**0.01***	**0.05***	**0.03***	0.12	0.31	**0.04***
Scheffe					1>2,3	1>2		2>3			2>3

Note: *p < 0.05, **p < 0.01

4.4 The Results of IPA

4.4.1 IPA of service quality perceived by doemetic travel respndents

Following the importance-performance analysis proposed by Martilla and James (1977), we plotted the importance and performance ratings of those service attributes in a 2D grid with the vertical axis denoting importance ratings and the horizontal axis denoting performance ratings.

According to the median importance rating of 4.28 and median satisfaction rating of 3.84, the grid was divided into four quadrants. They were, clockwise from the right, "keep up the good work," "concentrate here," "low priority," and "possible overkill." As shown in Figure 3, four attributes, including convenience of ground transportation to/from the airport, health center, comfort of the terminal, and the efficiency of complaint handling, were considered important but unsatisfactory, and thus are areas that should be improved first. In addition, 15 service attributes were perceived as important and satisfactory and should be maintained. There were four service attributes that were possible overkill. In other words, they were of low importance but had high satisfaction. Finally, 15 attributes of low importance and low satisfaction were classified in the "low priority" quadrant.

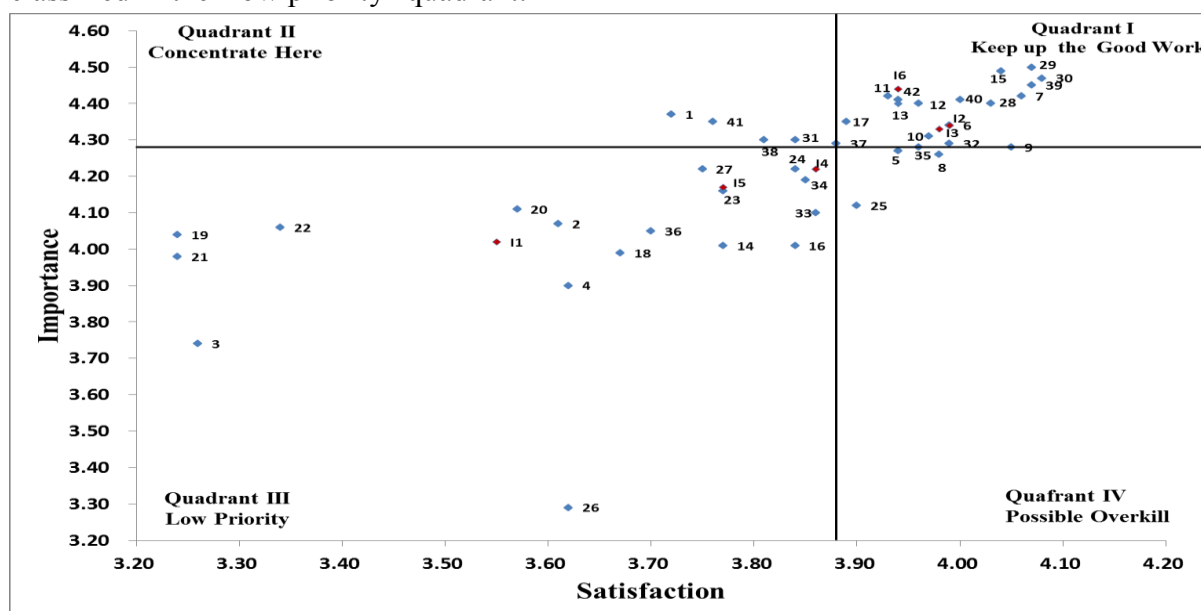Note: See Table 4 for what each item denotes

Figure 3. Importance-performance grid with attribute and dimension ratings for the domestic terminal

Dividing the 38 service attributes into five dimensions and showing them in a IP grid revealed that most of the attributes were satisfactory and only three dimensions—including *ground transportation*, *airport services and facilities*, and *signs and information*—were in the "low priority" quadrant. This means that, besides these three dimensions, the airport must improve its food and beverages services and the prices and staff attitudes in its shops to raise

the satisfaction of domestic passengers.

4.4.2 IPA of service quality perceived by international travel respndents

According to the median importance rating of 4.28 and median satisfaction rating of 3.88, the grid was divided into four quadrants. As shown in Figure 4, four attributes, including convenience of ground transportation to/from the airport, services for disabled passengers, the efficiency of complaint handling, and the speed of baggage claim were considered important but unsatisfactory, and thus are areas that should be improved first. In addition, 16 service attributes were perceived as important and satisfactory and must be maintained. There were five service attributes that were possible overkill. In other words, they were of low importance but had high satisfaction. Finally, 17 attributes with low importance and low satisfaction were classified in the "low priority" quadrant.

Note: See Table 4 for what each item denotes

Figure 4. Importance-performance grid with attribute and dimension ratings for the international terminal

Figure 3 shows that the three service dimensions of *arrival services*, *check-in services*, and *departure security inspection* fell into the "keep up the good work" quadrant. This means that the airport should accord high priority to the attitudes and efficiency of inspection staff to improve to raise passenger satisfaction. Those in the "low priority" quadrant were *signs and information*, *ground transportation*, and *airport services and facilities*. Although not rated high in importance, they are in need of improvement to raise overall satisfaction. For the signs at the airport, the airport should make signs clear and legible for both local passengers and foreign visitors, and airport information should be easy to obtain. As the numbers of independent travelers and backpackers increases, ground transportation is of vital importance.

In addition to reasonable parking charges, the airport should coordinate with public transport operators, such as Kaohsiung Rapid Transit and bus companies, to provide passengers with more convenient ground transportation by offering more bus trips, punctual service, and extended running times based on flight schedules.

5. CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

This study conducted a questionnaire survey on KIA's domestic and international passengers to investigate their perceptions of service quality at the airport and to indicate services that need improvement based on the results of IPA.

The domestic travel respondents were most satisfied with the waiting time at ID inspection, cleanness of the terminal, and courtesy and helpfulness of check-in staff. In contrast, they were least satisfied with *ground transportation*. The three attributes they rated low in satisfaction were variety of shops and prices, availability and variety of food and beverage services, and quality and prices of food and beverage. The survey revealed that the respondents were less satisfied with the variety and prices of the food and beverages and the shops at the airport. In addition, taxi services and parking charges in the domestic terminals require improvement. Four service attributes were in the "concentrate here" quadrant (Fig. 3) and should be accorded high priority for improvement to raise passenger satisfaction.

The international travel respondents were satisfied with the cleanliness of the terminal, cleanliness of restrooms, and passport/ID inspection upon arrival. In contrast, they were less satisfied with the availability and variety of food and beverage services, quality and prices of food and beverage, and parking charges. This indicates that the passengers were less than satisfied with the shops and food and beverage services at the airport and were least satisfied with the airport's speed of complaint handling. This means that the airport must focus more on the efficiency of compliant handling. Four service attributes fell into the "concentrate here" quadrant (Fig. 4) and were considered important but less satisfactory by the respondents. Because the number of independent travelers and backpackers is increasing, signs at the airport and ground transportation to/from the airport are of vital importance.

5.1 Suggestions

Modern airports have transcended convention and become diversified economic entities that not only have transport functions, but expand into peripheral businesses. Because more and more airlines are cutting their operating costs, airports must seek growth in non-aeronautical

and peripheral value-added services and create a comprehensive service supply chain. KIA should work with the local government on a win-win strategic plan regarding independent travel products for Chinese and other foreign passengers. It is possible to act rather than reacting to effectively change the dependence on the airlines' market mechanisms if the airport can combine the resources of airlines and the local tourism office, following the example of the tourist bus packages offered by major cities in Japan that have launched short-term compact bargains that feature Southern Taiwan.

Competition from the Taiwan High Speed Rail and the economic recession make airline operations increasingly difficult. Airlines must active communicate and coordinate, building consensus and creating a favorable environment to achieve wins for the airport, airlines and passengers. Airport officials should first improve services that either domestic or international passengers consider important. These measures include rebuilding the domestic terminal, partial expansion of the international terminal, and enhanced information system setup. Reducing queuing time, eliminating operation bottlenecks, planning clear traffic flows and signs, increasing the variety of business services and area, and providing better public facilities can raise overall service quality and offer comfortable and convenient services to passengers. Therefore, KIA should regularly participate in the ACI's assessment and conduct investigations into or consult with industry, governmental, and academic experts regarding certain issues to understand users' needs and view and develop a more comprehensive operation strategies.

Passenger perceptions and expectations of airport service are influence by not only demographic passenger characteristics but also by other factors such as flight (connections, flight length, time of departure, delays), carrier features, time of service, and duration at the airport. For example, service expectations of low-cost-carrier passengers may be different from those of full-service-carrier customers. The concept of environmental protection has received increasing attention in recent years and can be applied to buildings, harbors, and airports for energy efficiency, carbon reduction, and environmental sustainability. Because organizations that assess airports pay less attention to the environmental aspect in their assessment, future research can include concepts of green operations and services in the designs of assessments to enhance service quality in this respect.

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