Passenger Perceptions and Choice Behavior of National, Low Cost and Foreign Carriers: A Case Study on Incheon International Airport

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Abstract: Recently, the LCCs (low cost carriers) using ICN (Incheon International Airport) as a hub have increased their international routes. In addition, foreign nationality airlines, including Middle Eastern carriers, have gradually increased their operations at ICN. This growth in carrier services has resulted in a more competitive market environment, and reasonable resource assignment has become an important issue for airport operators. Moreover, the airport will open a new terminal—T2 (terminal 2) in early 2018, and carriers will need to adjust their operations reflecting the utilization of newly assigned facilities. Motivated by this change, we investigate the differentiation of airport service perception as well as airline choice behavior by passenger groups at ICN. This paper employs a MNL (multinomial logit) model as well as a SEM (structural equation model). The results indicate that airline gate allocation is a significantly important value for passengers in terms of airport service perception and choice behavior. Passenger perception and choice behavior differ according to the selected carrier. This study concludes that it is significantly important to consider the characteristics of passenger perception and choice behavior to improve airport operational efficiency, particularly with respect to carrier facility assignment.

Key words: Terminal facility assignment, passenger perception, choice behavior.

1. Introduction

South Korean LCCs (low cost carriers) have increased their international services at ICN (Incheon International Airport) since beginning operations for the domestic network in 2006. Their collective international market share reached approximately 17.6% by 2016. The supply and demand of foreign carriers have also increased at ICN, as shown in Fig. 1. In terms of supply, three airlines from the Middle East—Emirates, Qatar Airways and Etihad Airways—have large fleets at 250, 190 and 120 aircraft, respectively. Korea's two national carriers, Korean Air and Asiana Airlines, have 171 and 84

aircraft, respectively. In terms of demand, the three Middle Eastern carriers are able to sell tickets approximately 50 percent cheaper than the national carriers. LCCs attract more passengers because of the low fares and short travel times [1]. By leveraging supply power and low fares, LCCs and foreign carriers attempt to attract passengers. Their growth has made the airport busier, more complex and more competitive.

Rapid increases in supply and demand cause many airports to face capacity problems. Accordingly, effective resource assignment management has become an important issue for airports in complex environments [2]. In 2018, T2 (terminal 2) will open at ICN to meet the greater demand. Carriers, including Korea Air, Delta Airlines, Air France and KLM were allocated at T2 after its grand opening. For the airport,

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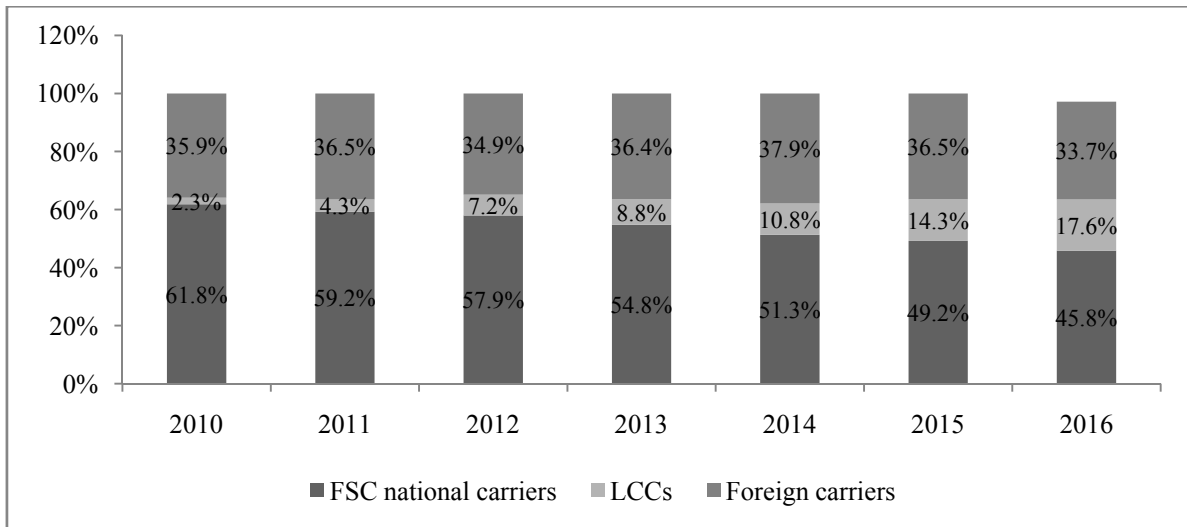
Fig. 1 Carrier passenger market share at ICN.
Source: OAG traffic analyser, 2017.

it is necessary to consider the characteristics of passenger perception when assigning facilities to individual airlines with the purpose of improving the efficiency of airport operations. Furthermore, according to the diversity of airport services, passengers consider not only low fares or short flight times, but also airport service quality at the terminal. Airport passengers have different needs and wants when using different resources at the airport [3]. Therefore, understanding their needs as well as the main factors that affect passenger behavior is gradually becoming more significant to efficiently manage and develop air transport [4]. In this study, we investigate the difference in the airport service perception and differentiated choice behaviors according to ICN passengers using different carrier categories—i.e. FSC national FSCs, LCCs and foreign FSCs. This paper employs an SEM (structural equation model) and MNL (multinomial logit) model to carry out estimates.

2. Literature Review

Service evaluations allow management to identify service quality. Their main purpose is to minimize the gap between passenger expectations and perceptions, which could improve the reliability and quality of

services [5]. Hsu et al. [4] studied the relationships between passenger behavioral intentions and the various factors that affect them. The authors analyzed five key factors—motivation, service expected, service perceived, destination and image—with the SERVQUAL service quality model. Wahyuni-TD and Fernando [5] conducted service quality evaluations with 23 items that linked service quality and safety quality. They suggested that their service quality evaluation could increase passenger confidence and improve human factors, processes, punctuality, sales and marketing and safety. Park and Jung [6] studied transfer passenger perceptions of airport service quality and their influence on value, satisfaction, airport image and passenger behavior at ICN. Service quality perception was measured using 22 measurement items based on the SERVQUAL instrument, which is a diagnostic tool based on five service quality dimensions—tangibles, reliability, responsiveness, assurance and empathy [7]. The results indicated that airport service quality had direct or indirect effects on value, satisfaction, and airport image and passenger behavior.

Various previous studies looked at the different requirements and perceptions of passengers to understand differing passenger needs and wants when

using different resources at the airport. Warnock-Smith and Potter [8] studied different requirements depending on airline characteristics. The results suggested that airport managers should tailor their service offerings to individual airline sectors rather than provide a standard service to all sectors. Park and Jung [6] studied differences in transfer passenger perception. They found that regarding airport service quality, passenger perception differed according to different cultural backgrounds. Kim [9] studied passenger perception as it pertained to the relationship between perceived value, satisfaction and purchase intention in South Korean FSCs and LCCs. The results indicated that passenger perceptions of value differed between FSCs and LCCs. In particular, LCC passenger satisfaction was affected by perceptions of hedonism and utilitarianism, while FSC passengers only recognized hedonism as important for their satisfaction. O'Connell and Williams [10] investigated the differences in passenger perception between LCCs and FSCs. They revealed that differences existed between the two groups of passengers. Passengers using FSCs emphasized six factors—reliability, quality, flight schedules, connections, frequent flyer programmers and comfort. On the other hand, LCC passengers focused exclusively on fare. Chiou [11] estimated passenger intentions and compared contributing factors between Taiwanese FSCs and LCCs. The results showed that the service perceptions of FSC and LCC passengers differed. These previous studies used variables such as value, satisfaction, airport image, human factors, process, punctuality and safety. They then measured the effects of these variables on passenger perception. Collectively, these previous papers have studied passenger service perception because the results may be useful in improving service quality and passenger satisfaction.

In addition, previous studies have investigated the impact of variables related to airline choice behavior, including airfare, air travel time, service frequency, access time and past experience. Başar and Bhat [12]

concluded that by understanding the factors that influenced passenger choice behaviors, airport managers and airlines could attract more passengers via methods such as appropriate upgrades to airport facilities and equipment. Proussaloglou and Koppleman [13] determined that passengers considered a combination of factors, including airline market presence, schedule convenience, low fares, on time performance, reliability and the availability of FFPs (frequent flyer programs), when choosing a carrier. Pels et al. [14] estimated the competition between FSCs and LCCs by analyzing three key dimensions of passenger choice—airfare, surface-access cost and frequency. Suzuki [15] analyzed airport and airline choice behavior in a study that included not only the airport attributes of access time and past experience, but also airfare, service frequency and the existence of an FFP.

3. Research Methodology

The present study employed the SEM and MNL method to estimate the difference in airport service perception and choice behavior of passengers using different carrier categories at ICN. The required data were gathered via the measurement items for service quality perception. The questionnaire was designed based on multiple-item measurement on a 5-point Likert-type scale and the SP technique for choice behavior. For the analysis, this paper divided the passengers into three airline category groups—national FSCs, LCCs and foreign FSCs.

First, this study proceeded by considering previous research and analyzing the differences in passenger perception regarding airport service quality via an ANOVA (one-way analysis of variance). Twenty-two measurement items were used to measure the perception of airport service quality; the items were modified and new items were added to make the questionnaire suitable for deriving airport-related data.

Second, the influence of airport service quality on value, satisfaction, airport image and passenger

behavior at ICN were analyzed using the SEM. Table 1 shows the hypotheses of the cause and effect relationships in which all of the paths positively affect the other values—i.e. value, image, satisfaction and loyalty.

Finally, this paper employed the MNL model to estimate the differences in passenger choice behavior. Following previous studies on the impact of variables for passenger choice behavior, this study used two of the same variables as previous studies—airfare and air travel time—that were related to airline choice behavior. In addition, two more variables concerning airport services—access time from the duty-free shop to the gate and gate location—were added.

4. Analysis Results

For data collection, the main survey was conducted for four weeks at ICN in Feb 2017. Interviews and questionnaires were employed. A pilot study of 30 respondents was performed prior to the full administration of the survey. Some 200 completed questionnaires were collected, but 33 questionnaires were incomplete, leaving 167 for analysis. Of them, 56.3% of them were male, and 43.7% were female. The profiles also indicated that 16.2% of the respondents were travelling for business, while 77.2% were travelling for non-business and other purposes. 37.1% of them used national FSCs, 29.3% used LCCs, and 33.5% used foreign FSCs. Their profiles are shown in Table 2.

Table 3 shows the 22 measurement items used to measure the perception of airport service quality. These items were modified and new items were added to make the questionnaire suitable for airports. The

Table 1 Cause and effect relationship hypotheses.

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H1:	Service quality has a positive impact on value.
H2:	Service quality has a positive impact on satisfaction.
H3:	Service quality has a positive impact on airport image.
H4:	Value has a positive impact on satisfaction.
H5:	Value has a positive impact on passenger loyalty.
H6:	Airport image has a positive impact on satisfaction.
H7:	Airport image has a positive impact on passenger loyalty.
H8:	Satisfaction has a positive impact on passenger loyalty.
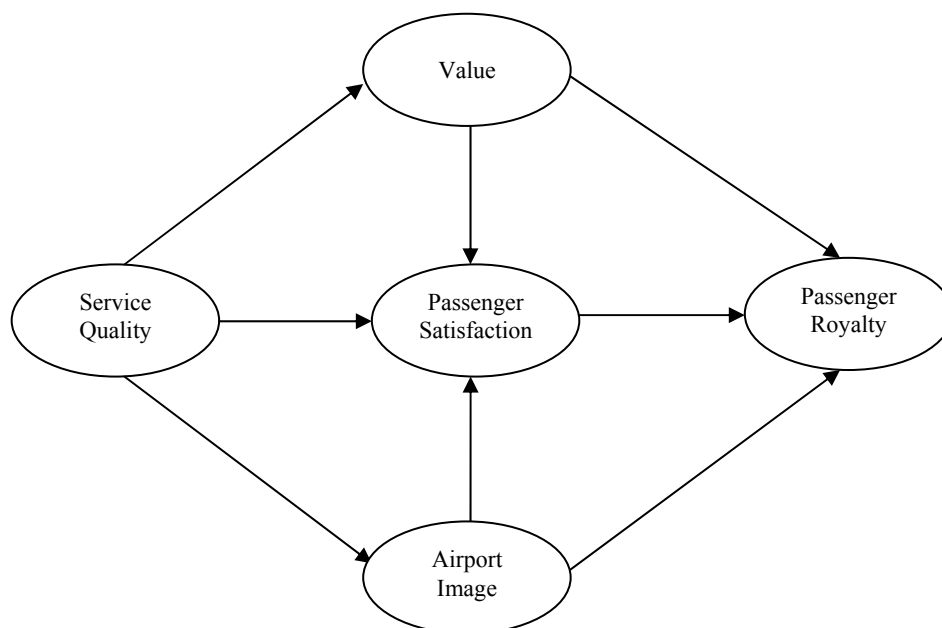
Fig. 2 Conceptual relationship of SEM model.

perception of airport service quality was measured via the 22 measurement items, and the exploratory factory analysis was subsequently estimated before estimating passenger perceptions. The results of the exploratory factor analysis on the data collected from ICN indicated that the six dimensions fit the data. Airport service quality was measured via the six observed dimensions, which were calculated as the mean score of the respondents' ratings of each item in each dimension.

The ANOVA test was conducted to estimate the differences in the dimensional passengers' perceptions, as shown in Table 4. The test confirmed that different passenger groups had different perceptions. Regarding the six dimensions, the mean values did not differ among passenger group categories, except for the facility service dimension, which included walking distance/walking times and walking facilities. In other words, all passengers had similar perception of airport service outside of the facility services dimension,

meaning that the differences in passengers' perception stemmed from the airline gate allocation. Therefore, the data indicated that this allocation has become a significantly important value with respect to passenger airport service perception.

This paper also analyzed airport service quality and its influence on value, airport image, satisfaction and loyalty at ICN, as shown in Fig. 3.

Table 5 indicates the goodness-of-fit of each passenger category's SEM, including for all carriers, national FSCs, LCCs and foreign FSCs. To measure the model fit, the GFI (goodness-of-fit index), AGFI (adjusted goodness-of-fit index), NFI (normed fit index) and RMR (root mean square residual) were estimated via the SEM. The model fit of each group indicated that the theoretical models had a good fit.

Table 6 shows the results of the SEM analysis. They revealed that for the total group, airport service quality had a significant positive effect on value and airport image, meaning that airport service quality did

Table 2 Passenger profiles.

Alternatives/distribution	Sample number	(Frequency %)
Gender		
Male	94	56.3
Female	73	43.7
Age		
19-25	17	10.2
26-35	63	37.7
36-45	55	32.9
46-55	21	12.6
56 and over	11	6.6
Purpose of travel		
Business	27	16.2
Non-business	129	77.2
Other purpose	11	6.6
Airline use for this trip		
National FSCs	62	37.1
LCCs	49	29.3
Foreign FSCs	56	33.5
Direct or indirect flights		
Direct	127	76.0
Indirect	40	24.0
Total	167	100.0

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Table 3   Results of exploratory factor analysis.

Dimensions	Items	Factor loadings	Eigen value	Cumulative % of variance
Staff service	Courtesy of employees	0.754	7.956	36.165
	Employees who are willing to help passengers	0.702		
	Provide passengers with service without delay	0.690		
	Sincere interest in solving problems	0.678		
	Provide passengers with personal attention	0.650		
	Employees who have the knowledge to answer passenger questions	0.571		
	Reliability of employees	0.547		
	Understanding passenger needs	0.531		
Terminal service	Terminal atmosphere/comfort	0.768	2.115	45.780
	Modernity of terminal facilities and cleanliness	0.760		
	Safety of transfer terminal	0.689		
Flight service	Flight information displays	0.662	1.689	53.457
	Availability of seats in transfer area	0.648		
	On-time performance	0.647		
Commercial service	Duty free shops' availability of goods/variety	0.778	1.321	59.461
	Duty free shops' prices compared to other countries	0.763		
	Restaurants and bars variety/prices	0.637		
	Restaurants and bars quality	0.493		
Facility service	Walking distance/walking times	0.845	1.181	64.832
	Walking facilities (escalators/elevators/moving walkways)	0.785		
Convenient facility service	Children's play areas	0.807	1.093	69.801
	Medicine/pharmacies	0.717		

Table 4   Six dimensions influencing passenger perceptions by carrier category.

Dimensions	National FSCs	LCCs	Foreign FSCs	P-values
Staff service	3.65	3.65	3.68	0.957
Terminal service	4.18	4.14	4.06	0.526
Flight service	3.69	3.72	3.58	0.522
Commercial service	3.33	3.19	3.17	0.394
Facility service	3.65	3.74	3.41	0.047**
Convenient facility service	3.29	3.36	3.18	0.475

*** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$.

not directly influence service satisfaction. In addition, value and airport image had positive effects on satisfaction and loyalty. The results indicated that airport service quality was a key driver of passenger value perceptions and airport image formation. Value and airport image influenced passenger satisfaction and loyalty. The passengers using national and foreign FSCs were more likely to reuse due to positive airport image. On the other hand, passengers using LCCs were positively inclined to reuse due to higher satisfaction. Accordingly, the results indicated that

passenger airport service quality perceptions had a different effect on value, and airport image had different effects on service satisfaction and loyalty depending on the category of passenger groups.

Table 7 showed the results of the MNL estimation. Variables, including airfare, air travel time, access time from duty-free shops to the gate and gate location were used in the analysis. The results show the parameters with the corresponding t-values, pseudo-R^2 values and x^2. The value of the likelihood ratio test was larger than the value of x^2 at the 95% confidence level. The
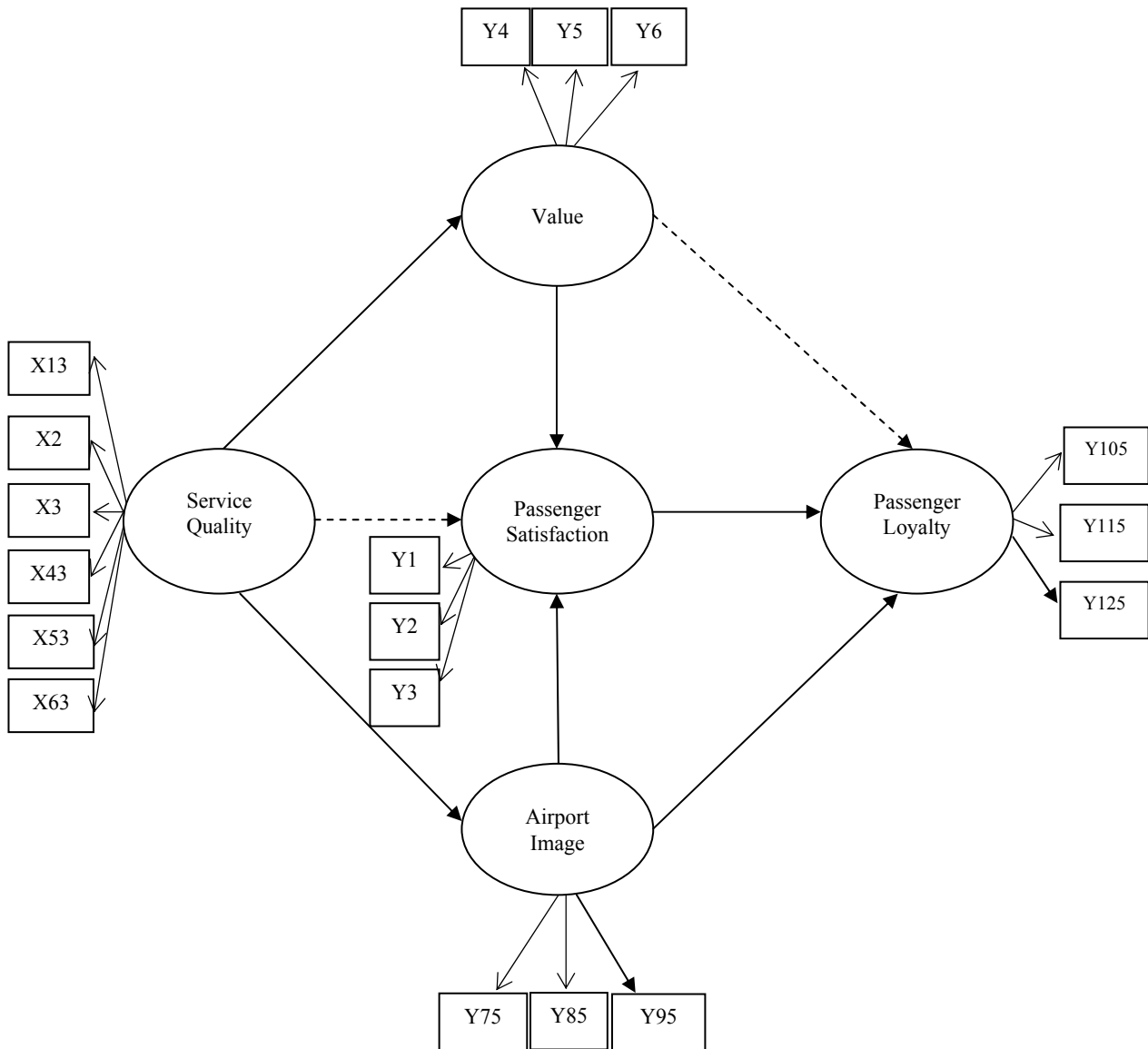
Fig. 3   The SEM analysis model.

Table 5   Goodness-of-fit measures.

Goodness-of-fit measure	Total	National FSCs	LCCs	Foreign FSCs
x^2 (Chi-square value)	282.75	182.25	231.22	229.05
DF (degrees of freedom)	111	111	113	111
x^2/DF	2.54	1.64	2.04	2.06
P-value	0.000	0.000	0.000	0.000
GFI	0.840	0.761	0.694	0.863
AGFI	0.779	0.671	0.586	0.560
NFI	0.879	0.823	0.691	0.770
RMR	0.032	0.032	0.053	0.044

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Table 6   Results of SEM analysis.

Path	Total	National FSCs	LCCs	Foreign FSCs
Service quality→Value	1.484** (7.100)	1.282** (7.160)	1.172* (2.414)	1.984** (4.123)
Service quality→Satisfaction	0.271 (0.148)	0.301 (0.199)	1.452** (2.659)	0.152 (0.431)
Service quality→Airport Image	1.495** (7.156)	1.153** (7.073)	1.476** (2.720)	1.888** (3.976)
Value→Satisfaction	0.367** (3.232)	0.460 (0.196)	0.155 (1.257)	0.499** (3.339)
Value→Loyalty	0.104 (1.039)	0.082 (0.394)	0.109 (0.754)	0.253 (-0.558)
Airport Image→Satisfaction	0.246** (3.085)	0.665 (0.571)	0.340 (0.197)	0.069 (0.877)
Airport Image→Loyalty	0.468** (6.262)	1.102** (2.881)	0.556** (3.491)	0.312** (3.058)
Satisfaction→Loyalty	0.412** (2.826)	0.060 (-0.272)	0.512* (2.026)	1.277 (1.602)

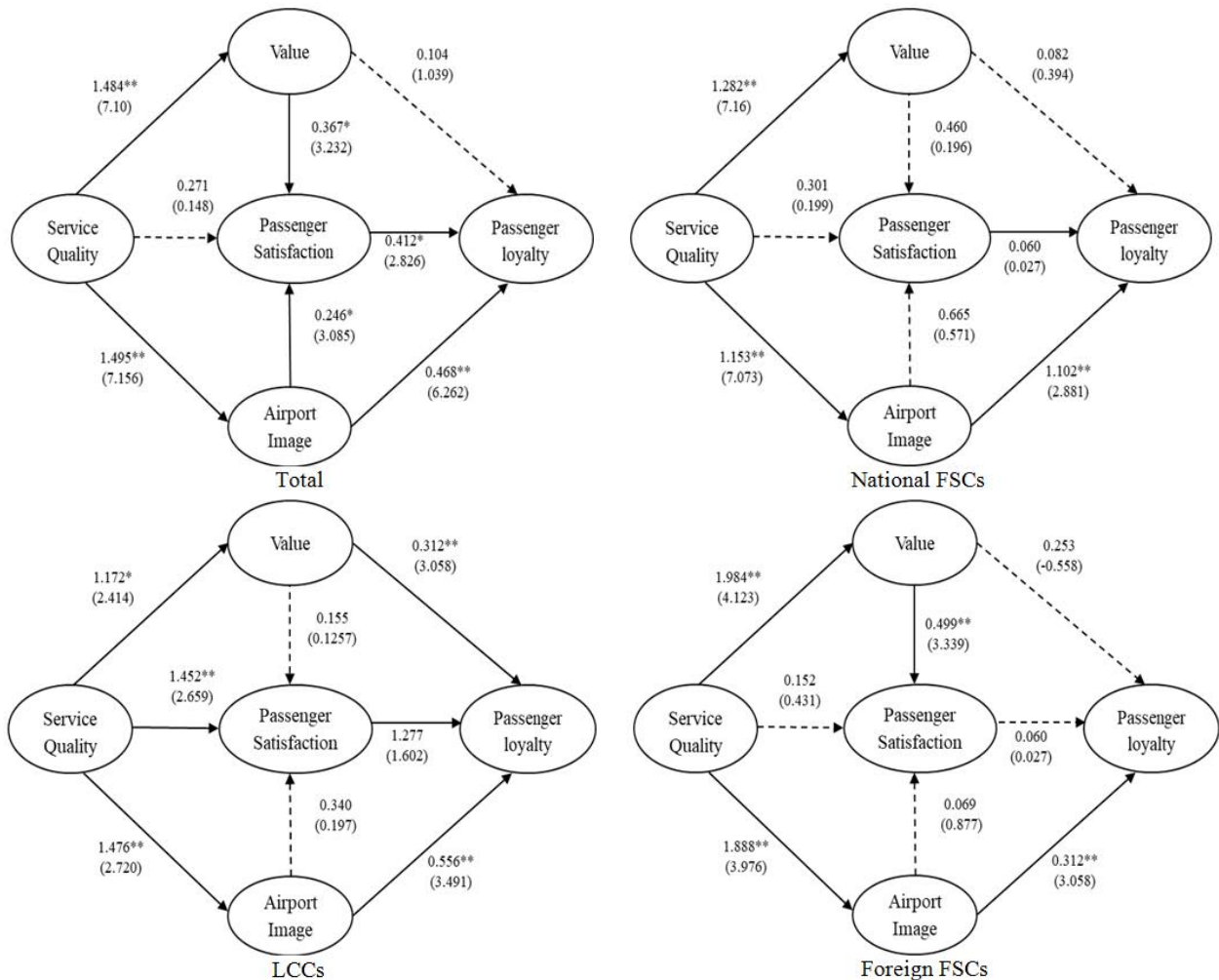* $p < 0.05$, ** $p < 0.01$.

Fig. 4   Results of passengers' different perception analysis.
* $p < 0.05$, ** $p < 0.01$ level.

Table 7   Logit model results.

	Total	National FSCs	LCCs	Foreign FSCs
Constants				
ASC_{LCCs}	1.310	1.333	1.348	1.332
$ASC_{Foreign\ FSCs}$	0.766	0.784	0.792	0.781
Variables				
Airfares	-0.0052** (-6.347)	-0.0053** (-3.754)	-0.0054** (-3.319)	0.0053** (-3.954)
Air travel times	-0.0168** (-4.378)	-0.0177** (-2.647)	-0.0182* (-2.363)	0.0176** (-2.779)
Access time from duty free shop to gate	-0.0001 (-0.137)	-0.0003 (-0.219)	-0.0003 (-0.249)	-0.0002 (-0.207)
Gate location	0.0062** (12.402)	0.0063** (7.326)	0.0063** (6.472)	0.0063** (7.717)
Model fit statistics				
$L(\beta)$: Log likelihood function	-3959.3	-1364.1	-1058.8	-1516.8
$L(0)$: likelihood with zero coefficients	-8762.5	-3010.2	-2333.5	-3348.6
pseudo-R^2	0.548	0.546	0.545	0.546
x^2	0.000	0.000	0.000	0.000
Value of time (\$/per hour)	16.6	17.2	17.4	17.1

* $p < 0.05$, ** $p < 0.01$ level for one-tailed test (*t*-values are shown in parentheses). 1,158 Korean won (₩) is equivalent to US 1\$ (March 2017).

Table 8   Results of elasticity analysis.

Airport		Direct-elasticities	
		E airfare	E air travel time
National FSCs		-0.310	-1.051
LCCs		-0.584	-0.720
Foreign FSCs		-0.329	-0.447
Airport		Cross-elasticities	
		E airfare	E air travel time
National FSCs	LCCs	0.114	0.542
	Foreign FSCs	0.104	0.232
LCCs	National FSCs	0.124	0.697
	Foreign FSCs	0.374	0.124
Foreign FSCs	National FSCs	0.117	0.408
	LCCs	0.332	0.252

models indicated pseudo-R^2 values of 0.54, which implied a good fit for the data. Three variables—airfare, air travel time and gate location—were greater than the critical Wald-value, indicating that they significantly affected choice behavior. However, the *t*-value for the access time from duty-free shops to the gate was less than the critical Wald-value. The access time from duty-free shops to the gate was not statistically significant. Therefore, gate location became a significantly important new value that affected passenger choice behavior at ICN.

Direct and cross elasticities were estimated to measure sensitivity, as shown in Table 8. Two values—airfare and air travel time—were used for the elasticity values. The results of the elasticity analysis indicated that ICN passengers using LCCs were the most sensitive to airfare. In other words, passengers using national FSCs were the most sensitive to air travel time. Table 8 also shows the cross elasticity effects. Examining the cross elasticity effects, the specified model suggests that a 1% increase in airfare

for the national FSCs alternative will result in a 0.11% increase in choice probability for the LCCs alternative. A 1% increase in the air travel time for the LCCs alternative will result in a 0.69% increase in choice probability for the national carrier alternative. The results indicated that competition was more severe between LCCs and foreign FSCs than other alternatives in terms of air fare. On the other hand, in terms of air travel time, competition between national FSCs and the LCCs alternative was cutthroat.

5. Conclusion

In 2018, ICN's airport terminal facilities for airline use, including check-in counters and gates, will be re-allocated after the grand opening of T2. When assigning facilities, the characteristics of passenger perception should be considered to improve airport management efficiency. In addition, according to service diversity, understanding passengers' needs when using airport resources is gradually becoming more significant to efficiently manage and develop an airport. Accordingly, this paper investigated the different airport service perception and different choice behavior of passengers at ICN by employing the SEM and MNL method.

The results of the ANOVA test indicated that all passengers had similar perceptions of airport service except for the walking distance/walking times and walking facilities. The SEM results revealed that airport service quality was a key driver of passenger value perception and airport image formation. Value perception and airport image influenced passenger satisfaction and loyalty. In terms of differences in service perception, the results indicated that the passengers using national and foreign FSCs were more likely to reuse due to positive airport image. On the other hand, passengers using LCCs were positively inclined to reuse due to higher satisfaction. The results of the MNL model also showed that three variables—airfare, air travel time and gate location—significantly affected choice behavior.

However, the access time from duty-free shops to the gate was not statistically important. This showed that passenger groups considered gate location when they chose airlines at ICN. Accordingly, airport management staff would do well to adjust their service offerings to individual airlines and airport sectors. Likewise, effective resource assignment management has become an important key for airports in this complex environment.

Through this research, we have studied several factors that explain how air passengers select airlines. However, we have not included the accessibility of ground transportation to T1 and T2 at this time. It would be interesting to include this factor in future research. According to the current plan developed by the IIAC (Incheon International Airport Corporation), the Concourse Terminal will be used for LCCs and some Sky Team carriers for their arrivals and departures. It will also be interesting to see how this reallocation will impact the airline choice of air passengers in the future.

Acknowledgments

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