



A Study on Relative Importance and Priority Regarding Airport Selection Attributes Utilizing AHP

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ABSTRACT

The aim of this study is to investigate relative importance and priority regarding airport selection attributes using Incheon International Airport and Gimpo International Airport, the two main gateway airports to Seoul, Korea, as the target. For the purpose, a survey was carried out with aviation experts as target utilizing five factors which consist of 15 airport selection attributes. The analysis has been conducted on the relative importance and priority of the airport selection factors by expert group using Analytic Hierarchy Process (AHP). As a result of the analysis, the relative importance of airport selection attributes turned out to be different depending on the expert group. Aviation experts working in government agencies and aviation experts working in educational institutions and research institutes regarded accessibility as the most important airport selection factor, and aviation experts working for airlines and companies related to air travel regarded operation as the most important selection factor.

Keywords: AHP, airport competitiveness, airport selection attributes.

JEL Codes: J30, J31.

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1.0 INTRODUCTION

Nowadays, the competition between the airports has been increasing continually, so airports make strenuous efforts to attract as many airlines and airport users as possible in order to improve profitability. Korean airports are also involved in fierce completion with other airports in the Northeast Asia, including those in China, Japan, Hong Kong, and Taiwan. Especially, Incheon International Airport (IIA) and Gimpo International Airport (GIA), the two main gateway airports of Korea, are making on-going efforts to attract more airport users in order to occupy the privileged position in comparison to other airports. But in order to respond proactively to rapidly changing environments and to keep

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attracting more airport users, it is important to clearly grasp the importance and priority being recognized by airport users regarding airport selection attributes. Accordingly, in this study an attempt was made to analyze the relative importance and priority regarding airport selection attributes and to present strategic implications that an airport should be aware of in order to secure its competitiveness. To be more specific, in what follows an attempt will be made to analyze airport selection factors and airport competitiveness with emphasis on IIA and GIA, the two main gateway airports of Korea, through a survey with aviation experts of Korea as target.

2.0 LITERATURE REVIEW

According to ICAO, the number of airline passengers is expected to grow 4.4% a year on the average up to 2030, more than doubling the figure for 2013 in the process, and the number of departure flights is expected to increase from 32 million flights to 59 million flights during the 2013~2030 period (ICAO, 2013). Especially, air transportation market of the Asia-Pacific region is expected to grow unceasingly in the midst of rapid environmental changes, recording high growth rate of 5.5% per annum up to 2032 and occupying a 34% share of the world air transportation market (Airbus, 2013). In order to respond proactively to this kind of the business environment, Korean airports are making on-going efforts for an increase in air and non-air profitability through the increase of airport users. In this regard, it is deemed very important to derive factors being regarded important by the airport users themselves who happen to be the decision makers on airport selection attributes and to distinguish the priority thereof. When travelers opt for air travel, they are bound to select an airport for immigration and customs clearance. And various airport selection attributes will have a certain effect on their selection of the airport to be used. Selection attribute, which refers to physical and observable characteristics of a certain product, has a relatively specific meaning. An attribute that is differentiated from importance, it is a major determinant serving as the selection criteria of a product that has a certain effect on the decision making of a consumer. When selecting an airport for their travel, the airport users are influenced by this selection attributes. Airport selection attributes have been studied by various scholars. Although airport selection is affected by various elements, researchers have singled out the following factors that have a major influence on airport selection.

In most preceding studies, the number of flights is regarded as one of the most important attributes in selecting an airport. Marcucciand Gatta(2011)stated that the number of flights in a day, together with the number of flights in a week, affects one's airport selection. Other attributes such as type of the airline (low cost carrier or full service carrier), connect ability, waiting time, and shape of parking space (small size &service charge, large size & service charge, small size& free parking, large size &free parking) also belong to airport selection attributes. Among studies that included the number of flights in selection attributes, Marco(2008)has presented, among attributes that affect one's airport selection, availability of flight route to a particular destination, flight service provided by a particular airline, preferential treatment for business passenger, number of flights, ticket price, in-flight service, and timeliness as variable. He called the above attributes as variable that has a significant effect on airport selection since, as the number of flight increases, the availability that an airport user can choose from is that much increased. Windle and Dresner (1995)pointed out the importance of time to access airport and the number of flights, and stated that, the fiercer is the market competition, the importance of timely accessibility is considerable reduced. Bradley (1998) presented airfreight, number of flights, time to access airport, and transportation to the airport as attributes that affect one's airport selection. Among these, he singled out air freight and time to access airport as the most significant attributes. However, he also mentioned that, in the market of business airport users, travel time and the number of flights is more important. Harvey (1987) studied airport selection attributes using Logit model, and he discovered that accessibility to the airport and the number of direct flights to the desired destination are more important in selecting an airport. Loo (2008) has found that time to access airport and the number of flights is important in all markets regardless of the continent where they are located. Skinner (1976) carried out a survey of three airports that are located in Baltimore-Washington area and the number of flights and accessibility turned out to be significant attributes. Naohara et al. (1993)and Furuichi (1994) carried out a survey with airport users in Japan who are traveling to foreign countries,

and the result revealed that accessibility, time to access airport, and the number of flights are more important. Adler et al. (2005) and Hess et al. (2007) noted that time to access the airport, flight time, airlines, airfare, connectivity, aircraft model, flight delay, frequent flyer program, and punctuality were considered as important airport choice attributes by airport users. Judging from these preceding studies, most of the studies thus far have been carried out with overall airport users as the target. Hence, it is very difficult to find a study on airport selection attributes which is based on special characteristics of airport users. Accordingly, in this study, an attempt was made to analyze the relative importance of airport selection attributes by group airport users and to discover what a difference there is in relative importance of airport selection attributes by airport. Therefore, unlike preceding studies, the aim of this study is to present the kind of strategy and alternative that each airport should take to enhance its competitive edge.

3.0 METHODOLOGY

The research model we have adopted is a hierarchical model that is necessary for AHP analysis. The second stage research model is a hierarchical one that utilizes the airport selection attributes that were favored by the airport users in preceding studies, which include accessibility, operation, facilities, services, and spatiality. And for each factor so constituted in the second stage, two to four attributes have been selected to constitute lower-level elements. At the third stage, an expert evaluation has been carried out based on the above factors by airport. Relative importance among constituting elements has been evaluated using a nine-point scale that can produce the most similar result to the actual value as in the case of Saaty's study (2008). The final constituents that have been selected for the hierarchical research model of this study are presented in Table 1 as upper-level factors and lower-level elements, and an established research model is presented in Figure 1. To investigate the relative importance of airport selection factors, our research model embraces six top factors and fifteen sub-factors.

Table 1: Factors definition

Factor	Attribute	
Accessibility(A)	A1	Time to access airport
	A2	Transportation to the airport
	A3	Transportation cost
Operation(B)	B1	Flight frequency
	B2	Flight schedule
	B3	Routes
Facilities(C)	C1	Resting facilities
	C2	Parking facilities
	C3	Information facilities
	C4	Commercial facilities
Services(D)	D1	Customs, immigration and quarantine (CIQ) service quality
	D2	Luggage handling
	D3	Employee service quality
Spatiality(E)	E1	Airport image
	E2	Airport cleanliness

Survey for the present study was carried out with IIA and GIA, the two main gate airports of Korea as target. We visited government agencies, educational institutions and research institutes, airlines and companies related to air travel concerned to meet the aviation experts at the site and carried out the survey for a month from July 2014 to August 2014. We distributed a total of 120 questionnaire copies and recovered 105 copies from aviation experts. Of these, we excluded 13 copies that exceeded the threshold value of 0.1 in consistency ratio as lacking reliability for significant questionnaires. Therefore, for this study, we have used a total of 92 copies including 29 copies from government agencies, 19 copies from educational institutions and research institutes, and 44 copies from airlines and companies related to air travel for an analysis. General characteristics of our sample are presented in Table 2 as shown below:

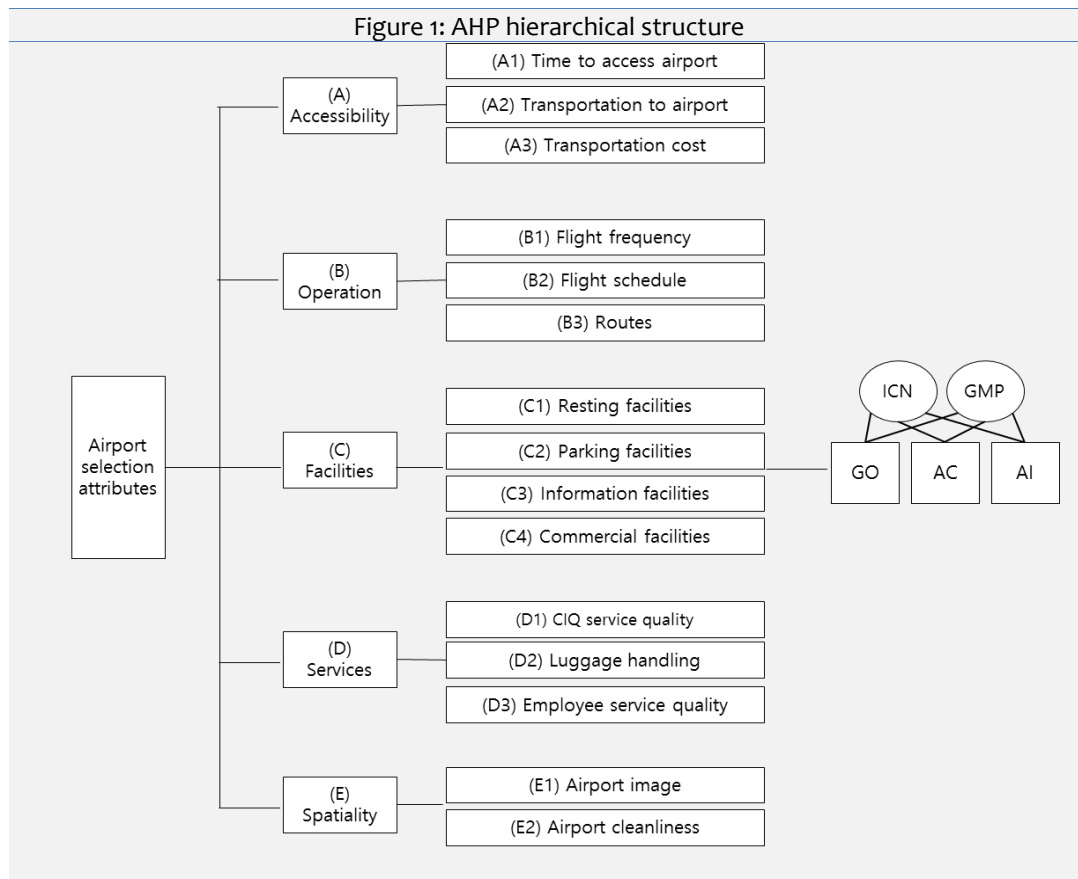


Table 2: Sample characteristics

Item		Government agency (%)	Educational institution and research institute (%)	Airline and company related to air travel (%)	Total number (%)
Work experience	>5 years	4(4.3)	11(12.0)	5(5.4)	20(21.7)
	Between 5 and 10 years	2(2.2)	6(6.5)	11(12.0)	19(20.7)
	For 10~15 years	8(8.7)	2(2.2)	10(10.9)	20(21.7)
Main Airport used	<15	15(16.3)	0(0.0)	18(19.6)	33(35.9)
	GIA	14(15.2)	2(2.2)	9(9.8)	25(27.2)
	IIA	14(15.2)	17(18.5)	34(37.0)	65(70.7)
	Etc.	1(1.1)	0(0.0)	1(1.1)	2(2.2)
Main route used	China route	0(0.0)	3(3.3)	3(3.3)	6(6.6)
	Japan route	0(0.0)	2(2.2)	4(4.4)	6(6.6)
	Southeast Asia route	12(13.2)	5(5.5)	19(20.9)	36(39.6)
	Etc. route	16(17.6)	9(9.9)	18(19.8)	43(46.3)
Travel companion	Alone	6(6.5)	7(7.6)	4(4.3)	17(18.5)
	2~3	14(15.2)	12(13.0)	28(30.4)	54(58.7)
	4~5	8(8.7)	0(0.0)	9(9.8)	17(18.5)
Travel purpose	6 or more	1(1.1)	0(0.0)	3(3.3)	4(4.3)
	Sightseeing	13(14.1)	14(15.2)	37(40.2)	64(69.6)
	Visiting relatives/ friends	1(1.1)	3(3.3)	1(1.1)	5(5.4)
	business	14(15.2)	1(1.1)	5(5.4)	20(21.7)
	Etc.	1(1.1)	1(1.1)	1(1.1)	3(3.3)

General characteristics of these samples suggest that, in the area of work experience, more than 50% of the experts had 10 years of experience or more. As a major airport used, IIA occupied about 70%, and as a major route used, the Southeast route occupied about 39%. As for travel purpose, sightseeing occupied 58%, and as for travel companion, 2~3 persons were the highest at 58%.

In AHP analysis, consistency ratio (CR) of the survey can be regarded as reliability of the responses. Satty (2008) noted that only when CR is 0.1 or below, it is feasible logically, and when the ratio is 0.2 or below, it is allowable, but when the ratio exceeds 0.2, it can be regarded as lacking in consistency. In this study, the result of pair-comparison CR for 92 respondents revealed that, CR Index for 85 respondents was 0.1 or below, suggesting that it is logically feasible, CR Index for seven respondents was above 0.1, suggesting that the responses failed in securing reliability. Therefore, the seven questionnaires recovered were excluded from this analysis. As a result of the consistency ratio analysis, CR Indices IIA and GIA turned out to be 0.1 or below, suggesting that the reliability of our survey questionnaires was relatively high.

4.0 EMPIRICAL RESULTS

As a result of data analysis for entire aviation experts, of the upper-level factors, operation turned out to be more important than others at 37.3% of relative importance, to be followed by accessibility and services in descending order. In contrast, facilities and spatiality turned out to be somewhat low in importance. In the survey of total respondents, flight schedule, flight routes, and easily accessible airport were regarded as important elements both in airport selection attributes and the airport competitiveness (Table 3).

Table 3: Pair-comparison matrix and factor weights (total respondents)

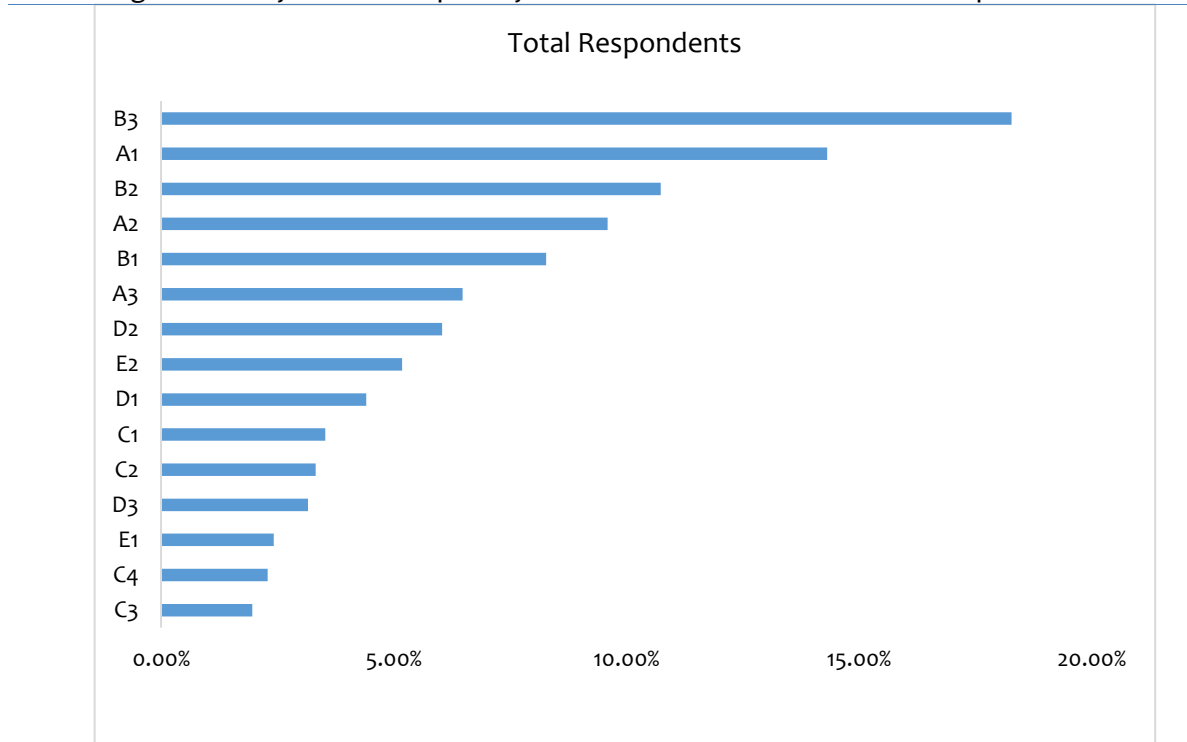
Factors	Weight	Attributes	Local weight	Gross weight
Accessibility(A)	30.4%	Time to access airport(A1)	47.10%	14.32%
		Transportation to airport (A2)	31.60%	9.60%
		Transportation cost (A3)	21.30%	6.48%
Operation(B)	37.3%	Flight frequency (B1)	22.20%	8.28%
		Flight schedule (B2)	28.80%	10.74%
		Routes (B3)	49.00%	18.28%
Facilities(C)	11.1%	Resting facilities (C1)	31.80%	3.53%
		Parking facilities (C2)	29.90%	3.32%
		Information facilities (C3)	17.70%	1.96%
		Commercial facilities (C4)	20.60%	2.29%
Services(D)	13.6%	CIQ service quality (D1)	32.40%	4.41%
		Luggage handling (D2)	44.40%	6.04%
		Employee service quality(D3)	23.20%	3.16%
Spatiality(E)	7.6%	Airport image(E1)	31.90%	2.42%
		Airport cleanliness(E2)	68.10%	5.18%

When overall priority of lower-level elements for total respondents was examined, routes turned out to be most important, to be followed by time to access airport, flight schedule, transportation to airport, and flight frequency in descending order. In contrast, lower-level elements belonging to facilities factor such as information facilities, commercial facilities, parking facilities, and resting facilities turned out to be low in importance and did not have much effect on airport selection. Importance of lower-level elements by priority is shown in Figure 2.

Unlike total respondents, the respondents among government agency aviation experts showed a different preference, choosing accessibility as the most important among the upper-level factors. Operation factor that ranked at the top among total respondents appeared as the second among government agency experts, while in other upper-level factors the same priority was maintained or it was followed by services, facilities, and spatiality in descending order. Analysis result of importance for government agency experts is shown in Table 4.

When overall priority of lower-level elements, which come from the analysis result of aviation experts working in government agencies, was examined, the relative importance of routes was the highest, to be followed by time to access airport, transportation to airport, transportation cost, and flight schedule in descending order.

Figure 2: Analysis result of priority for lower-level elements of total respondents



As a result of data analysis of the government agency experts, accessibility and operation turned out to be important factors in airport selection attributes and the airport competitiveness. In contrast, lower-level elements of facilities factor and employee service quality turned out to be low in priority. Importance of lower-level elements by priority can be summarized as shown in Figure 3.

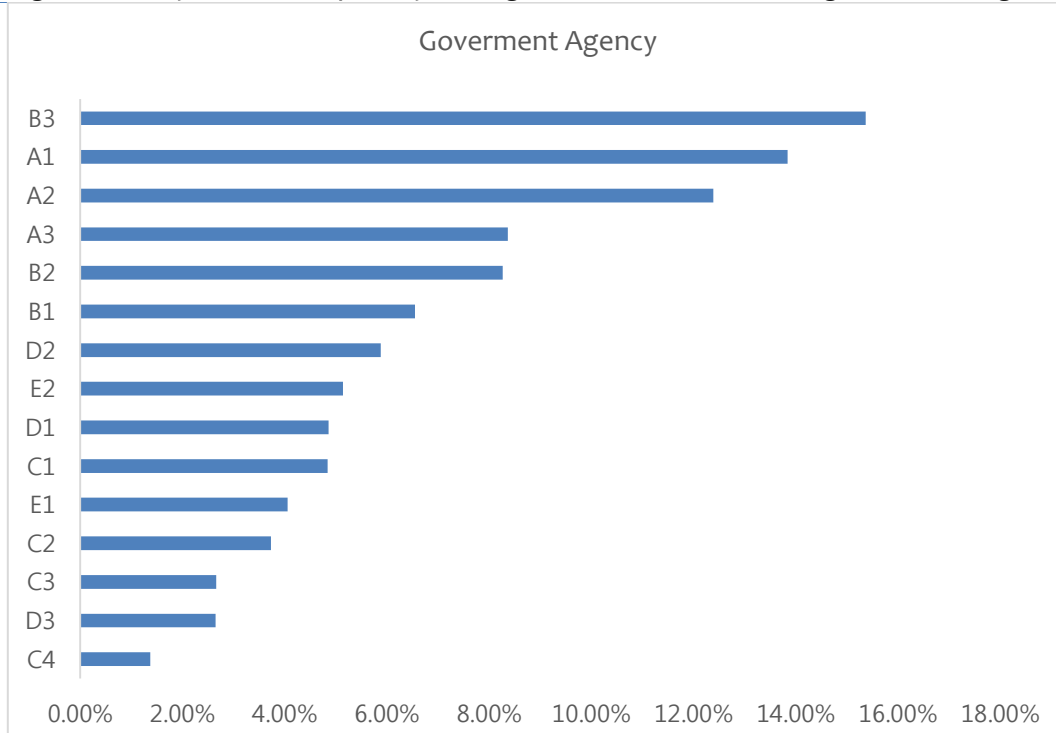
Table 4: Pair-comparison matrix and factor weights (government agency)

Factor	Weight	Attribute	Local weight	Gross weight
Accessibility(A)	34.6%	Time to access airport(A1)	40.00%	13.84%
		Transportation to airport (A2)	35.80%	12.39%
		Transportation cost (A3)	24.20%	8.37%
Operation(B)	30.2%	Flight frequency (B1)	21.70%	6.55%
		Flight schedule (B2)	27.40%	8.27%
		Routes (B3)	50.90%	15.37%
Facilities(C)	12.6%	Resting facilities (C1)	38.40%	4.84%
		Parking facilities (C2)	29.60%	3.73%
		Information facilities (C3)	21.10%	2.66%
		Commercial facilities (C4)	10.90%	1.37%
Services(D)	13.4%	CIQ service quality (D1)	36.30%	4.86%
		Luggage handling (D2)	43.90%	5.88%
		Employee service quality(D3)	19.80%	2.65%
Spatiality(E)	9.2%	Airport image(E1)	44.10%	4.06%
		Airport cleanliness(E2)	55.90%	5.14%

As a result of data analysis of the aviation experts who work in educational institutions and companies related to air travel, accessibility turned out to be the most important factor as in the case of government agency in airport selection and airport competitiveness, to be followed by operation and services. Factors such as facilities and spatiality turned out to be lower in importance. (Table 5)

When evaluation result of importance among all lower-level elements in educational institutions and research institutes was examined, time to access airport has the most effect on airport competitiveness, to be followed by routes, transportation to airport, luggage handling, and flight schedule in descending order.

Figure 3: Analysis result of priority among lower-level elements of government agency



At the same time, as were the cases in total respondents and government agency aviation experts, commercial facilities, parking facilities, information facilities, and resting facilities that belong to lower-level elements of facilities factor turned out to be low in importance. Importance of lower-level elements by priority can be summarized as shown in Figure 4.

Table 5: Pair-comparison matrix and factor weights (educational institution and research institute)

Factor	Weight	Attribute	Local weight	Gross weight
Accessibility(A)	0.336	Time to access airport(A1)	0.548	0.1841
		Transportation to airport (A2)	0.278	0.0934
		Transportation cost (A3)	0.174	0.0585
Operation(B)	0.282	Flight frequency (B1)	0.236	0.0665
		Flight schedule (B2)	0.275	0.0776
		Routes (B3)	0.489	0.1379
Facilities(C)	0.095	Resting facilities (C1)	0.343	0.0326
		Parking facilities (C2)	0.226	0.0215
		Information facilities (C3)	0.234	0.0222
		Commercial facilities (C4)	0.197	0.0187
Services(D)	0.205	CIQ service quality (D1)	0.359	0.0736
		Luggage handling (D2)	0.413	0.0847
		Employee service quality(D3)	0.228	0.0467
Spatiality(E)	0.082	Airport image(E1)	0.317	0.0259
		Airport cleanliness(E2)	0.683	0.0560

As a result of data analysis on aviation experts who work for airlines and companies related to air travel, of the upper-level factors, operation turned out to be most important at 48.1% in airport selection, to be followed by accessibility, facilities, services, and spatiality in descending order. (Table 6)

When overall priority of lower-level elements was examined, routes turned out to be most important, to be followed by flight schedule, time to access airport, flight frequency, and transportation to airport in descending order. In contrast, information facilities, airport image, employee service quality turned out to be low in importance, and have less effect on airport selection and the airport competitiveness. Importance of lower-level elements by priority can be summarized as shown in Figure 5.

Figure 4: Analysis result of priority among lower-level elements of educational institution and research institute

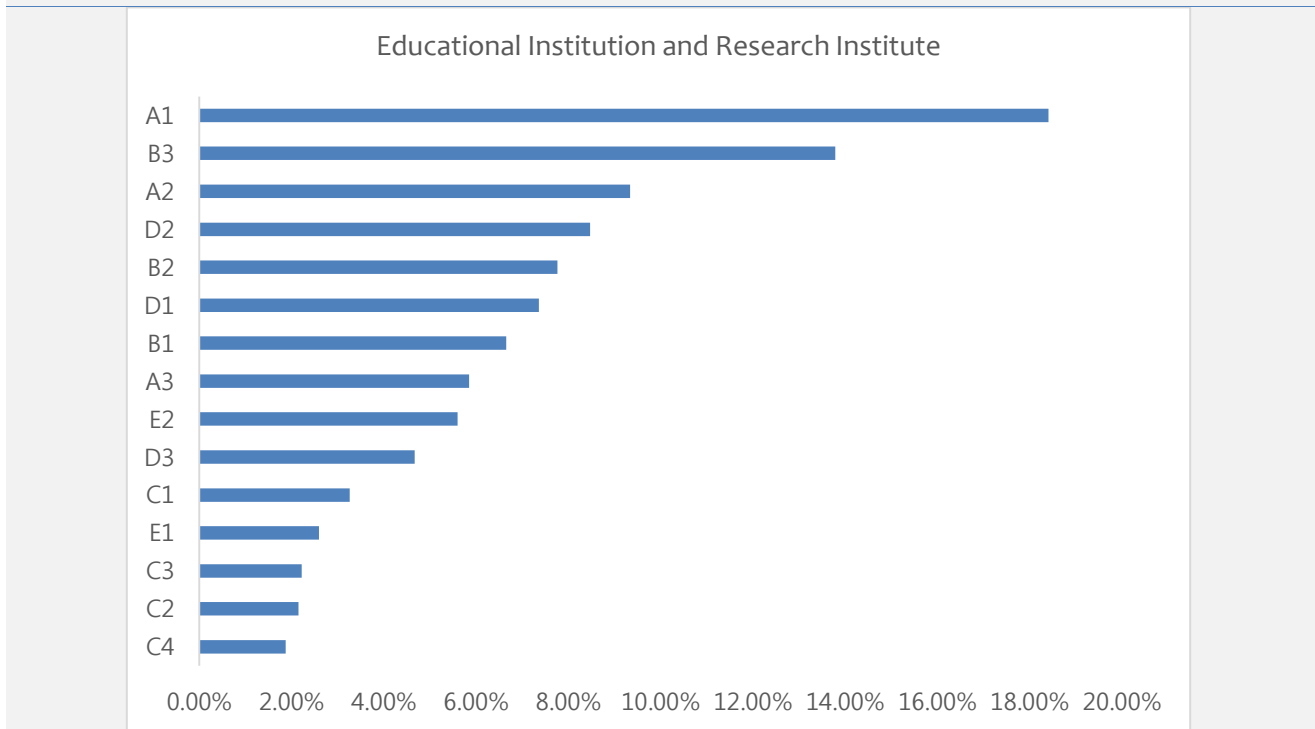


Table 6: Pair-comparison matrix and factor weights (Airline and company related to air travel)

Factor	Weight	Attribute	Local weight	Gross weight	Priority
Accessibility(A)	0.254	A1	48.20%	12.24%	3
		A2	30.40%	7.72%	5
		A3	21.40%	5.44%	6
Operation(B)	0.481	B1	21.80%	10.49%	4
		B2	30.70%	14.77%	2
		B3	47.50%	22.85%	1
Facilities(C)	0.105	C1	25.30%	2.66%	12
		C2	34.20%	3.59%	9
		C3	11.90%	1.25%	15
		C4	28.60%	3.00%	10
Services(D)	0.099	D1	27.50%	2.72%	11
		D2	46.60%	4.61%	8
		D3	25.90%	2.56%	13
Spatiality(E)	0.061	E1	22.60%	1.38%	14
		E2	77.40%	4.72%	7

When the content of Table 7 is examined carefully, the results from total respondents reveal that IIA has a comparative advantage overall, especially in operation and facilities. In contrast, in terms of accessibility that has high importance weight, GIA turned out to be evaluated more highly. As revealed by the results from the government agency, competitiveness of IIA is lower in accessibility.

In comparison, in all remaining factors IIA was evaluated as superior, making it top international airport in overall service competitiveness. The reason is not hard to find as IIA was selected as the top world airport in 2013 in the world airport service assessment (ASQ). In fact, IIA has maintained its top ranking position nine years in a row since 2005, a remarkable feat by any measure, since it received superior evaluation in almost all selection attributes. In contrast, GIA was judged inferior in relative evaluation due to its obsolete airport facilities (i.e., construction of its international line was completed in 1988).

Figure 4: Analysis result of priority among lower-level elements of airlines and companies related to air travel

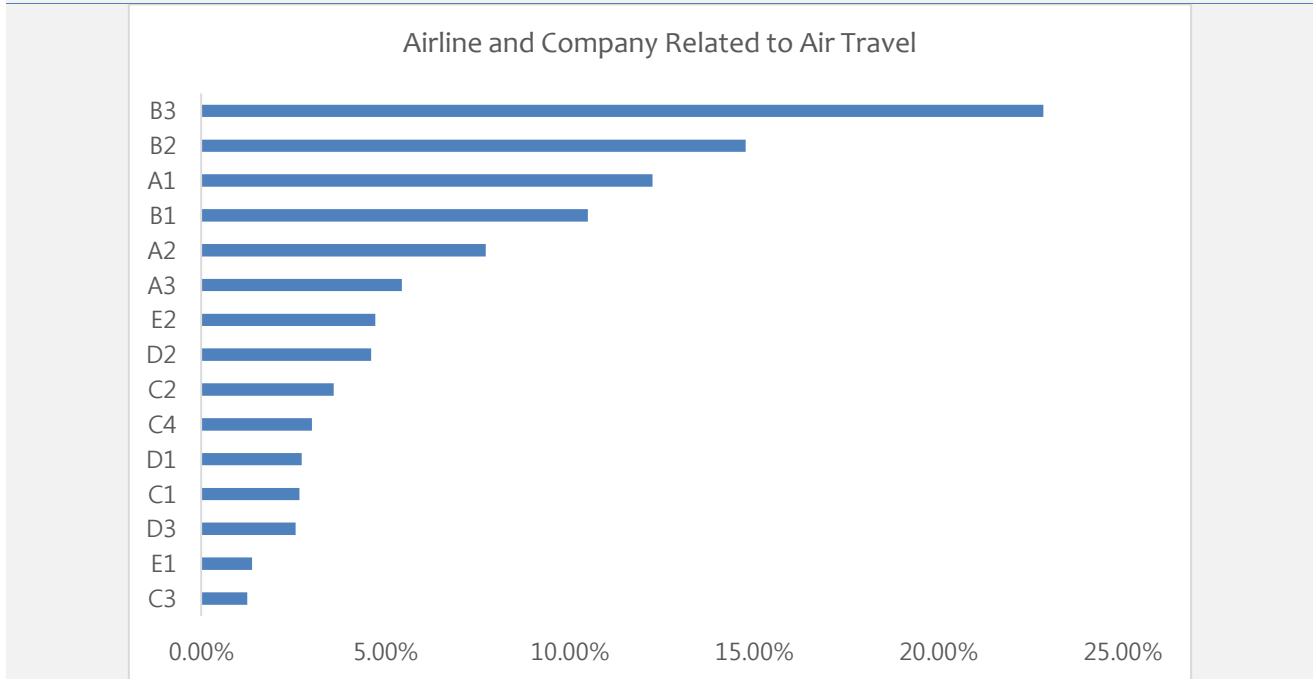


Table 7: Analysis result of airport competitiveness

	Airport	Accessibility (A)	Operation (B)	Facilities (C)	Services (D)	Spatiality (E)	Overall (Priority)
Total Respondents	I/A	0.0380	0.3279	0.0805	0.0976	0.0554	0.5994 (1)
	G/A	0.2660	0.0451	0.0305	0.0384	0.0206	0.4006 (2)
Government Agency	I/A	0.0412	0.2624	0.0735	0.0838	0.0747	0.5356 (1)
	G/A	0.3048	0.0396	0.0525	0.0503	0.0173	0.4645 (2)
Educational Institution and Research Institute	I/A	0.0417	0.2473	0.0713	0.1400	0.0439	0.5442 (1)
	G/A	0.2943	0.0347	0.0238	0.0650	0.0381	0.4559 (2)
Airline and Company Related to Air Travel	I/A	0.0338	0.4291	0.0885	0.0837	0.0513	0.6864 (1)
	G/A	0.2202	0.0519	0.0165	0.0153	0.0097	0.3136 (2)

As for the educational institution and research institute, I/A enjoys a relative superiority in operation and services, whereas G/A turned out to enjoy a relative superiority in accessibility. In addition, when the content of airline and company related to air travel is examined carefully, it is clear that I/A has a competitive advantage in four out of five factors, especially in operation.

5.0 CONCLUSION AND IMPLICATION

In this study, an attempt was made to analyze relative importance of airport selection attributes and airport competitiveness with I/A and G/A as target with an emphasis on opinion of aviation experts who work in government agencies, educational institutions and research institutes, and airlines and companies related to air travel. Results of the analysis can be summarized as follows.

First, the analysis result revealed that aviation experts evaluated the operation as the most important element among airport selection attributes. Especially they regarded flight routes as the foremost criterion for airport selection. Accordingly, to enhance profitability by securing airport competitiveness and attracting more airport users, more concentrated investment has to be made in operation that is closely related with the number of flights, flight schedule, and flight routes. For better outcome,

therefore, it is essential that IIA and GIA should come up with a customized airport operation plan in terms of flight route development and facility improvement, reflecting recent trend of the aviation industry. Second, aviation experts evaluated accessibility as the second most important factor. Accordingly, both IIA and GIA should improve convenience in relation to transportation and transportation cost by utilizing available transportation system to access the airport. Third, the result also revealed that there was a difference in recognition of the importance of airport selection attributes by group of aviation experts. While the experts in government agencies and research institutes considered accessibility as the most important factor, those working for airlines and companies related to air travel considered operation was the most important. Fourth, when considered in terms of the airport competitiveness, aviation experts evaluated IIA more highly as it has more in the number of flights and flight routes as well as better airport facilities, services, and spatiality. Although regarded somewhat low in accessibility in comparison to GIA, the competitive edge of IIA was fully recognized by aviation experts since all other factors are superior.

This study enables grasping of relative weights and priority by selection attribute in selecting an airport based on a survey of aviation experts, and presents a number of strategic implications that can enhance competitiveness of each airport based on the resulting index. Therefore, in planning an airport strategy, it can provide valuable information on where to place an emphasis and where to concentrate at present time. When current situation of the Northeast Asia is taken into consideration, which requires an understanding of customer needs and a customer-oriented strategy and promotion method to beat the competition, this analysis result of the present study may be regarded as more useful. At the same time, certain limitations of this study should also be mentioned to provide a direction for future studies. At present, there are more than 10 airports in Korea in addition to IIA and GIA. Of these, we have covered only two airports that are located in Seoul metropolitan area in this study. For this reason, we have not been able to analyze the importance of airport selection attributes and competitiveness of other airports in Korea sufficiently.

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REFERENCES

- Airbus (2013). Annual Report
- Adler, T., Falzarano, C.S., & Spitz, G. (2005). Modeling service trade-offs in air itinerary choices, Paper presented at the 84th Annual Meeting of the Transportation Research
- Bradley, M. (1998). Behavioral models of airport choice and air route choice. In J. D. Ortuzar, D. Hensher, & S. Jara-Diaz (Eds.), *Travel behavior research: Updating the State of Play* (pp. 141–145). Amsterdam: Elsevier.
- Furuichi, M., & Koppelman, F. S. (1994). An analysis of air travelers' departure airport and destination choice behavior. *Transportation Research Part A*, 28(3), 187-195.
- Harvey, G., (1987), Airport choice in a multiple airport region. *Transportation Research A*, 21(6), 439-449.
- Hess, S., Adler, T., & Polak, J.W. (2007). Modelling airport and airline choice behavior with the use of stated preference survey data. *Transportation Research Part E*, 43(3), 221-233.
- ICAO (2013). Annual Report of the Council
- Loo, B. (2008). Passengers' airport choice within multi-airport region (MARs): some insights from a stated preference survey at Hong Kong International Airport. *Journal of Transport Geography*, 16(2), 117-125.
- Marco, K., (2008). The Role of Accessibility in Passengers' Choice of Airports, International Transport Forum, Discussion Paper No. 2008-14
- Marcucci, E., & Gatta, V. (2011). Regional airport choice: Consumer behavior and policy implications. *Journal of Transport Geography*, 19(1), 70-84.

- Naohara, S., Uai, T., Hyodo, T., & Morichi, S. (1993) Analysis of international passengers from non-major airports. Proceedings of Annual Conference of JSCE, 4(43), 492-493.
- Saaty, T.L (2008), Decision making for leaders: The analytics hierarchy process for decision in a complex world, Pittsburgh: RWS
- Skinner Jr., R. E. (1976). Airport choice: an empirical study. Transportation Engineering Journal, 102, 871-883.
- Windle, R., & Dresner, M. (1995). Airport choice in multiple-airport regions. Journal of Transport Engineering, 121(4), 332-337.