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A Study on Competitiveness Assessment Indicators for Global Aviation Training Organizations

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Abstract

This study aims to develop a competitiveness assessment index for global aviation training organizations. The study utilizes the four factors of the Diamond model developed by Michael Porter. To select candidate indices, expert consultations were made, and two stages of Delphi survey were conducted on 24 experts in the area of global aviation training and education. Finally, 19 indices were selected for analysis. In order to assess the reliability of the final indices and justify selection, an empirical study was conducted with 100 participants, yielding statistically significant results. The 19 indices were organized into a three-level hierarchy system, and an analytical hierarchy process (AHP) was conducted to evaluate the importance of each index. The results of the AHP indicated that 'quality of instructors' was the most important index, followed by 'feedback from trainees for the course (level of satisfaction with the course)' and 'director's management skills and leadership'. This study will contribute to enhancing the competitiveness of global aviation training organizations.

Keywords: competiveness, competiveness assessment indicator, aviation training organization, Delphi, Analytic Hierarchy Process (AHP), Diamond model, Content Validity Ratio (CVR), Coefficient of Variation (CV)

1. Introduction

The world has entered an era of limitless competition, and the field of training is no exception. Training and education service areas (e.g. universities) as well as aviation training organizations compete fiercely to survive. Aviation training organizations in particular, aggressively seek out methods of enhancing their competitive power in the global aviation training market. For instance, they attempt to attract competitive, highly qualified instructors to develop and deliver courses. In this regard, studies on how to measure competitive power of global aviation training organizations to survive and gain competitive advantage are of vital significance.

This study aims to explore the implications of competitiveness assessment indices in evaluation of aviation training organizations in order to conceptualize competitiveness of global aviation training organizations.

With that in mind, in order to research theoretical aspects on competition and establish criteria on competitiveness assessment for global aviation training organizations, literature and precedent studied were reviewed. Since studies on global aviation training competitiveness do not exist, studies on completion assessment for higher education institutions were mainly reviewed.

This study endeavors to develop competitiveness assessment criteria and indices optimized for global aviation training organizations using statistical analysis associated with competitiveness assessment theory. To accomplish this objective, this study attempts to collect and empirically analyze expert opinions in the field of aviation personnel training.

2. Research Methodology

Competitiveness assessment for this study is carried out on the basis of Michael Porter's Diamond theory. The hierarchy structure and weighted value of assessment indices are analyzed via an analytic hierarchy process (AHP), and the Delphi survey is used to collect expert opinions. A brief instruction of each method is as follows.

2.1 Diamond Theory

Diverse theoretical approaches to competitiveness assessment have been introduced. Among those approaches, the Diamond model offered by Professor Michael Porter (1990) at Harvard University has become the most representative. This study aims to draw all relevant variables for the competitiveness assessment of global training organizations on the basis of the four key elements from Michael Porter's Diamond framework – (1) factor conditions, (2) demand conditions, (3) related and supporting industries, and (4) firm strategy, structure and rivalry. The Diamond framework was originally designed to analyze national competitiveness. However, because it can be applied to various industries, enterprises and numerous non-business areas, it has been used as a basic model to effectively assess the competitiveness of global aviation training organizations.

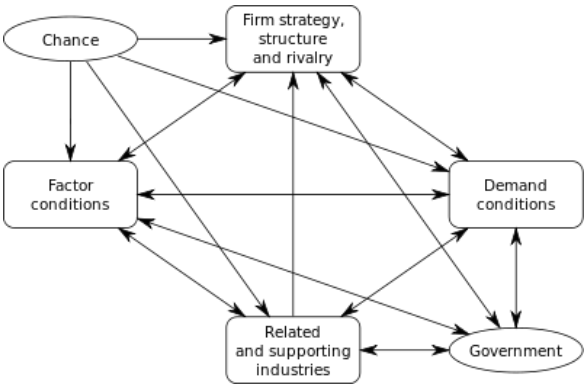

Figure 1. Diamond Model

In the Diamond model, factor conditions is a comprehensive concept that includes social overhead capital such as natural resources, manpower, capital, technology status, roads, ports, airports and telecommunication facilities. Demand conditions is the demand size and quality. Firm strategy, structure and rivalry can potentially affect national competitiveness in terms of economic and business environments and strong competitors which are closely related to creation, structure and operation of firms. The development and growth of related local supporting industries and suppliers can become key competitiveness assessment indicators as these industries directly complement each other in the overall national economy.

2.2 Delphi

In the event of insufficient precedent research and literature, a Delphi survey can be carried out on a panel of experts in corresponding area. Until the opinions of experts converge to an agreement, rounds of a basic survey method is performed until a criteria can be justified from the survey responses. A criterion can be assumed to be justified if the responses from experts converge in a consistent pattern in terms of the level of convergence and agreement and the Kendall's coefficient of concordance (Kendall's W). The Delphi survey leads to a convergence in expert opinions via a formula that divides the difference between the upper quartile (Q3) and lower quartile (Q1) in half, thus (Q3-Q1)/2. The agreement level can be estimated using the difference between the quartiles and the median. This level varies from 0 to 1, and a value closer to 1 would imply a higher level of agreement. The value of Kendall's W ranges from 0 to 1. A Kendall's W value closer to 1 implies that the level of opinion convergence is high (Schmidt, 1997). The following formula represents the calculation of the Kendall's W value;

$$Kendall's\ \ W = \frac{12\sum_{j=1}^{m}(\sum_{i=1}^{n}R_{ij})^2}{m^2n(n^2-1)} - \frac{3(n+1)}{n-1}$$

where the total number of judges (respondents) in a group is 'm', the number of objects, 'n', regarding object '*i*' ranked by judge 'j'.

The survey can be justified using the agreement level according to the content validity ratio (CVR). Lawshe (1975) indicated that when the panel number was 15 or 25, the CVR had to be at least 0.49(P=0.05) or 0.37(P<0.05), respectively. Table 1 is to show index selection criteria.

Table 1. Detailed Index Selection Criteria

	Contents	Criteria
Content Validity Ratio (CVR)	If the number of respondents answering 4 or 5 in a 5-point Likert survey exceeds 50%, it is deemed justified.	CVR ≧ 0.37 (When the total panel number exceeds 25)
Level of Agreement	As the difference between the 3rd and 1st quartile decreases, the value approaches 1. As the difference increases, the value approaches 0 and the level of agreement decreases.	Level of Agreement ≧ 0.75
Level of Convergence	As the difference between the 3rd and 1st quartile decreases, the level of convergence increases. When the difference increases, the level of convergence decreases.	Level of Convergence ≦ 0.50
Positive Rate	This is the percentage of respondents answering relatively positively (indicating 4 or 5 points in a 5-point Likert survey).	More than 55%
Average Value	These are the average values of the positive answers in a 5-point Likert survey. (The 5-point value in a 7 point Likert survey which is considered a positive- answer-value, is converted to this value in a 5-point Likert survey.)	3.56 (5-point Likert survey)

2.3 AHP

The analytic hierarchy process (AHP) was developed by Professor Thomas L. Saaty in the early 1970s and is also known as multi-criteria decision making (MCDM). It is a decision making method that applies knowledge, experience and intuition from respondents via pairwise comparisons between objects comprising each hierarchy level (Kim Yong-Jung, 2013). The AHP method is usually carried out in order to analyze the weight (significance level) of each individual subject after conducting a Delphi survey. The combination of Delphi and AHP is theoretically a justifiable survey(Lee Hwa Jin, 2011; Song Dal Yong, 2007; Cho Geun Tae, Cho Yong Gon & Kang Hyun Soo, 2003).

The judgments (responses) from the respondents in an AHP survey must be verified for consistency using the consistency index (CI). The consistency ratio (CR) also demonstrates whether consistency of opinions has been maintained. Consistency is the reasoning of the replies from respondents, namely reliability. The CR utilizes characteristics in which the closer the largest Eigen value (λ_{max}) approaches n., the more consistent it becomes. The CI can be calculated using the following formula.

$$CI = \frac{\lambda_{\max} - n}{n-1}, \qquad \lambda_{\max} = \frac{1}{n}\sum_{a=1}^{f}\frac{\sum_{a=1}^{f} v_b \times r_{ab}}{v_a}$$

There are two ways to synthesize the weight values of each hierarchy level. One is to calculate the values from a single paired comparison after collecting opinions from more than two respondents. The other is to add up the results after collecting a pairwise comparison matrix (Saaty, 1980). The latter is usually used. When adding up the results, organizing a single pairwise comparison after combining a geometric mean is the most desirable method (Cho Geun Tae et al. 2003).

This study synthesized the overall results via a pairwise comparison based on the AHP. To calculate the weight values (r_{abi}),the respective weight values had to be synthesized from the pairwise comparison matrix of each respondent (n) as a geometric mean ($GM(r_{ab})$), and a single pairwise comparison matrix had to be organized. The formula is as follows.

$$GM(r_{ab}) = \prod_{i=1}^{n} \sqrt[n]{r_{abi}} = \prod_{i=1}^{n} (r_{abi})^{1/n}$$

2.4 Delphi Analysis and Results

The survey items for the Delphi were selected by literature review on competitiveness assessment indices for higher education institutions. In total, 62 indices for competitiveness assessment for global aviation training organizations were selected in four distinctive areas of Diamond theory, through literature research – 19 indices for factor conditions; nine indices for demand conditions; 18 indices for firm strategy, structure and rivalry; and 16 indices for related and supporting industries.

Subsequently, the first Delphi survey was carried out through a group of Delphi panelists who are composed of 24 experts selected at the area of internationally renowned aviation institute. The 2nd Delphi survey was designed to encourage panelists to change or amend their opinions referring to an average value and a median value from opinions of panelists collected in the 1st Delphi survey (Best, 1974).

The verification procedure was applied utilizing content validity ratio (CVR) (Lawshe, 1975). Because the coefficient of variation (CV) value of the second Delphi survey was below the CV value of the first Delphi survey and change in value of CV remained within a difference in value of 0.5, no further Delphi surveys (after the second Delphi survey)

were deemed necessary. Table 2 is to show the results of Delphi analysis.

Table 2. 1st and 2nd Round Delphi Results

	Competitiveness Assessment Index	Delphi	Descriptive Statistics			Convergence Tendency			Selection Result
			Average	Standard Deviation	Positive Rate	Convergence Level	Agreement Level	CVR	
Factor Conditions (5 indices) (Kendall's W= 0.297, χ^2=9.698, df=5, p=0.000)	Average length of instructors' experience	1st	**3.74**	**0.915**	73.9%	0.50	0.75	0.478	○
		2nd	**3.80**	**0.616**	70.0%	**0.50**	**0.75**	**0.40**	**x**
	Quality of instructors of aviation training organizations (Level of satisfaction with instructors)	1st	**4.65**	**0.573**	95.7%	0.50	0.8	0.913	○
		2nd	**4.85**	**0.366**	100%	**0.00**	**1.00**	**1.00**	●
	Level of qualification training and academic background of staff and instructors	1st	**4.22**	**0.671**	87.0%	0.50	0.75	0.739	○
		2nd	**4.35**	**0.489**	100%	**0.50**	**0.75**	**1.00**	●
	Convenience of facilities (e.g. accommodation, cafeteria, sports facilities)	1st	**4.13**	**0.548**	91.3%	0.00	1.00	0.826	○
		2nd	**4.30**	**0.571**	95.0%	**0.50**	**0.75**	**0.90**	●
	Level of training quality management system (e.g. LMS, Internal Quality Assurance Program)	1st	**4.43**	**0.590**	95.7%	0.50	0.75	0.913	○
		2nd	**4.40**	**0.598**	95.0%	**0.50**	**0.75**	**0.90**	●
	Personnel engagement and commitment	1st	**Newly added**						
		2nd	**4.55**	**0.510**	100%	**0.50**	**0.80**	**1.00**	●
Total Average			**4.38**	**0.530**	**93.3%**	**0.42**	**0.80**	**0.87**	-
Demand Conditions (4 indices) (Kendall's W= 0.374, χ^2=44.851, df=6, p=0.000)	Number of overseas trainees in aviation training organizations	1st	**3.70**	**0.822**	69.6%	0.50	0.75	0.391	○
		2nd	**3.40**	**0.681**	50.0%	**0.50**	**0.71**	**0.00**	**X**
	Market size (Business market size / markets available to firms)	1st	**3.87**	**0.869**	78.3%	0.00	1.00	0.565	○
		2nd	**3.70**	**0.470**	70.0%	**0.50**	**0.75**	**0.40**	**X**
	Scale of aviation labor market	1st	**4.09**	**0.668**	82.6%	0.50	0.75	0.652	○
		2nd	**4.25**	**0.550**	95.0%	**0.50**	**0.75**	**0.90**	●
	Aviation industry growth rate in the selected region (e.g. Asia-Pacific, Europe)	1st	**4.09**	**0.596**	87.0%	0.00	1.00	0.739	○
		2nd	**4.15**	**0.489**	95.0%	**0.00**	**1.00**	**0.90**	●
	Goods market efficiency (Customer orientation, level of how demanding customers are) / buyer sophistication in the country	1st	**3.87**	**0.920**	73.9%	0.50	0.75	0.478	○
		2nd	**3.85**	**0.745**	65.0%	**0.50**	**0.75**	**0.30**	**X**
	Number of trainees per one training staff member	1st	**3.78**	**0.850**	69.6%	0.50	0.75	0.391	○
		2nd	**4.20**	**0.616**	90.0%	**0.50**	**0.75**	**0.80**	●
	Feedback from trainees for the course (Level of satisfaction with the course)	1st	**4.61**	0.499	100%	0.50	0.80	1.000	○
		2nd	**4.65**	0.489	95.0%	**0.50**	**0.80**	**0.90**	**●(SA)**
Total Average			**4.03**	**0.58**	**80.0%**	**0.43**	**0.79**	**0.60**	-

(continuous)

	Competitiveness Assessment Index	Delphi	Descriptive Statistics			Convergence Tendency			Selection Result
			Average	Standard Deviation	Positive Rate	Convergence Level	Agreement Level	CVR	
Related and supporting industries (6 indices) (Kendall's W = 0.366, χ^2=51.255, df=7 p=0.000)	Quality of air transport infrastructure	1st	**4.13**	**0.869**	91.3%	0.50	0.75	0.826	○
		2nd	**4.00**	**0.725**	75.0%	**0.75**	**0.63**	**0.50**	**X**
	Cooperation between international organizations and aviation training organizations (e.g. ICAO, IATA, ACI, CANSO)	1st	**4.09**	**0.733**	78.3%	0.50	0.75	0.565	○
		2nd	**3.90**	**0.788**	75.0%	**0.38**	**0.81**	**0.50**	●
	ICAO safety/security audit (USOAP and USAP)	1st	**4.04**	**1.065**	78.3%	0.50	0.75	0.652	○
		2nd	**4.20**	**0.768**	90.0%	**0.50**	**0.75**	**0.80**	●
	Level of IT technological readiness (including Internet	1st	**4.30**	**0.765**	82.6%	0.50	0.75	0.652	○
		2nd	**4.35**	**0.489**	100%	**0.50**	**0.75**	**1.00**	●

	usage level)								
	Comprehensive world aviation transportation ranking (passenger and cargo)	1st	**3.78**	**0.902**	69.6%	0.50	0.75	0.391	○
		2nd	**3.45**	**0.826**	55.0%	**0.50**	**0.75**	**0.10**	**X**
	Travel and tourism competitiveness within the country	1st	**3.61**	**1.196**	82.6%	0.50	0.75	0.652	○
		2nd	**3.50**	**0.946**	50.0%	**0.50**	**0.71**	**0.00**	**X**
	Language (English) command capability	1st	**4.17**	**0.717**	82.6%	0.50	0.75	0.652	○
		2nd	**4.40**	**0.503**	100.%	**0.50**	**0.75**	**1.00**	●
	Average salary of instructors	1st	**4.00**	**1.000**	82.6%	0.50	0.75	0.652	○
		2nd	**4.40**	**0.503**	100%	**0.50**	**0.75**	**1.00**	●
	Budget for training aviation personnel, facilities and equipment	1st	**4.48**	**0.730**	87.0%	0.50	0.80	0.739	○
		2nd	**4.55**	**0.510**	100%	**0.50**	**0.80**	**1.00**	●
Total Average			**4.08**	**0.67**	**82.8%**	**0.51**	**0.74**	**0.66**	-
Strategy, Structure & Rivalry (4 indices) (Kendall's W = 0.369, χ^2=51.659, df=7, p=0.000)	Business sophistication (higher efficiency in the production of goods and services)	1st	**3.87**	**0.626**	73.9%	0.50	0.75	0.478	○
		2nd	**3.70**	**0.733**	65.0%	**0.50**	**0.75**	**0.30**	**X**
	Level of directors' management skills and leadership of aviation training organizations	1st	**4.57**	**0.728**	95.7%	0.50	0.80	0.913	○
		2nd	**4.85**	**0.366**	100%	**0.00**	**1.00**	**1.00**	●
	Administration of innovation and growth of aviation training organizations	1st	**4.17**	**0.778**	87.0%	0.50	0.75	0.739	○
		2nd	**4.30**	**0.571**	95.0%	**0.50**	**0.75**	**0.90**	●
	Number of specialized training academies within aviation training organizations (e.g. ATC, Pilot, Security, Safety)	1st	**3.78**	**0.998**	69.6%	0.50	0.75	0.391	○
		2nd	**4.30**	**0.571**	95.0%	**0.50**	**0.75**	**0.90**	●
	Structure and means of teaching	1st	**4.39**	**0.656**	91.3%	0.50	0.75	0.826	○
		2nd	**4.55**	**0.510**	100%	**0.50**	**0.80**	**1.00**	●
	Proximity to major downtown areas	1st	**4.00**	**0.603**	82.6%	0.00	**1.00**	0.652	○
		2nd	**3.45**	**0.826**	45.0%	**0.50**	**0.67**	**-0.10**	**X**
	Accolades or awards given by international organizations	1st	**4.17**	0.834	82.6%	0.50	0.75	0.652	○
		2nd	**3.90**	**0.968**	70.0%	**1.00**	**0.50**	**0.40**	**X**
Total Average			**4.15**	**0.65**	**81.4%**	**0.50**	**0.75**	**0.63**	-

Note X : Eliminated Index, ○ : Index selected in the 1st Delphi , ● : Index selected in the 2nd Delphi, Elimination cause

The 1st Delphi survey was carried out with open-ended and close-ended questionnaires. A total of 62 competitiveness assessment indices were assessed, with the aim of adding or amending other items not included in the original 62 indices. Six indices were moved or merged into other associated indices, four indices were amended, and one index was newly added. A total of 29 competitiveness assessment indices were finally selected as a result of the first Delphi survey.

These 29 indices were sorted out into a total of 19 indices through the second Delphi survey. Considering the number of panelists, the corresponding CVR values (first Delphi: 0.37, second Delphi: 0.42) were applied (Lawshe, 1975). The indices with values lower than the corresponding reference CVR values were eliminated. In addition, a positive response rate (i.e. indicating responses of 4 or 5 on the 5-point Likert scale) of over 55 percent was applied, with a convergence level of below 0.5 and an agreement level exceeding 0.75.

The indices with average values over 3.56 applied in the first Delphi survey were selected as applicable indices for the competitiveness assessment of global aviation training organization. This proved that the panelists agreed relatively well with one another because the Kendall's W values ranged from 0.297 to 0.374 which is within the valid reference value in the second Delphi survey.

Among the 19 selected indices, 'Quality of instructors of aviation training organizations' and 'Level of directors' management skills and leadership of the training organizations' had the highest average values (4.85). These indices were followed by 'Feedback from trainees for the course (Level of satisfaction with the course)' with an average value of 4.65, suggesting that feedback from trainees indicating satisfaction with the training courses was also very significant. Next, 'Personnel engagement and commitment' had an average value of 4.55, indicating that the most vital elements for the competitiveness assessment of a global aviation training organization were human performance related items.

Table 3. Empirical Study on Delphi Results

Upper Class	Lower Class	Particular index	Average	Standard Deviation	CV	Cronbach's α after removal	Cronbach's α
Factor conditions	Personnel Organization	Quality of instructors of aviation training organizations (Level of satisfaction with instructors)	**4.790**	**0.4094**	0.09	0.942	**0.736**
		Level of qualification training and academic background of staff and instructors	**4.720**	**0.4513**	0.10	0.942	
		Personnel engagement and commitment	**4.720**	**0.4513**	0.10	0.941	
	Training facility & System	Convenience of facilities (e.g. classroom, accommodation, cafeteria, sports facilities) of aviation training organizations	**4.750**	**0.4352**	0.09	0.940	**0.831**
		Level of training quality management system (e.g. LMS, Internal Quality Assurance Program)	**4.740**	**0.4408**	0.09	0.941	
Demand conditions	Size of training market	Scale of aviation labor market	**4.550**	**0.5389**	0.12	0.941	**0.856**
		Regional aviation industry growth rate (e.g. Asia-Pacific, Europe)	**4.590**	**0.5143**	0.11	0.940	
	Quality of training market	Number of trainees per one training staff member	**4.640**	**0.4824**	0.10	0.941	**0.730**
		Feedback from trainees for the course (Level of satisfaction with the course)	**4.730**	**0.4462**	0.09	0.940	
Related and supporting industries	Professional and technical support environment	Cooperation between international organizations and aviation training organizations (e.g. ICAO, IATA, ACI, CANSO)	**4.740**	**0.5049**	0.11	0.941	**0.834**
		ICAO safety/security audit (USOAP and USAP) results in the country	**4.740**	**0.5049**	0.11	0.940	
		Level of IT technological readiness (including internet usage level)	**4.660**	**0.5360**	0.12	0.940	
	inancial/general ıpporting ɔnditions	Language (English) command capability	**4.740**	**0.4845**	0.10	0.943	**0.719**
		Average salary of instructors	**4.520**	**0.5409**	0.12	0.943	
		Budget for aviation personnel training, facilities and equipment	**4.690**	**0.4648**	0.10	0.940	
Firm strategy, structure, rivalry	Organization strategy	Level of director's management skills and leadership of aviation training organizations	**4.680**	**0.4688**	0.10	0.941	**0.754**
		Administration of innovation and growth of aviation training organizations	**4.680**	**0.4899**	0.10	0.940	
	Structure of training organization	Number of specialized training academies within aviation training organizations (e.g. ATC, Pilot, Security, Safety)	**4.670**	**0.5329**	0.11	0.940	**0.756**
		Structure and means for teaching	**4.760**	**0.4292**	0.09	0.940	

In accordance with the empirical analysis, as Table 3 illustrates, all 19 competitiveness assessment indices were verified as justifiable (with average values of over 4.2) as competitiveness assessment indices. The analysis also proved that all indices were stable with CV values under 0.12.

3. AHP Analysis and Structure of Assessment Indices

The AHP analysis was conducted with the 19 indices selected from the Delphi survey through 162 participants (22 aviation training experts and 140 general trainees). Some responses from general trainees were eliminated because the CR values were not satisfactory.

The decision making hierarchy structure was organized for an AHP survey with three classes (upper, lower and particular indices) as shown in Fig. 2 On the basis of the triple-class hierarchy structure, a total of 24 questionnaire

items regarding the 19 indices was drafted. Each questionnaire item was designed to analyze the relative importance level (weight) of the upper and lower class items as well as the particular indices based on a 9-point Likert scale.

The results of the importance level (weight) for each upper class item are illustrated in Table 4. 'Factor conditions' (0.297) was ranked first, followed by 'Demand conditions' (0.253), 'Strategy, Structure and rivalry' (0.227) and 'Related and supporting industries' (0.224). The analysis showed that the importance level (weight) of each upper class item was evenly distributed.

The CR values of each panelist for the relative importance assessment of each upper class item were within 0.100, meaning the consistency of each item was satisfactory.

Table 5 illustrates the relative importance and the priority ranking of each lower class item, and the comprehensive analysis results of the importance level (weight) of each index and class item (i.e. upper class, lower class and particular indices) are illustrated in Fig. 2.

Table 4. Numerical Weight and Priority of Upper Level

Upper Class Item	Results		Panelists		General Trainees	
	Relative Importance	Priority Ranking	Relative Importance	Priority Ranking	Relative Importance	Priority Ranking
Factor conditions	0.296	1	**0.369**	**1**	**0.283**	**1**
Demand conditions	0.253	2	0.176	4	**0.268**	**2**
Related and supporting industries	0.224	4	**0.271**	**2**	0.215	4
Strategy, structure and rivalry	0.227	3	0.184	3	0.234	3
CR	0.000		0.001		0.001	

Table 5. Numerical Weight and Priority of Lower Level

Lower Class Item		Results		Panelists		General Trainees	
		Relative Importance	Priority Ranking	Relative Importance	Priority Ranking	Relative Importance	Priority Ranking
Factor conditions	Personnel organization	0.624	**1**	0.697	1	0.610	1
	Training facility and system	0.376	2	0.303	2	0.390	2
Demand conditions	Size of training market	0.422	2	0.267	2	0.453	2
	Quality of training market	0.578	**1**	0.733	1	0.547	1
Related and supporting industries	Professional and technical support environment	0.598	1	0.520	1	0.612	1
	Financial/general support conditions	0.402	2	0.480	2	0.388	2
Firm strategy, structure, and rivalry	Organization strategy	0.600	**1**	0.589	1	0.602	1
	Structure of training organization	0.400	2	0.411	2	0.398	2

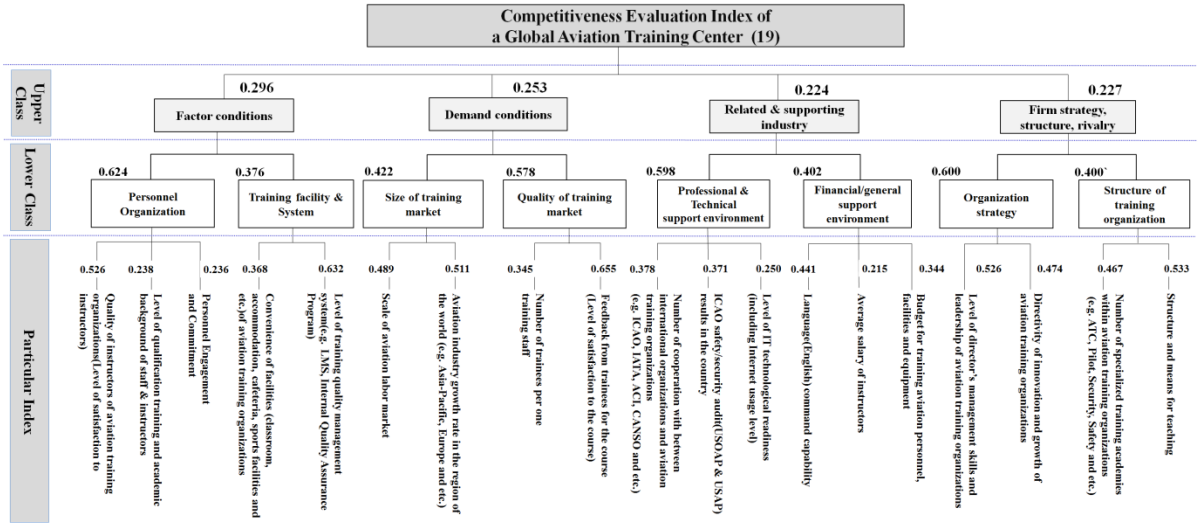

Figure 2. Weighted Value Hierarchy of Competitiveness Evaluation Index

Out of a total of 19 indices for competitiveness assessment of global aviation training organizations, the highest weight

was given to 'Quality of instructors of aviation training organizations (Level of satisfaction with instructors)' (0.097) and the lowest weight (significance level) was given to 'Average salary of instructors' (0.019). Detailed analysis results are illustrated in Table 6.

Table 6. Final Competiveness Index and Numerical Weight

Upper Class	***Lower Class***	***Particular Index***	**Weight (Significance Level)**	**Priority**
(a)	***(b)***	***(c)***	***(a x b x c)***	
Factor conditions	Personnel organization	Quality of instructors of aviation training organizations (Level of satisfaction with instructors)	0.097	**1**
		Level of training qualification and academic background of staff and instructors	0.044	**12**
		Personnel engagement and commitment	0.044	**13**
	Training facility and system	Convenience of facilities (e.g. classroom, accommodation, cafeteria, sports facilities) of aviation training organizations	0.041	**15**
		Level of training quality management system (e.g. LMS, Internal Quality Assurance Program)	0.070	**4**
Demand conditions	Size of training market	Scale of aviation labor market	0.052	**7**
		Regional aviation industry growth rate in the (e.g. Asia-Pacific, Europe)	0.054	**6**
	Quality of training market	Number of trainees per one training staff member	0.050	**9**
		Feedback from trainees for the course (Level of satisfaction with the course)	0.096	**2**
Related and supporting industries	Professional and technical support environment	Cooperation between international organizations and aviation training organizations (e.g. ICAO, IATA, ACI, CANSO)	0.051	**8**
		ICAO safety/security audit (USOAP and USAP) results in the country	0.050	**10**
		Level of IT technological readiness (including Internet usage level)	0.034	**17**
	Financial/general support conditions	Language (English) command capability	0.040	**16**
		Average salary of instructors	0.019	**19**
		Budget for training aviation personnel, facilities and equipment	0.031	**18**
Firm strategy, structure, rivalry	Organization strategy	Level of directors' management skills and leadership of aviation training organizations	0.072	**3**
		Administration of innovation and growth of aviation training organizations	0.065	**5**
	Structure of training organization	Number of specialized training academies within aviation training organizations (e.g. ATC, Pilot, Security, Safety)	0.042	**14**
		Structure and means for teaching	0.048	**11**

The differences between the panelists' group and general trainees' group are illustrated in Table 7. The panelists assessed the weight of each particular index in the following order: 'Quality of instructors' (0.141), 'Feedback from trainees for the course' (0.096), 'Level of directors' management skills and leadership of aviation training organizations' (0.073), 'Level of training quality management system(0.072) and so on. Meanwhile, the general trainees assessed the weight of each particular index in the following order: 'Feedback from trainees for the course (Level of satisfaction with the course)' (0.096), 'Quality of instructors' (0.090), 'Administration of innovation and growth of aviation training organizations' (0.071), 'Level of directors' management skills and leadership of aviation training organizations' (0.070) and so on.

Table 7. Final Competiveness Index and Numerical Weight of Experts and Trainees

Particular index	Panelist (a)		General Trainee (b)		Gap between both groups (a-b)	
	Weight	Rank	Weight	Rank	Weight	Rank
Quality of instructors of aviation training organizations (Level of satisfaction with instructors)	**0.141**	**1**	**0.090**	**2**	0.051	-1
Level of training qualification and academic background of staff and instructors	0.057	6	0.042	13	0.015	-7
Personnel engagement and commitment	**0.059**	**5**	0.041	14	0.018	-9
Convenience of facilities (e.g. classroom, accommodation, cafeteria, sports facilities) of aviation training organizations	0.040	12	0.041	15	-0.001	-3
Level of training quality management system (e.g. LMS, Internal Quality Assurance Program)	**0.072**	**4**	**0.069**	**5**	0.003	-1
Scale of aviation labor market	0.022	19	0.060	7	-0.038	12
Regional Aviation industry growth rate (e.g. Asia-Pacific, Europe)	0.025	18	0.061	6	-0.036	12
Number of trainees per one training staff member	0.033	16	0.053	8	-0.02	8
Feedback from trainees for the course (Level of satisfaction with the course)	**0.096**	**2**	**0.093**	**1**	0.003	1
Cooperation between international organizations and aviation training organizations (e.g. ICAO, IATA, ACI, CANSO)	0.052	7	0.050	11	0.002	-4
ICAO safety/security audit (USOAP and USAP) results of the country	0.044	11	0.050	9	-0.006	2
Level of IT technological readiness (including Internet usage level)	0.045	10	0.031	17	0.014	-7
Language (English) command capability	0.050	8	0.038	16	0.012	-8
Average salary of instructors	0.031	17	0.018	19	0.013	-2
Budget for aviation personnel training, facilities and equipment	0.049	9	0.028	18	0.021	-9
Level of directors' management skills and leadership of aviation training organizations	**0.073**	**3**	**0.070**	**4**	0.003	-1
Administration of innovation and growth of aviation training organizations	0.035	15	**0.071**	**3**	-0.036	12
Number of specialized training academies within aviation training organizations (e.g. ATC, Pilot, Security, Safety)	0.038	14	0.043	12	-0.005	2
Structure and means for teaching	0.038	13	0.050	10	-0.012	3

The level of gaps in weights between the two groups were demonstrated in the following order: 'Scale of aviation labor market' (Gap value: 0.038), 'Regional aviation industry growth rate (e.g. Asia-Pacific, Europe)' (Gap value: 0.036) and 'Administration of innovation and growth of aviation training organizations' (Gap value: 0.036).

The trainee group put the highest value on the items associated with the training market, while the panelist group, as training suppliers, thought of the training market the least important area. Among the 19 indices, 10 indices showed ranking differences between 1 to 4, six indices indicated a ranking difference between 7 to 9, and three indices showed 12 ranking differences. However, it appeared that the gap difference between the panelist group and the general trainee group was not big.

4. Conclusion

This study was carried out in order to finalize the competitiveness assessment indices of global aviation training organizations through Delphi surveys and an AHP survey by expert panelists. All indices were classified into four categories (Upper class at AHP structure) based on Diamond theory.

The AHP analysis results revealed that among the 19 indices for the competitiveness assessment of global aviation training organizations, 'Quality of instructors' (0.097) and 'Feedback from trainees'(0.096) were selected as the most significant indices. The third most important index was 'Level of director's management skills and leadership of aviation training organizations'(0.073).

This study provided a meaningful opportunity to study competitiveness assessment for global aviation training organizations and opened up opportunities to connect strategies of global aviation training organizations with business strategy research.

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