AIRLINE SELECTION CRITERIA AT AIR CARGO TRANSPORTATION INDUSTRY

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Abstract: In terms of sustainability and increasing competitiveness, airlines' serving at air cargo transportation determining strategies with regards to significance levels of selecting criteria is critical. The purpose of this research is to determine the criteria that affect the selection of airline at air cargo transportation, to calculate the significance levels of these criteria with Analytic Hierarchy Process method, one of the multi-criteria decision making methods. In this context, this paper investigates important factors affecting the selection air cargo carrier. The data was gathered with survey technique. The survey was implemented to the senior executives at air cargo agencies. The analysis result reveal that "Price" is the most important criteria among airline selection criteria.

Key words: Air Cargo Transportation, Analytic Hierarchy Process (AHP), Airline Selecting Criteria.

1   INTRODUCTION

Transportation systems provide the interaction of physical and organizational elements to produce transport facilities. So demand the transport of goods is met. This transport demand is a result of economic and social interaction of company and individual consumer [1]. The fastest freight transport among transportation system is air cargo. Air cargo industry with the development of global trade has become an integral part of the trade among the transport systems [16].

Air cargo market volume has increased to twice every 10 years since 1970. This trend is expected to continue increasing by 6% annually over the next 20 years [2]. This increase in air cargo volume is due to the growth in global trade. In fact, the air cargo sector has been growing faster than international trade. With the rapid growth of the air cargo industry, many passenger airline has begun to show its activities in the air cargo market [20]. Besides, the

stiff competition in air cargo transportation is concerned. Shipper can send cargo by both lower compartments of passenger planes and cargo plane [7].

There are many different approaches to classification of air cargo business. Doganis has classified the air cargo business with a heterogeneous structure as follow; combined air cargo carrier, fully air cargo carrier and integrated air cargo carrier [4]. Another classification is sorting by Zondag shown in figure 1 [21].
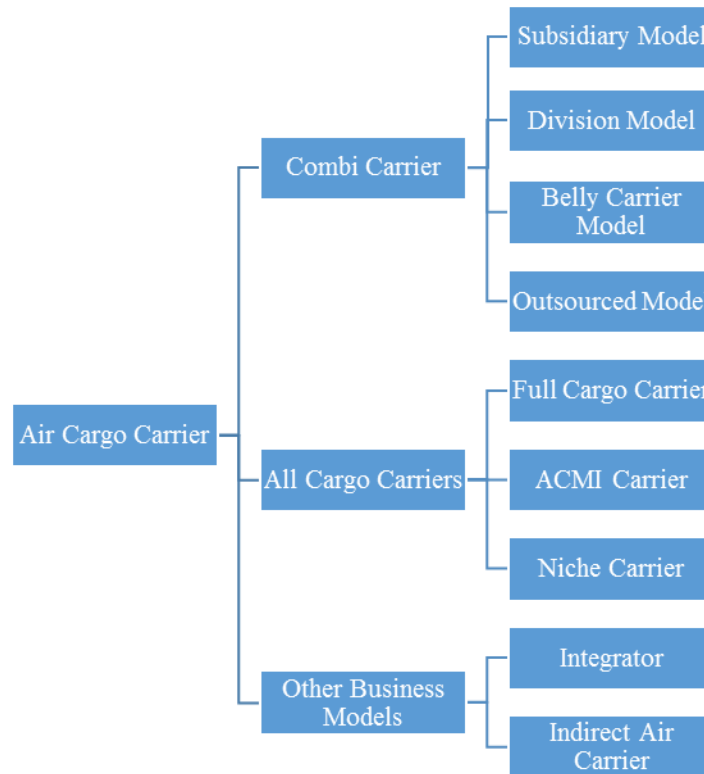

Fig. 1. *Air Cargo Carrier Classification*

Air cargo transport has been the most remarkable modes of transportation in the world. It has continued to grow rapidly from past to present. Figure 2 shows the statistical data of the amount of air cargo transported between the years 1973 and 2013. Overall growth trend is observed though fluctuations.
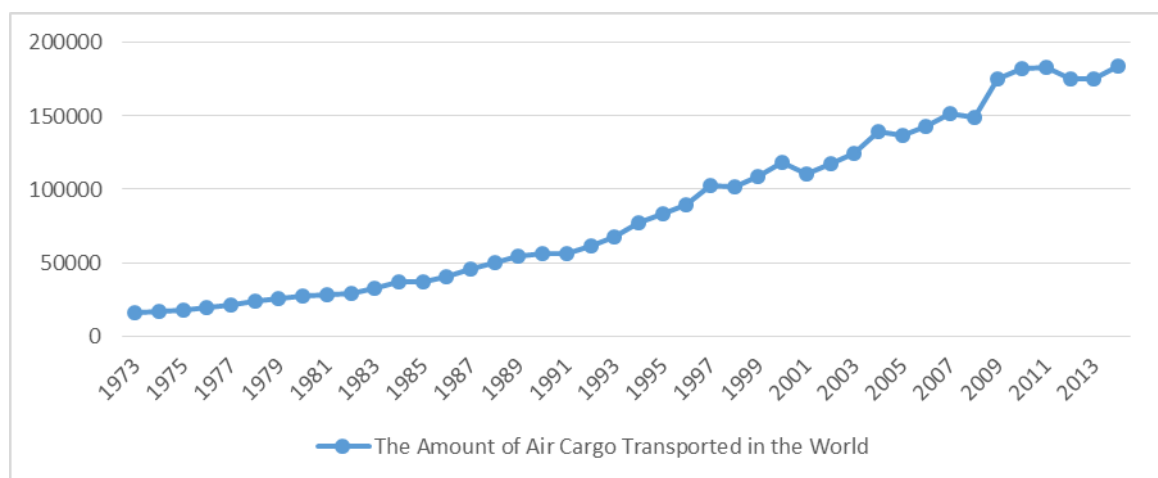

Fig. 2. *1973-2013 World Air Freight Volume (Million Tons)*
Source: [17]

The amount of cargo transported by air cargo in 2014 by proportional distribution of region is located in Figure 3. The most amount of air cargo has been carried by Asia Pacific region. Asia Pacific region is followed by Europe. North America and the Middle East ranks third with 16% of shares. Latin America has taken place at fourth with a rate of 4%. The least air cargo transportation has been done in Africa.
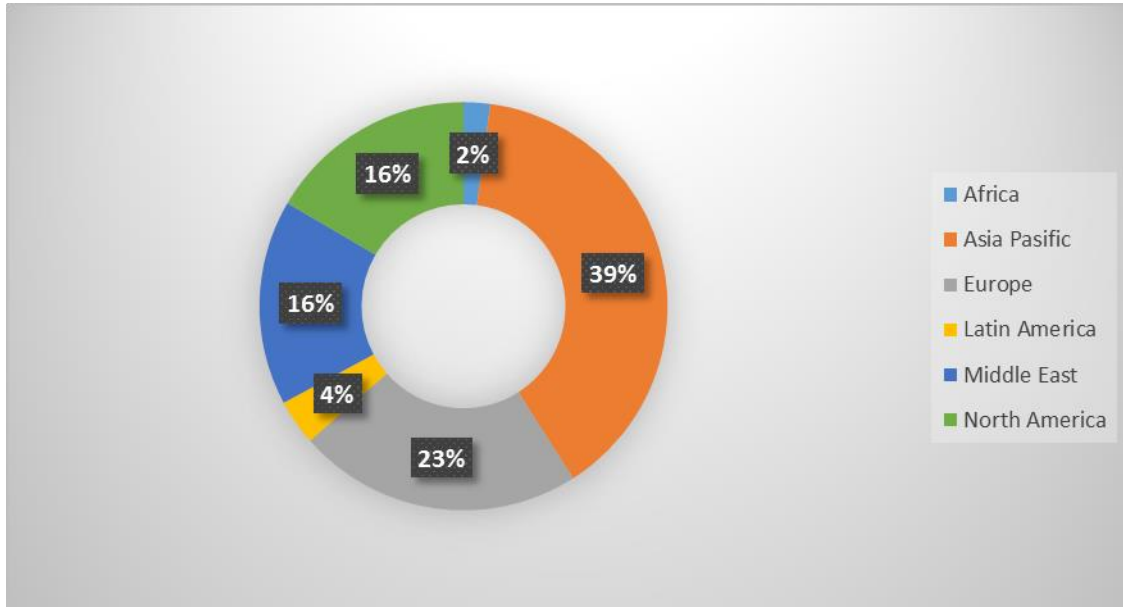

***Fig. 3.** Air Cargo Volume by Region in 2014*
Source: [6]

2   LITERATURE REVIEW

The share of air cargo transportation in the transport sector is increasing day by day. The literature about ongoing development of air cargo transportation have been many different studies.   A large number of studies have focused on air cargo transportation with using Analytical Hierarchy Process method.

Park, Choi and Zhang (2009) were compared 5 carrier to measure the competitiveness of express carrier operating in the air cargo industry by using the AHP. This evaluation was made by six criteria. As a result, most competitive express air cargo carrier between the carriers has been identified as DHL [12]. Chu (2014) examined the criteria that influence the choice of airline. Besides that affecting the choice of route has been investigated. The survey was conducted to determine the criteria. Ordered probit model was used to calculate the degree of influence that affect the airline and route selection criteria [3]. Yoon and Park (2015) have calculated the degree of significance of the criteria influencing the choice of airline and have made accordingly alternative selection with using the Analytic Hierarchy Process method in Korean air cargo industry. Price criteria of the five main criteria are indicated as the most important criteria. According to the study the order of significance of the criteria to be considered when choosing the airline as can be sorted; price (40%), speed (27%), reliability (21%), flexibility (6%), social factors (3%) [19].

3   METHODOLOGY

Research methodology is Analytic Hierarchy Process method, one of the multi-criteria decision making methods. The reason of using the AHP method is hierarchy's being multi-

criteria and approving professionals making pairwise comparisons at calculating significance levels of criteria. Analytic Hierarchy Process (AHP) developed by Saaty, one of the multi-criteria decision-making techniques, considering the group and the individual priority areas, is a mathematical method that qualitative and quantitative variables can be evaluated together [13]. Problem solving consists of pairwise comparisons and expert judgments. Binary comparison is done to determine how important an element to another [15].

Data was gathered with survey technique. Survey was implemented to the 24 senior executives at air cargo agencies. The level of relative importance between the criteria was evaluated using the likert 1-9 scale as shown Table 1. Firstly the criteria to be used in the hierarchy were determined. Then criteria were made binary comparing.

Tab. 1 *Scale of Relative Importance*

Intensity of Relative Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective.
3	Moderate importance of one over another	Experience and judgment slightly favor one activity over another.
5	Essential or strong importance	Experience and judgment strongly favor one activity over another.
7	Demonstrated importance	An activity is strongly favored and its dominance is demonstrated in practice.
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4, 6, 8	Intermediate values between the two adjacent judgments	When compromise is needed.

Source: [14]

Flow diagram related to the research method is given in figure 4.
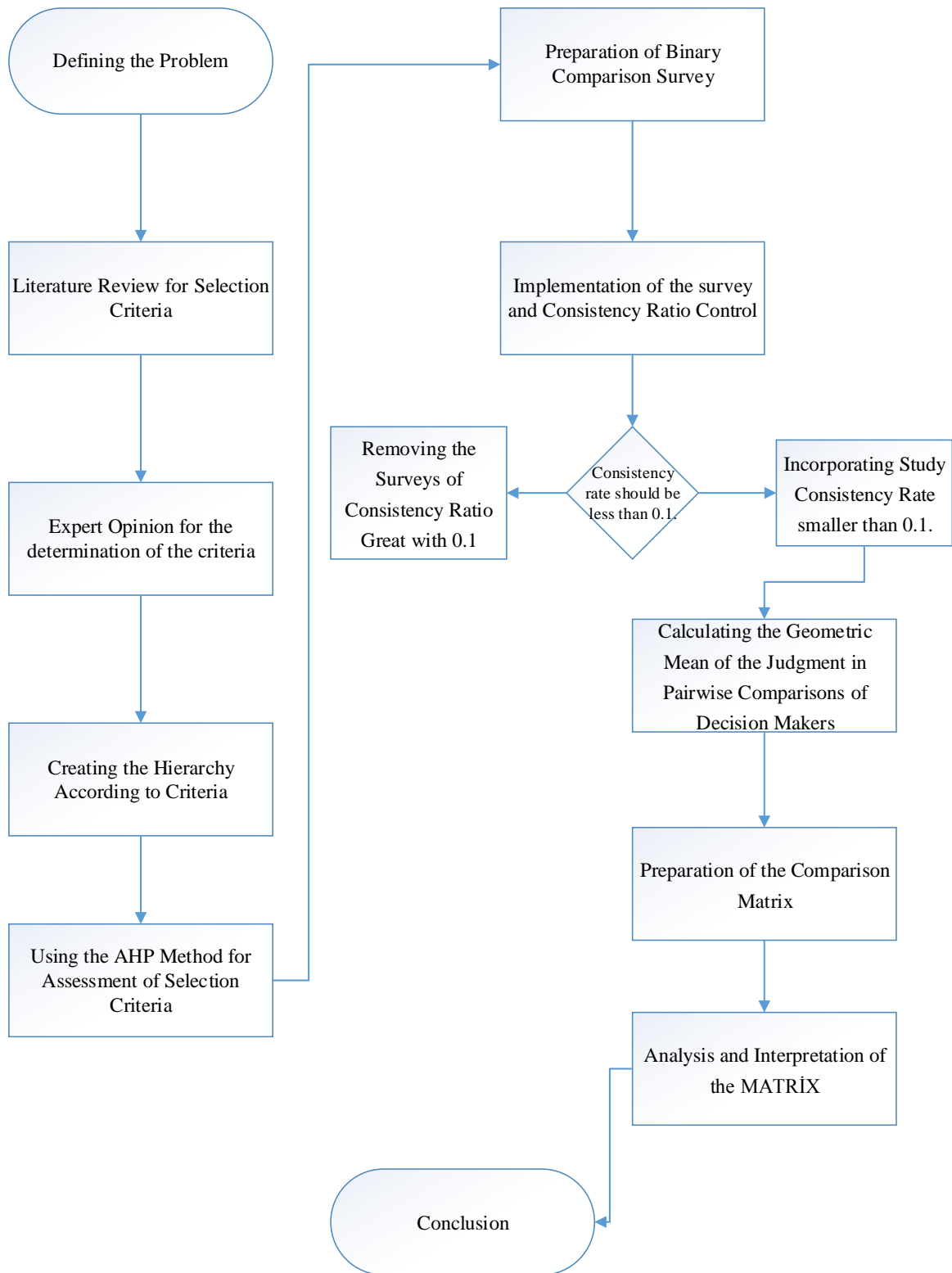
Fig. 4 *Flowchart of Research Methodology*

3.1 Determination of the Criteria

Firstly literature research have been made to determine the factors affecting the selection of airlines in the air cargo transport sector. Then factors identified in the literature were evaluated academicians and experts in the sector. Thus criteria to be used in practice was determined as given in table 2.

Tab. 2 *Airline Selection Criteria*

CRITERIA	REFERENCE
Price	•(Yoon and Park, 2015) •(Park et al., 2009) •(Matear and Gray, 1993) •(Chu, 2014) •(Lima, 2007) •(Wen et al., 2011) •(Hong and Jun, 2006) •(Yoon and Park, 2014) •(Mitra and Leon, 2013)
Speed	•(Yoon and Park, 2015) •(Park et al., 2009) •(Matear and Gray, 1993) •(Lima, 2007) •(Wen et al., 2011) •(Yoon and Park, 2014) •(Mitra and Leon, 2013)
Reliability	•(Yoon and Park, 2015) •(Park et al., 2009) •(Chu, 2014) •(Lima, 2007) •(Wen et al., 2011) •(Meng et al., 2010) •(Hong and Jun, 2006) •(Yoon and Park, 2014) •(Mitra and Leon, 2013)
Flexibility	•(Yoon and Park, 2015) •(Chu, 2014) •(Lima, 2007) •(Meng et al., 2010) •(Yoon and Park, 2014)
Risk	•(Park et al., 2009) •(Meng et al., 2010) •(Mitra and Leon, 2013)
Sociality	•(Yoon and Park, 2015) •(Chu, 2014) •(Yoon and Park, 2014)

Airline selection criteria are transformed to hierarchical structure as Figure 5. The hierarchy to be used in paper is determined by the light of literature and expert opinion. After

creating a hierarchical structure, all criteria must be compared with each other. Then, impact degrees of criteria are determined depending on experience and knowledge of decision makers using fundamental scale of AHP of certain values 1 to 9.

Fig. 5. *Hierarchical Structure in Air Cargo Industry*

3.2 Analysis of the Pairwise Comparison Matrix

After the establishment of AHP hierarchical model, another important step is analysis of the pairwise comparison matrix. At this stage, firstly a questionnaire has been prepared to determine the significance of the hierarchical structure elements. In an effort of conducting the study, 15 survey questions are sent out to senior executives at air cargo agencies. The process of taking feedback about answering the survey lasted about 5 weeks. The geometric mean of the judgement of decision makers in binary comparison is calculated to make them suitable for the analysis. The results of analysis of the survey on airline selection was composed of six main selection criteria. The survey results are as table 3.

Tab 3. *Comparison Matrix*

	Price	Speed	Reliability	Flexibility	Risk	Sociality
Price	1	4,21	3,3	6,54	3,82	8,32
Speed	-	1	1,14	2,71	2	6,21
Reliability	-	-	1	3,47	1,25	5,19
Flexibility	-	-	-	1	1 / 1,81	2,88
Risk	-	-	-	-	1	4,57
Sociality	-	-	-	-	-	1
					CR	0,03

After the construction of the comparison matrix of survey results, the next important task in the AHP analysis is to pair comparison with expert choice software. Figure 6 shows the outcome of the pair comparison calculation from expert choice software. In order to control the result of the method, the consistency ratio for above matrices and overall inconsistency

hierarchy are calculated. The consistency ratio is 0.03. It was concluded that matrix is consistent so the consistency ratio is smaller than 0.1.
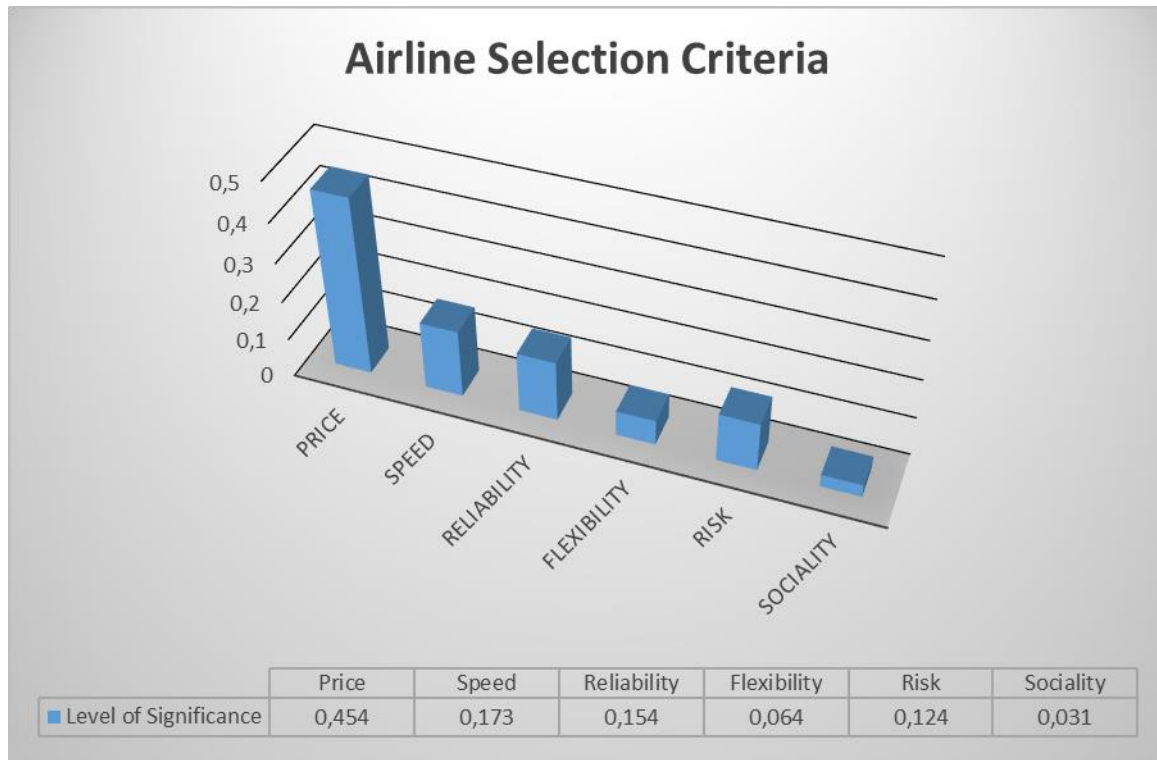

Fig. 6. *Pairwise comparisons of the airline selection criteria*

	Price	Speed	Reliability	Flexibility	Risk	Sociality
■ Level of Significance	0,454	0,173	0,154	0,064	0,124	0,031

Analysis of six criteria was carried out in the computer via "Expert Choice" software. Analysis results from software is given Figure 6. The highest importance criteria by 45.4 % relative is "Price" as can be seen in figure 6. As for the other criteria, "Sociality" (0.031) is the lowest points unlike "Price" criteria. The next criteria is the "Speed" (0.173) which is the second important airline selection criteria. The third one is "Reliability" (0.154) which is followed by "Risk" (0.124) and "Flexibility" (0.064).

4   CONCLUSION

This paper has analysed airline selection factor. Firstly literature research have been made to determine the factors affecting the selection of airlines in the air cargo transport sector. Then factors identified in the literature were evaluated by the academicians and experts in the sector. Thus criteria to be used in practice was determined. It was found that air cargo agencies consider "Price" as the most important criteria. So airlines should determine strategies based on the "Price" criteria to improve the competitiveness of the sector and follow a sustainable policy.

Air cargo agents in cargo submissions make the choice based on "Speed" criteria after the "Price" criteria when the choosing of airline. In this context, the second important criteria should be "Speed" when determining strategies by airline.

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