




Analysis of the Selection of Travel Transportation Modes to Bali Ngurah Rai International Airport

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Abstract. Airports as an area that awakens the revival and attractiveness of travel, it is necessary to analyze the factors that affect the selection of travel modes to the airport. Transportation users tend to choose transportation that meets their criteria because of many factors that affect the choice of transportation mode, namely speed, safety, comfort, and cost. Fashion selection is separating people's journeys to understand the relationship between fashion and the factors that influence other fashion choices. This needs special attention so that the increase in the number of vehicles every year and even every day does not cause problems in Badung Regency, a central tourist area in Bali Province. Research on the behavior of preference for the use of vehicles needs to be carried out, one of the steps that can be taken is to study the factors that affect the preference for the use of modes in daily trips to airports that have a large increase and pull of trips, using the Analytic Hierarchy Process method with the help of software selected by experts version 11. The results of data processing of respondents who use transportation modes to Ngurah Rai Airport show that safety received the highest weight of 28.8%, followed by the speed criterion of 25.7%, followed by the comfort criterion of 23.1%, and the cost criterion of 22.4%. And the most widely chosen alternative mode of transportation is private cars.

Keywords: Analytical Hierarchy Process (AHP), Mode of Transportation, Ngurah Rai

1 Introduction

I Gusti Ngurah Rai International Airport is an area that awakens the rise and pull of travel, it is necessary to analyze the factors that affect the selection of travel modes to and from the airport. Transportation users tend to choose transportation that meets user criteria because many factors affect the selection of transportation modes, namely time, safety, comfort, and cost factors. Everyone has different basic needs for traveling. For example, people need to go to work, children need to go to school, and so on. Traveling to Ngurah Rai International Airport will certainly affect the existing traffic system. This means that in the airport area itself, there are modes, traffic, and facilities needed. People who have one mode option are called captive against these modes. If there is

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more than one mode, then the mode chosen usually has the shortest, fastest, and cheapest route, or a combination of all three (Tamin, 2000). The decision in the selection of mode is based on the consideration of several factors such as time, distance, efficiency, cost, safety, and convenience (Khisty J.C & K.B, 1998). Mode selection and operator selection are part of the decision-making process in transportation that includes identifying relevant transportation performance variables, selecting transportation modes and operators, negotiating tariffs and service levels, and evaluating operator performance (Monczka et al., 2005).

The choice of people who travel in the morning, afternoon, afternoon, or on a given day is a mirror of the variation in time. Even mobility trends can be aimed at enjoying the travel activity itself along with the activities carried out. Based on the analysis of the selection of passenger transportation modes to the airport (Case Study: Soekarno-Hatta International Airport) it is known that the most sensitive thing affecting the probability of choosing a mode is the fare (travel cost). Where the change in the cost of travel will result in a relatively greater probability of choosing a mode than if there is a change in other attributes. Transportation is defined as the effort to move, move, transport, or transfer an object from one place to another, whereas in another place the object is more useful or can be useful for certain purposes (Miro, 2004). Public transportation is the entire means of transportation where passengers do not travel using their vehicles (Siswoyo, 2008). Online transportation (Amajida, 2016) is a transportation that can be accessed through Android application technology and uses the Global Positioning Systems (GPS) feature on smartphones. Online transportation provides new options for transportation and convenience for the community (Prihatin, 2016).

2 Methodology

2.1 Place and Time of Research

The location of this research was carried out at Ngurah Rai International Airport to observe the most widely used transportation. As for the distribution of questionnaires, it can be done anywhere to respondents who have traveled to the airport. The time for conducting the research is 6 months or 180 calendar days from the collection of primary and secondary data to the preparation of the final research report. The location of the airport is shown in the following Figure 1.

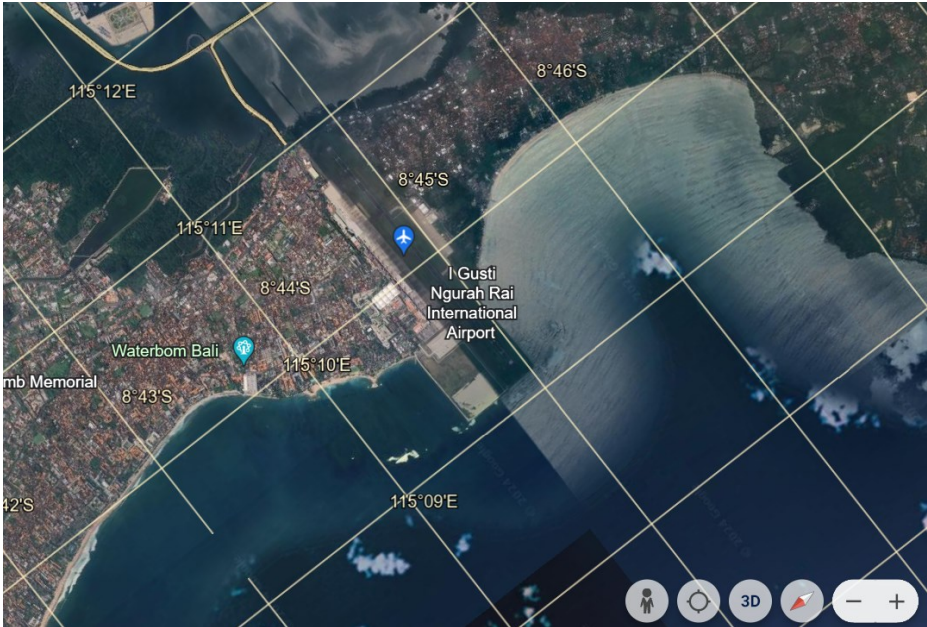


Figure 1. Location of Ngurah Rai International Airport

2.2 Research Stages

The stages in the implementation of this research are as follows: The first stage is to develop a hierarchy to represent the problem. At the top of the hierarchy is the overall goal, then alternative criteria and options are found at the bottom. The number of hierarchical levels depend on the complexity of the problem and the analysis/decision-making model of the problem hierarchy. The second stage is the process of building interconnected data to compare with alternatives. At this stage, data analysis is performed to make a paired comparison of each element at each relative level for each activity at the next level higher in the hierarchy. In the AHP method, the relational scale as described in the previous chapter consisting of numbers 1 to 9 is used. When comparing two attributes (or alternatives) with attention to higher-level criteria, the following relational number scale is used.

2.3 Data Analysis

The data analysis in this study uses the analysis of expert choice software version 11 based on hierarchical weighting factors for all criteria at level 1 and level 2. The data analysis process aims to analyze the data and interpret the data that has been processed, following the theoretical basis that has been explained in the previous chapter, so that later it can be used as a consideration for decisions and subsequently as recommendations for related parties. The method or technique used in this study is the

AHP method. This method is most appropriate for the application and evaluation of activities dominated by qualitative factors. This technique can be characterized as a multi-criteria decision-making technique that can be combined with qualitative and quantitative factors in the overall evaluation of alternatives. Combining quantitative and qualitative methods will provide a better understanding of the problem. The mixed method data obtained is more comprehensive, valid, reliable, and objective data. According to Sugiyono, the 2017 research variable is everything in any form determined by the researcher to be researched so that information about it is obtained and then conclusions are drawn. This variable will be divided into two levels, namely level I (criteria) including cost, travel time, safety, and comfort. After assessing the weight of the criteria, it was continued to conduct an alternative weighting analysis. This analysis aims to determine the most dominant factor in determining the most dominant mode used for travel to and from the airport. With the results of this analysis, it is hoped that it can be used as a guideline to improve public transportation services.

3 Results and Discussion

3.1 Result

In analyzing this study, a tool in the form of an expert's choice program was used. This software can help determine more efficient, analytical, and justifiable decisions. The steps in conducting an analysis using this software are as follows.

Pair Comparison. After the main focus, criteria, subcriteria, and alternatives are known, then a comparison of pairs of each element in one level of hierarchy is carried out in pairs, so that the level of importance of all elements is known. Expert choice software is software that is specifically used in the AHP method, it can support complex decisions by making more efficient, analytical, and justifiable decisions. The result of this paired comparison will form a matrix in which the ratio scale is derived in the form of the main vector eigens or eigenfunctions. The matrix is positive and reversed, namely $a_{ij} = 1/a_{ji}$ (Saaty, 1993). The first step is to enter the data resulting from the problem identification formed in the problem-solving hierarchy. The data is fed into the Expert Choice v. 11 software, shown in Figure 2. Expert Choice uses a consistency ratio. However, this consistency ratio has been criticized for allowing for contradictory judgments in the matrix (Kwiesielewicz et al., 2004) or rejecting a reasonable matrix (Karapetrovic & Rosenbloom, 1999).

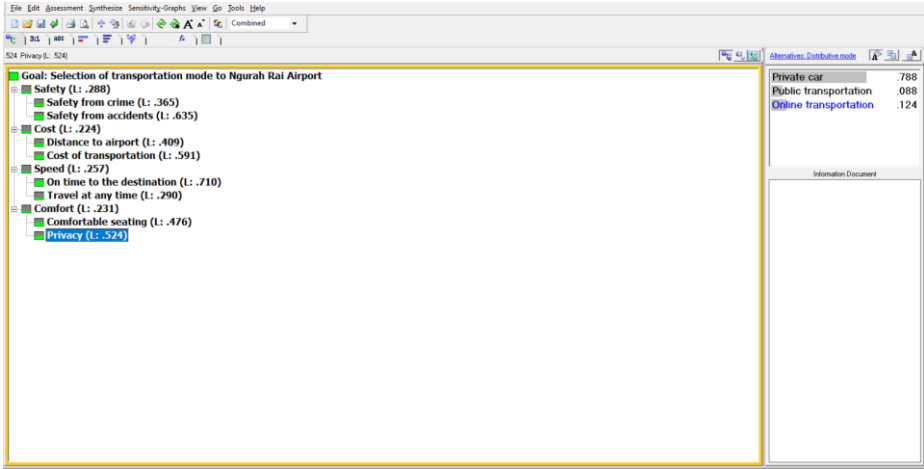


Figure 2. Pair comparison

Determining Priorities and Consistency. Priority is made for each element of the problem at the hierarchy level. Priority is determined by the criteria that have the highest weight, the weight of each criterion and sub-criteria is determined by re-entering the results of the paired assessment from the questionnaire into the questionnaire table at the choice of experts. The inconsistency ratio is a parameter used to check whether the paired comparisons in the questionnaire have been done consistently or not. The results are said to be consistent when it has an inconsistency ratio value of less than 10% or 0.1. If the inconsistency ratio value is obtained from 10% or 0.1, then the questionnaire should be revised again. The revision is carried out until a level of consistency with a small value of 0.1 is obtained. The results of the weighting of respondents can be seen in Figure 3.

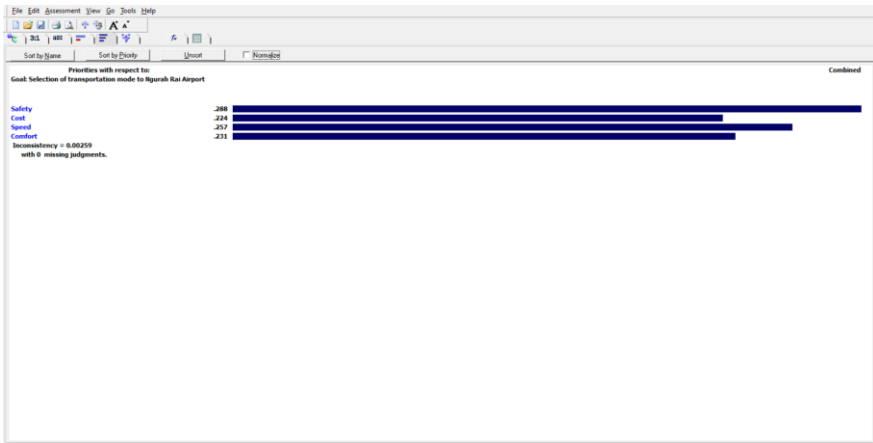


Figure 3. Priority and inconsistency criteria

Sensitivity Analysis. Sensitivity assessments are carried out on alternative decisions, used to see changes in components or elements of the hierarchical structure. Each change in the weight of the criteria results in an alternative change. The assessment process can be done on the dynamic sensitivity or performance sensitivity menu. Sensitivity analysis in the Analytical Hierarchy Process method can be used to estimate the situation when there is a major change, such as an increase/decrease in priority weight due to a change in decision-making (Teknomo et al., 1999).

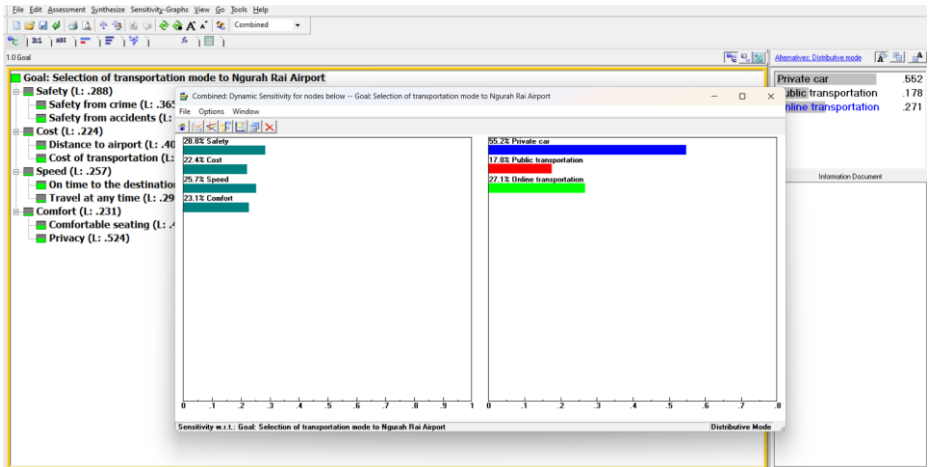


Figure 4. Dynamic sensitivity

Based on Figure 4, it can be seen that the most sensitive criterion for changing the weight change to change the alternative priority of choosing a mode of transportation to the airport is the safety criterion with a weight of 28.8%, while the criterion with the lowest sensitivity is the cost criterion with a weight of 22.4%.

Figure 5 shows the relationship between criterion weights and alternatives according to respondents' opinions. Based on the management policy, the simulation is carried out by increasing and decreasing the weight of each criterion by 10% and will see the effect on the 3 (three) alternatives that have been selected previously.

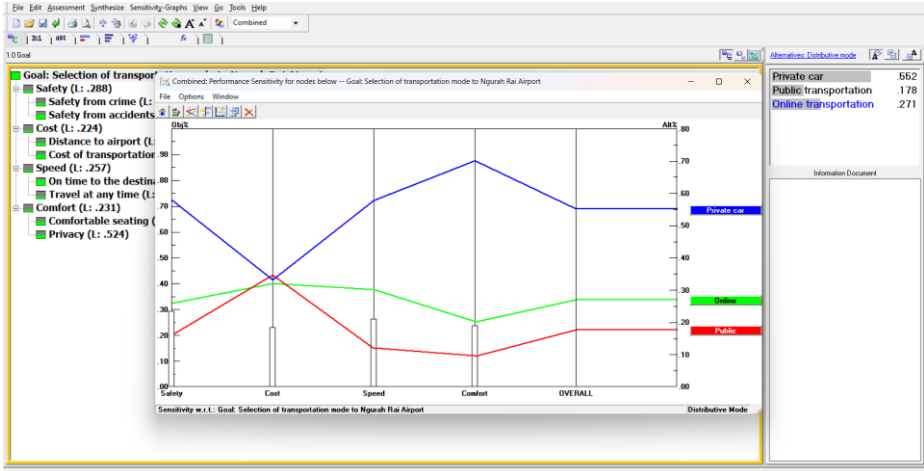


Figure 5. Performance sensitivity

3.2 Discussion

Based on the results of this study, safety criteria were obtained as the main criteria for respondents who traveled to the airport. As for the research at Soekarno Hatta airport, the cost criterion is the main criterion in choosing a mode of transportation to the airport. As for alternative modes of transportation, respondents prefer private vehicles even though they finally chose online transportation. This shows that public transportation service operators must be able to provide good service so that people can switch the use of online transportation and private transportation to public transportation. This will have a good impact on transportation services in Bali because it will reduce congestion, air pollution, and noise pollution.

4 Conclusion

The respondents in this study are only air passengers, so the resulting mode selection model is only specific to the behavior of choosing an airport access mode for air passengers. Although airport users are not limited to just passengers, there are airport employees and airport ushers/visitors who may have different mode selection behaviors from air passengers. Therefore, further research is still open to model the behavior of airport workers and visitors (non-air passengers).

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