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The Airport Development due to the Demand of Passengers (Case: Mutiara Palu, Indonesia)

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Abstract. The influence of service quality has limited attention to the airport study. The services are according to the demand that directly influences the development of the airport. This study investigates the development of the airport. The increasing of passengers used aircraft for the mode choice of transportation made the polemic. The quality of service with the growing demand of passengers could satisfaction the passenger to use the airport facilities and made a flight. The rising trend of passengers has to cover the quality of service performance with the expansion of the airport. The demand analysis is conducted to predict and optimize the services of the airport facilities According to the population and daily flight information. Demand shows the forecast of passengers use the semi-average method, least square method, and the quadratic trend method. The result confirms that the trend of passengers is attracted to choose a cheap flight as a priority than the safety factor. The population affected by the demand for a flight. Otherwise, the growth of domestic products is related to increasing flight demand. Finally, the result shows the factors that affected the demand of passengers to travel with aircraft influenced the expansion in developing the airport facilities.

1. Introduction

The airport is one of the transport infrastructures is very important for Indonesia as an archipelago. The growing demand for flight business has an important role as one of the transportation services. In Indonesia, the function of the airport is a strategical function cause the travel time will be short, fast, and effective, especially to the long travel distance and between the other island.

The development of the flight in transportation services is aiming to fulfill the demand or air transport services, which is increasing by the year. The fast transportation, safety, and comfort become an important thing to support economic growth so that airport as an indicator of developing city.

Palu, as the central city of Central Sulawesi Province, is located in the valley plain and bay. The area consists of five elements like mountain, valley, river, bay, and sea. The total area of Palu reaches 395,06 kilometers with a total population that according to the Statistical of Palu Government in 2015, around 367.342. Palu was also known as a transit city for water transportation that comes from the outer of Celebes Island [1].

The strategical location and support by the facilities of transportation: port, airport, and road make Palu as the busy city. The condition is making the other problems, especially for airport transportation services, while the quality service of the airport is the main part of air services.

Palu Mutiara Airport is located in the south of the Palu region. The airport has become the main gate of Palu City. According to the statistical of government, the total activity of airport records every year,



especially for 2015 to 2016, the increase of passengers are more than 100.000 people [2]. The trend of increasing passengers is not followed by the facilities and the quality, so that makes a new polemic. Further, the development of Palu Airport has become an international airport that has a special constraint in order to perform a good quality service and comfortable for totally customers and users of the airport. The masterplan of the airport is established gradually, continuously, comprehensives, and well-integrated.

According to the tren of passengers of the Mutiara Palu airport, the condition certainly concerns to the quality of service and affect the analysis of the developing airport is important. The demand analysis of passengers of the airport according to the income and the population as the initial information that supports the planning of the improvement and developing the quality of services. The services not only from the airport side but also comes from the assessments of the airline that operated in Mutiara airport as the preference for continuous improvement.

2. Study Literature

2.1. Air Transport

Transportation has an important role in developing countries. The transport facilities are used to growth finance, infrastructure, movement, others. Totally transportation is affecting social life. The transportation has provided effective services to open the isolation area, service the village, support to the rural area.

The transportation itself is an activity to transport people, stuff, and others that come from origin to destination. This is the similarity with the function of an airport to transporter people or cargo from origin to destination with a plane. The plane as air transportation has a characteristic, fast speed, and reachable to place that services by the other transportation mode [3].

2.2. Transportation Demand

Demand transportation services are determined by the transport of goods and passengers carried. Demand by consumers is very closely related to the consideration of service (service) arising from the use of transport services. The quality of transport services has to be provided effectively and efficiently. Transportation services are continuous/available, secure, safe, adequacy, frequency, regular, responsible, acceptable cost, and comfortable [4].

Transport services need to be highly qualitative and having different characteristics as a function of time, travel destinations, frequency, type of cargo transported, and others. Transportation services that do not fit the needs of the movement led to the transportation system useless [5]. Economically, an inefficient transportation system or transportation problems is a big waste [6].

Six factors that affect demand for air traffic is on the following description. First, the economic factors with elements that gross domestic income and exchange rates. Gross domestic income is attributed to how income levels, while the exchange rate affects the amount of travel. Second, the demographic factors such as population or the number of inhabitants of a region and urbanization. Third, the supply factors that are indicators of aviation service providers. As for factors including supply are the cost of transport (passengers per km), size of the aircraft, fuel costs, technology (navigation, communication and so on), management (network airlines, new routes, and so on), capacity constraints, and the ticket. Fourth, economic regulation, such as airline and airport privatization, free trade, open skies, foreign ownership, and tax regulation. Fifth, the regulatory environment. An example is the imposition of a carbon tax, which provides an additional impact on the cost of the trip. Sixth, cargo transportation, which related to the logistics needs of air transport [7].

2.3. The influence of Income and Demand

The per capita income is the amount of the average income of the population in a country. Per capita income show that construction has been implemented by the government have made it, how big this success, and as a result, incurred by the increase [8]. The GDP (Gross Domestic Product) is defined as the total value added generated by all business units within a region or the total value of final goods and

services produced by all economic units in a region. The value of GDP divided by the population in the region resulted in income per capita [9].

The analysis of the development of airports based on passenger demand can use the value of the GDP of a region and forecasting the population growth rate. There are two general approaches used in forecasting, as follows [10]:

- Quantitative forecasting, using various mathematical models that use historical data and or causal variables to forecast demand.
- The qualitative forecasting or subjective forecasting, utilizing important factors such as intuition, personal experience, and the value system of decision-making.

2.4. Mutiara Airport of Palu

Recently, the Palu city becomes the special economic zones (SEZ) in eastern Indonesia. The government of Palu already provides all instruments to support the special status, and for the total area of 1,520 hectares in the district of North Palu is prepared, which includes the Village Pantoloan, Baiya, and Bambara. The land area of 1,520 hectares will be divided into an industrial area of 700 hectares, residential area (500 hectares), the area of education and research (100 hectares), commercial area (100 hectares), sports area (50 hectares), warehouse area (50 hectares), plantation and garden area (20 hectares) [11].

Mutiara Palu Airport was located at an altitude of 86 meters (282 ft) above sea level, has two paved runways and concrete surfaces designation 15R / 33L with 2,500 x 45 meters and 15L / 33R with 3,450 x 60 meters. The airport has an extensive terminal building that covers 15,196 square meters [12]. The operation of the airport is facilitated by various support systems. The airline that services the flight are Batik Air, Citilink, Garuda Indonesia, Kalstar Aviation, Sriwijaya Air, Susi Air, Wings Air, and Xpress Air. Central Sulawesi government is trying to develop Mutiara airport into an international airport that given perspective with the high-interest air transport according to the population growth demand [13]. Furthermore, the analysis of Palu Mutiara airport development is essential as an input and as a preference.

3. Research methodology

The method used in this research is to interview the respondents who have a passenger that exists in the airport terminal building that would travel using the Mutiara Palu airport. The analysis of the study will use a forecasting method and the trend with linear regression, the average value, and moderate value to forecast the passenger demand with the variable value of GDP and population growth.

3.1. Location & Framework

The location of the research is at the airport terminal building. Previously, the study conducted the flow of research, including the preparation, the literature study, the method, the data analysis, and the following flow (Figure.1).

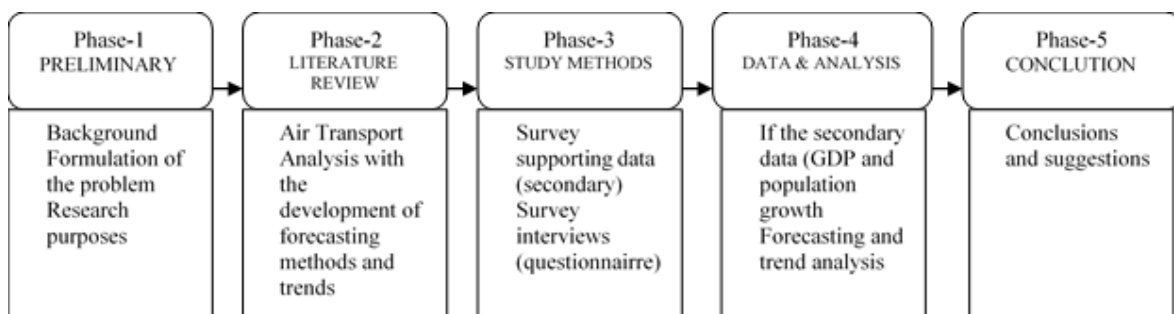


Figure 1. Flow framework research

3.2. The survey method

The interview was conducted with respondents passengers who were in the waiting room, arrival, and the terminal building. This interview was conducted by asking the respondents available time to interviewed about their opinion du to the airline services. Personal information has also recorded the preference through airfare, destination, time travel, and the quality of services. Other preferences as secondary data are received from official government websites such as location map, geographical conditions, the total number of operational airlines, the total passengers, and related information as like as domestic income and growing population.

4. Result and Discussion

The total respondents are 1006 passengers who have travel and use the Mutiara Palu airport services. The preferences of passengers are applied to knows the potential demand and the relation of gross domestic income and population due to the demand of airlines.

4.1. The Preferences of airlines selection

The preferences of passengers’ airlines through the services on airlines that fly from origin and destination to Palu city. The result is shown in figure 2. The total respondents’ preferences according to the services provided by the airlines such as services quality, safety, security, facility, timeliness, airfare cost, others. The respondent’s willingness priority services to improve, and each airline is various. As an example, Transnusa is focused on airfare costs and timeliness, Lion air is on the airfare cost and safety, Batik is on the secure and airfare cost, Sriwijaya is on the airfare cost and facility, Garuda is on the security and safety, and for the Wings is on the airfare cost. The majority respondent’s willingness priority is tending to airfare cost, followed by security and safety.

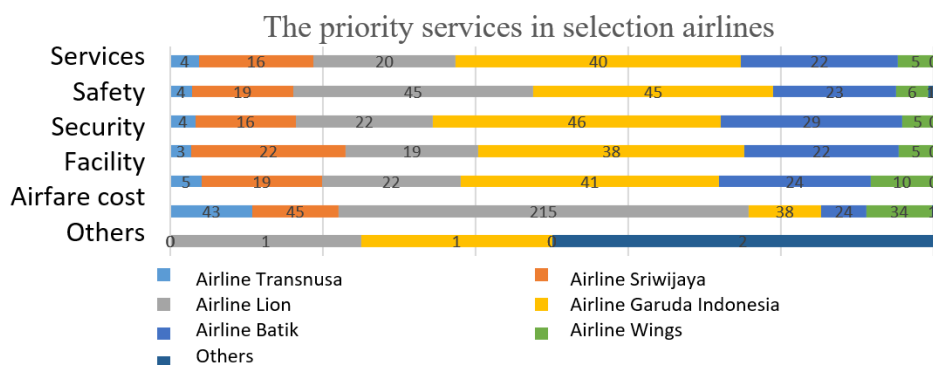


Figure 2. Respondents priority services in select the airlines

4.2. Respondents comparison priority in selected airlines

The whole airline has been assessed by the respondents. The total airlines are evaluated according to the providing services. The following figure 3 shows the percentage of respondent’s priority services for the total airline’s services.

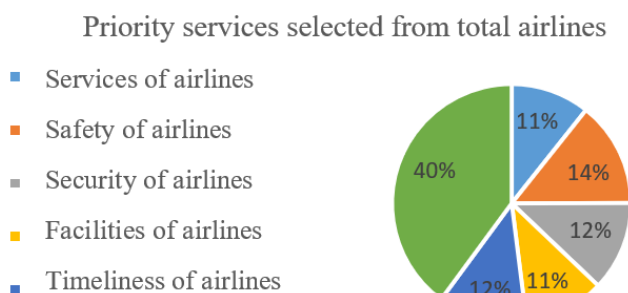


Figure 3. Respondents comparison chart priority selection airlines

Based on this, the comparison of priorities of respondents in the election of the airline in figure 3 shows that as much as 107 respondents (11%) priority the services, 143 respondents (14%) select the safety level, 122 respondents (12%) select the security level, 109 respondents (11%) choose the facility, 121 respondents (12%) selected the departure and arrival time, and the majority respondents stated that the airfare cost is suitable to the finance condition of respondents.

4.3. Regression result

The influence of the variable of services to the gross domestic regional and the population is calculated using linear regression. The multiple linear regression results are shown on the following table.1.

Table 1. Multiple linear regression results

Variables	Coefficient	Standard Error	t-statistics	Probability
C	3558534.355	1006452.493	3.535710208	0.071516923
X1	-9.349842469	2.878541705	-3.248117771	0.083135306
X2	0.054201215	0.009090084	5.962674744	0.026992994
R-Square	0.952144713			
Adjusted R Square	0.904289427			
Standard Error	51244.89701			
F-statistic	19.89633284			
Prob (F-Statistics)	0.047855287			

Note:

- C : constants / intercept
 X1 : Total population
 X2 : GDP

Based on Table 1, the regression model as follows:

$$Y = (-9.349842469 X1) + 0.054201215 X2 + 3558534.355 \quad (1)$$

4.4. Significant of F-Test

The result of F-test shows the values for 5.79 ($\alpha = 5\%$) and $F = (K; n - k = F(2,5) = 5, 79$. According F-statistics/ F-count equal to 964.153. Compare the-test and F-table, then the F-count is obtained, which is greater than F-table ($19.89633284 > 5.79$). Therefore, the independent variables simultaneously influence the dependent variable.

4.5. Significant of T-Test

The t-test usually shows the influence of the independent variables partially that explains the variations in the dependent variable. The influence of the independent variables on the dependent variable can be seen in Table 2 below.

Table 2. Partial regression results (T-test)

	Coefficients	Standard Error	t-Stat	P-value
Intercept	3558534.355	1006452.493	3.535710208	0.071516923
Population (X1)	-9.349842469	2.878541705	-3.248117771	0.083135306
GDP (X2)	0.054201215	0.009090084	5.962674744	0.026992994

According to the Table 2 result shows that several independent variables are significantly assuming the value of t-count $>$ t-table. The t-table obtained with 2.77645 ($\alpha = 5\%$) and $t(\alpha / 2; n - k - 1) = t$

$(0,025; 4) = 2.77645$. Compare the value of the t-test and t-table, the t count of population variables (X1) is smaller than t-table ($-3.248117771 > 2.77645$) and the value t count the GDP variable (X2) by ($5.962674744 > 2.77645$). Therefore, it shows that the independent variable (X2) partially affects the dependent variable.

4.6. The forecast of Airlines according to GDP value

The forecast of airlines use the growth rate method is shown in figure 4. The equations are used the growth rate with 13%, otherwise, while using linear regression is lightly straight with X value in equations that also as a total GDP in forecast year with the yellow line. The blue line is a moderate value compare to the linear regression and trend data.

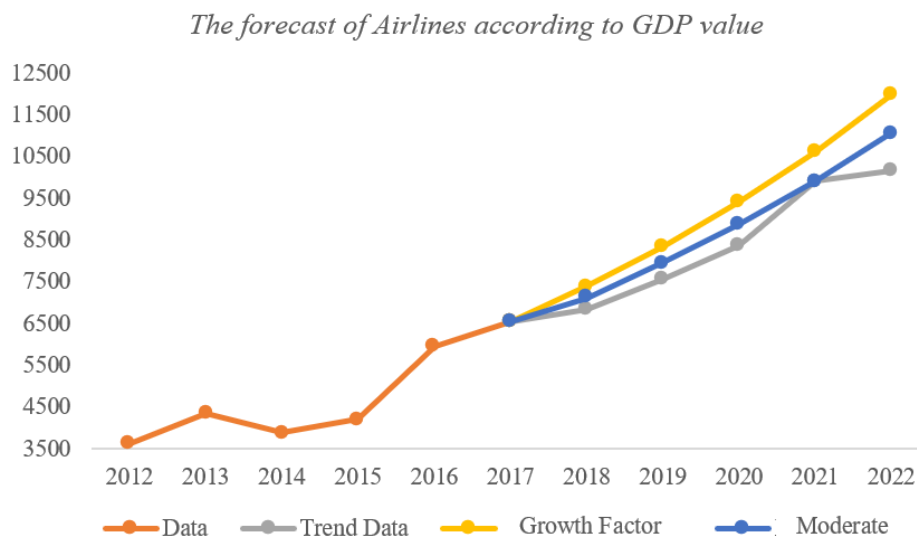


Figure 4. The airlines' forecast

5. Conclusions

According to the results and discussion before, it can be concluded:

- The result shows that 40% of respondents to prioritize prices in the offer of the airline, 14% prioritize the safety level of the airline, 12% prioritize security levels, 12% prioritize the punctuality of departure and arrival, 11% prioritize services that are provided, and 11% prioritize facilities given airline.
- The population has not significantly influence, and there is no linear relationship between the number of populations to the demand of passengers at the airport Mutiara according to the t-count value that smaller than t-table ($-3.248117771 < 2, 77 645$).
- The GDP has significant influence and has a linear relationship between the GDP of the passenger demand on the airport, with the t-test calculations more than t-table ($5962674744 > 2.77645$). The influence the GDP on passenger demand comes from the regression coefficient valued with 0.054201215, which is means that the increase of the GDP will increase in passenger demand at the airport.

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