A Comparative Analysis of the Effectiveness of Airport Public Transport System in Jakarta

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Abstract

Mobility of the people of Jakarta is increasing, likewise mobility of the people with the aim of/to Soekarno Hatta International Airport. Public transportation that can be used from Soekarno Hatta International Airport to Jakarta and vice versa includes airport trains, buses, and taxis. The Airport Bus and The Airport Train have relatively the same fare prices. However, the two transportation modes are considered not optimal in operation, the quality of service must be improved so that market share can be increased. Then, necessary to evaluate the effectiveness of services. The research method was carried out through surveys and questionnaires. Data is collected from the Airport Train Station and the Gambir Buses Stop. The analysis that used in this paper is the Validity, Reliability, Binary Logistics, and Importance Performance Analysis. The results showed that the performance and satisfaction factors on the Airport Train were good, while the performance and satisfaction factors on the Airport Bus were quite good. This paper answers doubts about the Airport Train's existence, which is considered not optimal, but has excellent facilities and infrastructure in terms of availability and management.

Keywords

Airport Train, Airport Bus, Performance, Satisfaction, Minimum Service Standards

1. Introduction

Soekarno Hatta Airport (SHIA) is the airport with the most considerable flight activity in Indonesia. The high activity is due to the high movement of people from and to the airport. SHIA is the largest airport in Southeast Asia, the most active in the southern hemisphere, the seventh most connected airport globally, functioning as a "mega-hub," the airport handled more than 63 million passengers in 2018 (Kim et al., 2019). An airport can be considered an operating system is comprising infrastructure, equipment, personnel, operating and management procedures that collectively provide services to its customer (Bardai et al., 2017). As the largest airport and the main gateway to the Indonesian state, it is highly relied on by the community. Soekarno Hatta Airport has the main transportation to serve airport users, airplane passengers, and prospective aircraft passengers going to and from the airport, namely airport trains, taxis, and buses.

Soekarno-Hatta Airport Train serves the Manggarai route to Soekarno-Hatta Airport along 36.3 km by passing through Sudirman Baru Station, Duri Station, Bekasi Station, and Batu Ceper Station. The 70 departure schedules every day with a *headway of* 30 minutes. They are operating hours updated with changes in flight schedules and a carrying capacity of 33,728 passengers per day (Railink, 2019). The Soekarno-Hatta Airport Train was produced *utterly knocked-down* (CKD) by Bombardier Transportation and assembled by the BUMN Railway Industry in Madiun, East Java. The 60 train units produced are divided into ten trains series with the formation of six trains per series, with facilities such as *audio-video on-demand* (AVOD), toilets and firecrackers, special seats for people with disabilities (Dimas, 2018).

Figure 1. Airport Train

The airport bus system has the vision to make airport bus a reliable transportation service company that can compete and meet stakeholders' expectations towards independence, which no longer depends on subsidies from the government.

Figure 2. Airport Bus

With the increasing number of aircraft movements (traffic) at Soekarno Hatta Airport, then more increasing number movement of passengers from/to the airport with existing transportation mode, then necessary to evaluate the effectiveness of services and satisfaction of transportation users in order to find out whether the services provided are sufficient or not.

The aims and objectives to be achieved from this research are:

a. Knowing the number of users of the Airport Bus route Gambir Pool - Soekarno Hatta Airport and Airport Train route BNI City Station - Soekarno Hatta Airport;
b. Identifying passengers satisfaction with the service facilities provided by the Airport Bus route Gambir Pool - Soekarno Hatta Airport and the Airport Train on the route of BNI City Station - Soekarno Hatta Airport;
c. We are analyzing Airport Bus service facilities for the Gambir Pool route - Soekarno Hatta Airport and the Airport Train route BNI City Station - Soekarno Hatta Airport against the specified Minimum Service Standards (MSS).

2. Literature Review

Effectiveness is a measure in terms of achieving predetermined goals. If the goal has been achieved following previously planned, it means that it is effective. If the goal is not following what has been determined, it is not sufficient (Rheva, 2018). Effectiveness measured reflects what is valued, and as a corollary, what is measured is valued (Goe et al., 2018).

Transportation has transferred the people from one place to another using tools or vehicles driven by humans or machines. There are two essential elements in transportation: *movement* and physically changing the place of goods or passengers to other places (Bulelengkab, 2018). Transportation is best, which accomplishes the movement of things with the least force and the shortest time (Charles, 2018).

The Minimum Service Standard (MSS) is the minimum service measure that service providers must meet to provide services to the public. MSS must be equipped with clear benchmarks to quickly provide services to the public (Kemenhub, 2015).

The minimum service standards used in this study for airport trains are based on the Regulation of the Minister of Transportation of the Republic of Indonesia Number PM 63 of 2019 concerning Minimum Service Standards for People by Train. While the minimum service standards used for Airport Bus based on PM 29 of 2015 concerning Amendments to the Regulation of the Minister of Transportation Number PM 98 of 2013 concerning Minimum Service Standards for Transportation of People with Public Motorized Vehicles on Routes, including:

a. Safety;
b. Security;
c. Reliability;
d. Convenience;
e. Equality.

3. Methodology

In this study, the data sources that were needed were primary data and secondary data. The variables used in this study are based on the Regulation of the Minister of Transportation of the Republic of Indonesia Number PM 63 of 2019 concerning Minimum Service Standards for People Transportation by Train. While the minimum service standards used for Airport Bus based on PM 29 of 2015 concerning Amendments to the Regulation of the Minister of Transportation Number PM 98 of 2013 concerning Minimum Service Standards

for People Transport with Public Motor Vehicles on Routes as well as field observations by seeing and feeling directly as users.

The survey technique in this study was to distribute questionnaires to 100 respondents. This questionnaire consists of 31 questions with the number of answers according to their position. Respondents checked the answers that best match their point of view. The questionnaire in this study used an interval measurement scale, namely the Likert scale. The questionnaire was distributed to respondents who used both Airport Train and Airport Bus transportation via google form and distributed to Soekarno Hatta Airport Train and Airport Bus services users.

3.1 Data Processing and Data Management

In data processing, researchers used descriptive statistical data analysis techniques. This technique used by researchers because data collection by distributing questionnaires and processing them is carried out by testing as follows:

3.1.1 Validity Test

Validity explains how well the collected data covers the actual investigation area, which basically means "measure what is intended to be measured" (Taherdoost, 2017). Validity refers to a test's appropriateness as a measure of assessment (JIN Ying-ying & QI Xiao-wen, 2018). The validity test in this study was carried out for indicating the extent to which the measuring instrument measures what you want to measure. Question items in the questionnaire are declared valid if r count > r table. Researchers used the SPSS program to determine the validity of the results.

3.1.2 Reliability Test

The indices reliability that is derived from these surveys (whether they provide the same results when the same person is questioned under the same circumstances on two separate occasions) is a critical issue in deciding which instrument to use in ongoing population monitoring and surveillance studies (Brown et al., 2018). In this study, the Alpha Cronbach technique will be used (c). This technique is used to measure the reliability of question items whose scores are in the form of a range of values (e.g., 0-10, 0-7) or a scale (or 1-3, 1-5). A scale's reliability is heavily dependent on the number of items composing the scale (Coster, 2018).

Reliability testing of a questionnaire has a basis for decision making in advance. In determining the reliability test results, the SPSS program is used to determine the final result. If the Cronbach's Alpha value is > 0,60, then it is reliable or consistent. Meanwhile, if the Cronbach's Alpha value is < 0,60, then it is not reliable or consistent.

3.1.3 Logistic Binary Test

The main focus of logistic regression analysis is a classification of individuals in different groups. This study aims to explain basic concepts and applications of binary logistic regression analysis intended to determine the combination of independent variables that best explain the membership in certain groups called dichotomous dependent variable (Çokluk, 2017).

Decision-making is faced with a pair of discrete alternatives where the alternative to be chosen with the most excellent utility. Utility, in this case, is seen as a random variable (*random*). The logit analysis model's basic approach is to find the form of probability transformation to be valued at $-\infty$ to $+\infty$, although the probability itself is limited from the values 0 and 1.

3.1.4 Analysis of the Effectiveness Level Analysis

Data begins with tabulating the data from the primary data collection for each of them. Then the variables were analyzed using descriptive statistics to determine the mean and standard deviation. The descriptive statistical results were analyzed and then entered into a Cartesian IPA (Importance Performance Analysis) diagram. To measure the extent of the performance and satisfaction of researchers used the Importance and Performance Analysis method. Importance Performance Analysis (IPA) allows researchers to visually identify gaps between stakeholders' perceptions of the importance of a specific attribute and the firm's actual performance or destination on managing that attribute (Boley et al., 2017).

3.1.5 Analysis of Minimum Service Standards

Analysis can be carried out after the questionnaire results have been obtained, where the results of the questionnaire that have been grouped based on the characteristics of the questionnaire are then compared with the Minimum Service Standard (MSS). MSS is the benchmark, used as a guide for service providers and a reference for assessing service quality as an obligation and promise. Service providers to the community to provide quality services, fast, easy, affordable, and scalable (Kemenhub, 2015).

The minimum service standards used in this study for airport trains are based on the Regulation of the Minister of Transportation of the Republic of Indonesia Number PM 63 of 2019 concerning Minimum Service Standards for People by Train. Meanwhile, the minimum service standards used for Airport Bus based on PM 29 of 2015 concerning Amendments to the Regulation of the Minister of Transportation Number PM 98 of 2013 concerning Minimum Service Standards for Transportation of People with Public Motorized Vehicles on Routes.

4. Results and Analysis
4.1. Analysis of the Characteristics of Respondents

In this study, the respondents taken were respondents who had used airport train and the airport bus with a total of 100 respondents, with the characteristics of the respondents as follows:
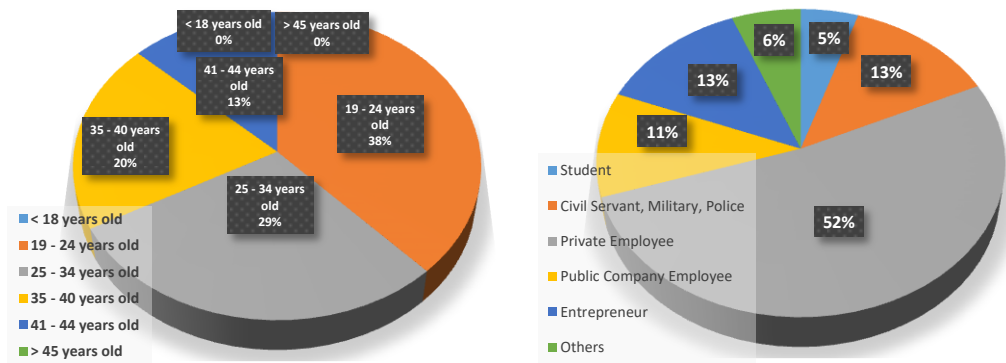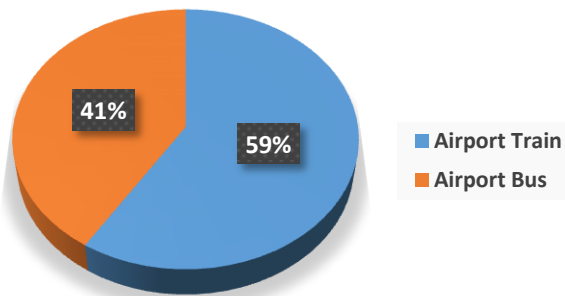

Figure 3. Characteristics of age and occupation

Figure 4. Graph of choice of transportation

The questionnaire results show that most respondents prefer to choose the airport train over than airport bus. This is also influenced because most respondents are young people, so that the convenience factors are the most significant factor that differentiates the valuations of the two modes of public transportation.Analysis Number of the Soekarno Hatta Airport Train Passengers

Analysis number of the Soekarno Hatta Airport Train passengers in January 2020 to September 2020 period, obtained the following data:
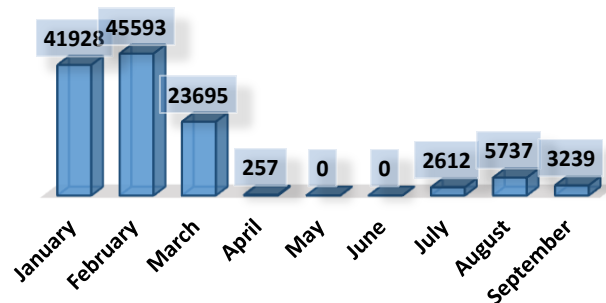

Figure 5. Graph of the number of airport train passengers

The average number of passengers obtained was 13,673 passengers per month, and the highest number of passengers was in February with 45,593 passengers.

4.2 Analysis Number of the Airport Bus Passengers

Analysis number of the Airport Bus passengers in January 2020 to September 2020 period, obtained the following data:
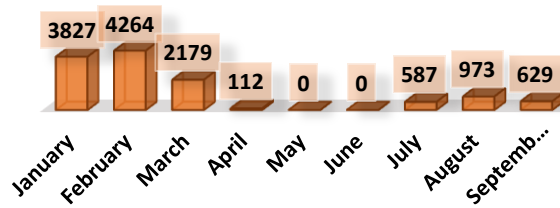

Figure 6. Graph of airport bus passengers

The average number of passengers obtained was 1397 passengers per month, and the highest number of passengers was in February with 4,264 passengers.

4.3 Validity Test

Data inputted for the validity test is the value of the performance factor or variable X and the satisfaction factor or variable Y, with the concept of comparing the calculated R-value and the R table value obtained. In this case, it can be calculated that the amount of df is 100-2 or df = 98 with an alpha of 0.10, then the R table is 0.1654.

The test results' validity shows that the R-value for performance and variable satisfaction gets R> table R's value with a significant value of 10%. These results indicate that the data is valid enough to be used as an instrument.

4.4 Reliability Test

In this study, researchers used the SPPS application to determine the results by including the factors respondents have given an assessment score for performance factors and satisfaction factors. The summary of the reliability test results is in the table below:

Table 1. Reliability Test Results of Performance Factors and Satisfaction Factors

Variable	Reabilitas Coefficient	Cronbach's Alpha	Criteria	Desc.
Performance Level (X)	12 Questions	0.882	0.6	Reliable
Satisfaction Level (Y)	12 Questions	0.891	0.6	Reliable

From the table, it can be concluded that the performance factor or variable X has a Cronbach's Alpha value of 0.882 > 0.6, so this questionnaire is considered reliable or consistent. While the satisfaction factor or variable Y, which has a Cronbach's Alpha value of 0.891> 0.6, this questionnaire is considered reliable or consistent.

4.5 Binary Logistics Testing

Variables which are proven to have a significant effect on the choice of mode to Soekarno Hatta Airport, then the value of B is the regression coefficient of each variable, where the positive (+) and negative (-) signs indicate the tendency of the independent variable to the dependent variable (mode choice), which becomes the benchmark for the independent variable with the data classification code 1. If B's value is positive, then the variable's tendency to move from 0 to 1 in the dependent variable data classification (0: using airport trains, 1: using airport buses). Conversely, if B's value is negative, then the variable's tendency to move from 1 to 0.

Table 2. Results of the Variable Equation

Variable	B
X1	-568
X2	-145
X3	152
X4	-192
X5	2216
X6	-1710

The value of the B Variable (X5) total required travel time is positive, then the tendency of this variable to move from using the airport train to using the airport bus.

The value of B variable (X6) total cost of travel required is negative, then the tendency of this variable to move from using airport bus to using airport train.

4.6 Analysis of Airport Train Passenger Responses

Analysis of passenger responses is used to determine how effective the Soekarno Hatta Airport Train's services and facilities to passengers. The results of the calculated analysis are then entered into a graph of service performance factors and passenger satisfaction factors as follows:
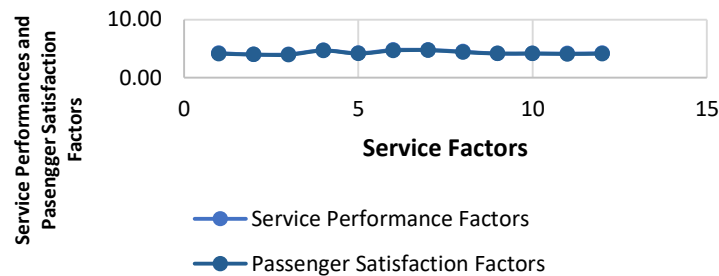

Figure 6. Service performance levels and levels of airport train passenger satisfaction

From the average calculation of each dimension as a whole, the following results are obtained:
1. The average service factor dimension for performance on the Soekarno Hatta Airport Train reaches 4.33, so it can be said that the service performance provided in each dimension of the service factor studied reaches the category **is Good.**
2. The average dimension of service factors for satisfaction on the Soekarno Hatta Airport Train reaches 4.27. It can be said that the service performance provided in each dimension of the service factor studied reaches the category **Satisfied.**

4.7 Airport Bus Passenger Responses

Analysis of passenger responses is used to determine how effective the services and facilities provided by Airport Bus to passengers. The results of the calculated analysis are then entered into the graph of service performance factors and passenger satisfaction factors as follows:
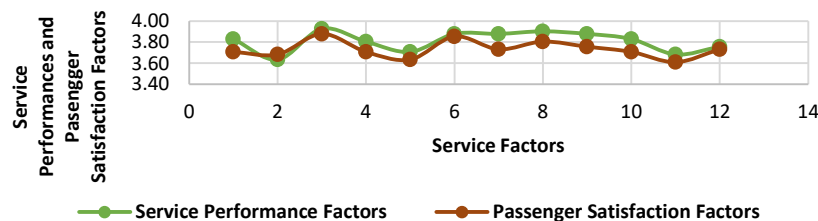

Figure 7. Service performance levels and airport bus passenger satisfaction levels

From the average calculation of each dimension as a whole, the following results are obtained:

1. The average service factor dimension for the Airport Bus performance reaches 3.81, so it can be said that the service performance provided in each dimension of the service factor studied reaches the category **Fairly Good.**
2. The average dimension of service factors for satisfaction on the Airport Bus reaches 3.73. It can be said that the service performance provided in each dimension of the service factor under study reaches the category **Fairly Satisfied.**

4.8 Calculation of Soekarno Hatta Airport Train Priority Level

After obtaining the average calculation of Soekarno Hatta Airport Train's performance assessment and passenger satisfaction, we can see the position of the service quality factors examined in the "Importance Performance Analysis" cartesian diagram. The average value of the performance factor is 4.33, and the average value of passenger satisfaction is 4.27.
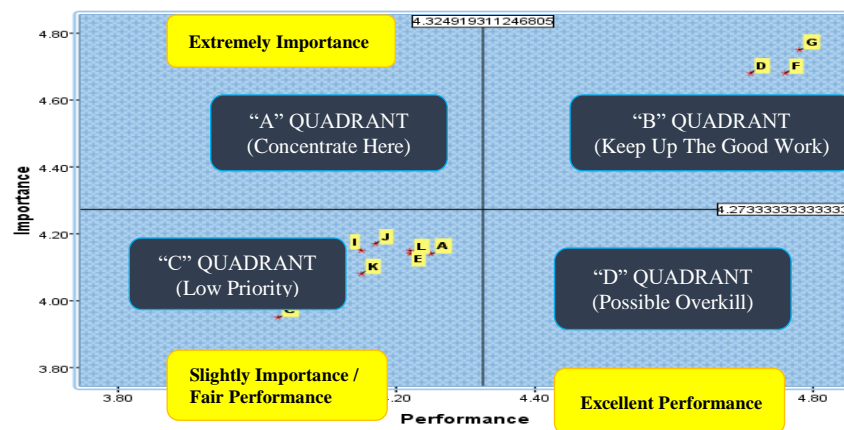

Figure 8. IPA Methods and Cartesian Diagram for Airport Train

Results from processing questionnaire data depicted in the cartesian diagram, can describe it as follows:

4.9.1. Service factors which are the top priority in handling

Service factors that are the top priority in handling are in the A quadrant of the cartesian diagram, where the average performance is below the average total service factor and average satisfaction above the total average service factor. In this study, there are no service factors that are in the quadrant. So that no service factor is a top priority in handling the Soekarno Hatta Airport train because it is already in the excellent category in terms of performance and satisfaction.

4.9.2. Service factors that must be maintained for performance

Service factors that must be maintained performances are in the B quadrant of the cartesian diagram, which is as follows:
3. Lighting is functioning correctly (D);
4. Availability of seating and a clean cabin area (F);
5. Availability (AC) air conditioning system that maintains room temperature (G);
6. Availability of places to place luggage in each train carriage (H).

4.9.3. Service factors with low priority in handling

Service factors that must be considered with low priority in handling are in the C quadrant of the cartesian diagram, which is as follows:
 f. Availability of safety facilities (APAR, intercom for emergency conditions, emergency brakes, and emergency doors) (A);
 g. Availability of first aid kits carried by security officers (B);
 h. Availability of information (in the form of stickers) that includes the telephone number and SMS of the complaint (C);
 i. According to the time of arrival and departure with the schedule (E);
 j. Availability of information on airport train departure schedules (I);
 k. Supporting connectivity between other modes of public transportation both from and to the station/terminal (J);
 l. Availability of unique space or passengers who carry chairs wheels (K);
 m. Availability of priority seats in one airport train or bus (L).

4.9.4. Service factors with excessive excess performance

Service factors with extreme excess performance are in the D quadrant of the cartesian diagram, where the average performance is above the average total service factor, and the average satisfaction is below the average total service factor. In this study, there are no service factors in the quadrant, so that the performance and satisfaction service factors of the Airport Train facilities are at the proper level of conformity and need to be always maintained to maximize performance maintain effectiveness.

4.10. Calculation of Airport Bus Priority Level

After obtaining the average calculation of the performance assessment and Airport Bus passenger satisfaction, we can see the position of the service quality factors examined in the Cartesian "Importance Performance Analysis" diagram. The average value of the performance factor is 3.81, and the average value of passenger satisfaction is 3.73.
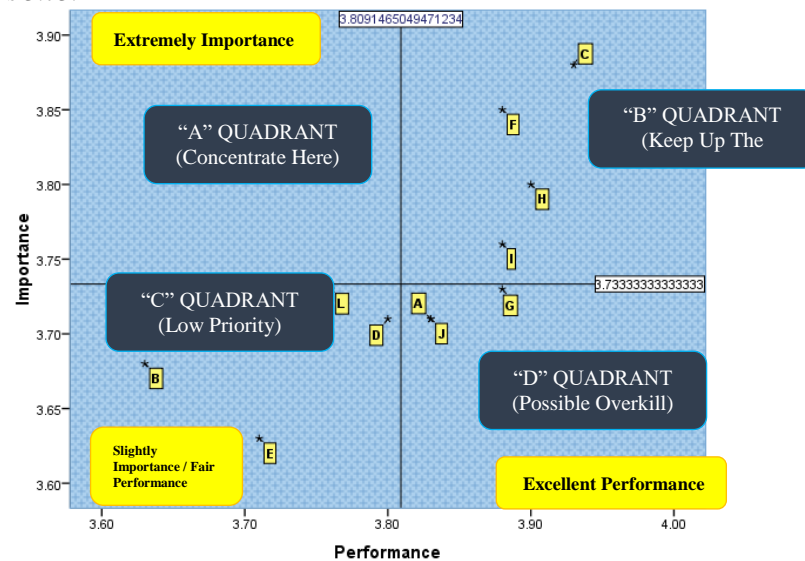

Figure 9. IPA Methods and Cartesian Diagram for Airport Bus

Results of questionnaire data processing described in the cartesian diagram can describe it as follows:

4.10.1. Service factors which are the top priority in handling

Excessive service factors are in the A quadrant cartesian diagram, where the average performance is below the average total service factor and average satisfaction above the total average service factor. In this study, there are no service factors in the quadrant, so there is no service factor that becomes the main priority in handling Airport Bus because they are already in the reasonably good category in terms of performance and satisfaction.

4.10.2. Service factor which must be maintained performance achievement

Service factors performance achievement that must be maintained is service factor is in the B quadrant of the cartesian diagram, which is as follows:
a. Availability of information (such as sticker) that lists telephone numbers and SMS complaint (C);
b. Availability Clean seating and cabin areas (F);
c. Availability of places to put luggage in each train/bus (H);
d. Availability of information on the departure schedule for the airport train/bus (I).

4.10.3. Priority in handling

Service factors that must be considered with low priority in handling are in the C quadrant of the *Cartesian Diagram,* which is as follows:
a. Availability of first aid equipment carried by security officers (B);
b. Lighting functions properly (D);
c. Adjusting the time of arrival and departure with the schedule (E);
d. Availability of a unique space/place for passengers who carry wheelchairs (L);
e. Availability of priority seats in one airport train/bus (K).

4.10.4. Service factors with excessive-performance

Service factors with excessive-performance are in the D quadrant of the cartesian diagram, where the average performance is above the average service factors and average satisfaction below the average total service factors, which are as follows:

A. Availability of safety facilities (APAR, intercom for emergency conditions, emergency brakes, and emergency exits) (A);
B. Availability of air conditioning systems that maintain room temperature (G);
C. Support connectivity between other public transportation modes from and to the station/terminal (J).

5. Conclusion

Based on the results of research and analysis that has been carried out on the Airport Train and Airport Bus facilities, it can be concluded that the performance and satisfaction factors on the Airport Train have a better valuation when compared to the Airport Bus, this is also influenced because the majority of respondents are young people. Convenience is the most significant factor that differentiates the valuations of the two modes of public transportation. Both of these transportation still need some improvement in facilities and infrastructure to attract the public's interest to switch from using private vehicles to using public transportation by maintaining those that are considered acceptable, improving those that are considered lacking, and developing the existing potential the maximum.

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Biography

Andri Irfan is a Senior Lecturer of Civil Engineering and Planning. He completed the PhD at the Universitas Indonesia & Universidade do Minho with Sandwich Program Scholarship from the Directorate General of Higher Education and LPDP scholarship. He has been teaching for more than 19 years and much active to applied his knowledge in the project construction in Indonesia. His research interest ranges from pavement management system to advanced data mining techniques for transportation engineering. He has published more than 50 papers in journals and 2 books.

Bagus Rulianto, born in Jakarta on May 11, 1996. Obtained a Diploma 3 Civil Engineering degree with a concentration in Civil Construction Engineering from the Jakarta State Polytechnic in 2017 with the title of the final assignment of Retaining Wall Fixing and Casting Work on the Depok - Antasari Zone Toll Road Construction Project 3. Now, he is still continuing his studies until he earned a bachelor's degree at Mercu Buana University.

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