An analysis of urban public transportation in Yogyakarta: case of Trans Jogja Bus

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Abstract. Transportation is the movement of humans or animals, goods, and information from one location to another. In other words, the action of transport is defined as a particular movement of an organism or thing from a point. Transportation is a derived demand that follow all basic human needs. The more populated of certain area, the more intensively of transportation, and it triggers the transport congestion. Public transportation is one solution to minimize congestion problems due to the large number of private vehicles. This study aims to (1) identify potential users of the Trans Jogja Bus; and (2) analyze the level of Trans Jogja bus occupancy. This study use quantitative research method, i.e. survey method, by using questionnaire instruments for conducting structured interviews and check lists for conducting observations. The mechanism for obtaining data in this study are by collecting primary and secondary data. The location of the research is Yogyakarta City and its surroundings which are covered by Trans Jogja Bus routes. The data was processed with SPSS 19.0 software and analyzed by quantitative descriptive analysis techniques. Results of this research shows that: (1) all of Trans Jogja Bus route actually have potential trip generation, as well as trip destination, however; (2) the occupancy level of Trans Jogja Bus are still little bit low even though service level is quite good.

1. Introduction
In this millennium era, transportation becomes a necessity for everyone. Transportation is a vital tool for every human being. There is no a single human who lives in this era does not use transportation in his life. Transportation is a tool used to facilitate human activities in mobilizing people, goods, and ideas. Although it is not a basic human need, transportation is a hereditary necessity that must follow all basic human needs. Moreover, transportation becomes a daily needs for peoples who live in urban areas.

Regarding to provider aspect, transportation can be divided into two, namely private transportation and public transportation. Public transportation is one of the transportation mode that is usually provided by the government or the private sector. According to Susanto [1], public transportation is a public transport service provider whose function is to provide comfort, convenience, and security services to its users. Public transportation is needed because it can connect important points, including airports, stations and terminals. Public transportation must be well integrated, therefore people prefers to use public transportation rather than private one.
Public transportation is one solution to overcome the problem of congestion due to the large number of private vehicles. The availability of roads that can equilibrate to the growth of vehicles number causes a tendency towards increasingly traffic jams in urban areas. Nowadays, every people who are living in Yogyakarta have perception that traffic jam is significantly frequent. Transportation Board’s data showed that at the beginning of 2018 the number of vehicles in Yogyakarta was more than 1,600,000 units with an increase in value ranging from 140,000 to 150,000 every year.

Yogyakarta City Government develops one of the public transportation facilities as one of the steps to reduce traffic congestion, so called Trans Jogja Bus. However, it seems that Trans Jogja Bus are not yet in great demand by most Yogyakarta residents as their mainstay of mobility. An interesting issue to study is: “whether Trans Jogja Bus has been effective in meeting the needs of public transportation?” To be able to answer this, understanding of the effectiveness indicators used to assess them is needed.

Effectiveness basically shows the level of achievement. Related to the Trans Jogja Bus, it is said to be effective if the existence of the Trans Jogja Bus can be a mainstay of public transportation in the city of Yogyakarta. To find out whether the Trans Jogja Bus has become a mainstay of public transportation for the people of Yogyakarta, it is necessary to examine how the level of utilization (occupancy) of the Trans Jogja Bus fleet that has been running so far. The design of this study tries to explore more deeply how the response of the people of Yogyakarta to the existence of the Trans Jogja Bus. The objectives of this study are:

1. to identify potential users of the Trans Jogja Bus
2. to analyse the level of Trans Jogja bus occupancy.

2. Methods
The research method used in this study is a quantitative research method. The research technique used was survey research, using questionnaire instruments for conducting structured interviews and check list for conducting observations. Data collection mechanism in this research are by collecting primary and secondary data. The research location is in the city of Yogyakarta and surrounding areas within the scope of services and Trans Jogja Bus routes.

Primary data is data which directly collected from original sources. Primary data in this study were obtained from interviews with passengers, supported by interviews with the manager, namely PT.Tugu Trans, and field observations related to bus services (Table 1).
Table 1. Primary Data Collection

| No | Data Requirement          | Source of Data                              |
|----|---------------------------|---------------------------------------------|
| 1  | Trans Jogja Bus Management| 1. In-depth interview to PT.Tugu Trans      |
|    | Description               | 2. Interview to bus operator                |
|    |                           | 3. Field observation                        |
| 2  | Trans Jogja Bus Passengers| 1. Interview to passengers                  |
|    | Characteristics           | 2. Interview to bus operator                |
|    |                           | 3. Field observation                        |
| 3  | Passengers Satisfaction  | 1. Interview to passengers                  |

Source: Adopted from Hermawan, 2009 (with modification) [2]

Secondary data is data that mainly be taken from existing publications. Secondary data is used to support information from primary data obtained, i.e. in-depth interviews, field observations, and questionnaires. The secondary data that needed obtained from literature studies related to service quality, management, and number of Trans Jogja Bus passengers.

Interviews were conducted with Trans Jogja Bus passengers regarding the reasons for using Trans Jogja Buses as the chosen transportation vehicle and the characteristics of the passengers. In-depth interviews were conducted to gather detailed information, which mostly contained opinions, attitudes, and personal observations. Field observations are observations with researchers looking at the research situation and making it possible to find out the respondent's behaviour. The factor to be sought from field observations is the services provided by the Trans Jogja Bus management.

Data processing in this study includes the validity test, reliability test, and normality test. Validity test serves to ensure that the variables have actually been measured [3]. Validity test aims to see whether the instrument used is valid and is in accordance with the measured variable. Validity test is done using Pearson Product Moment in the SPSS program.

Reliability test is used to determine the accuracy and stability of an instrument. The accuracy of an instrument shows the ability of the instrument to measure accurately, whereas stability shows the same results if conditions are met when the measurement does not change [3]. Normality test is used to see whether the data obtained is normally distributed or not.

The results of the questionnaire answers on aspects of perception and expectations are then weighted with a Likert scale score (Table 2).

Table 2. Likert Scale Classification

| Classification of Response | Score |
|----------------------------|-------|
| Very bad                   | 1     |
| Bad                        | 2     |
| Good                       | 3     |
| Very good                  | 4     |

Source: Likert, (1932) [4]

If the calculation results have a positive value, then the quality of the attributes used to measure passenger satisfaction is satisfying. If the calculation produces a negative value, the quality of the attributes used is unsatisfactory. The level of conformity which is the result of a comparison between the expectation and perception scores determines the order of priority in the increase of factors that affect the level of passenger satisfaction.

The weighting results are divided by the number of respondents in order to get an average value and then put in the following formula:
Q=P-E (Source: Parasuraman et al [5])

Explanation:
Q= Perceived Quality
P= Perception
E= Expectation

Cartesian diagrams can be used to get what it needs to do to improve a service [6]. The Cartesian diagram is divided into four quadrants.

Explanation:
1. “A” Quadrant shows the factors or attributes that are considered important and affect passenger satisfaction, but its management is not in accordance with passenger wishes.
2. “B” Quadrant shows the factors and attributes that are considered important and successfully carried out by the manager, however, it must be maintained.
3. “C” Quadrant shows the factors or attributes that are less important influence on passenger satisfaction and its management which is mediocre or unsatisfactory.
4. “D” Quadrant, showing factors or attributes that are less important influence on passenger satisfaction but has excessive management.

Effectiveness in general shows the level of achievement of an outcome, so the measurement of effectiveness emphasizes the results achieved. In the opinion of Krech et al. [7], It was stated that the effectiveness measures were as follows.

1. Number of results that can be issued, meaning that the results are in the form of quantity or physical form of a project, program or activity. The intended results can be seen from the ratio (ratio) between input (input) with output (output).
2. The level of satisfaction obtained, meaning that the measure of effectiveness can be quantitative (based on the amount or number) and can be qualitative (based on quality).
3. Productive-creative, meaning that the creation is conducive to real needs, which in turn can foster creativity and ability.
4. Intensity to be achieved, meaning to have high obedience in an intense level of something, where there is a sense of belonging with a high level.

The attribute that used to measure service quality is showed in Table 3.

| No | Dimension   | Code. | Attribute                                      |
|----|-------------|------|------------------------------------------------|
|    |             |      | 1. Bus Facility Completeness                    |
|    |             |      | 2. Bus Cleanness                               |
| 1  | Tangible    | 3.   | Shelter Facility Completeness                  |
|    |             | 4.   | Shelter Cleanness                             |
|    |             | 5.   | Operator Performance                          |
|    |             | 6.   | Waiting Time                                  |
|    |             | 7.   | Fixed Schedule Information                     |
| 2  | Reliability | 8.   | Accessibility to shelter                       |
|    |             | 9.   | Functionality of Bus facilities                |
|    |             | 10.  | Suitability of Bus Schedule                    |
|    |             | 11.  | Operator Sprightly to give Information needed  |
|    |             | 12.  | Operator speed to respond emergency condition  |
| 3  | Responsiveness | 13. | Operator speed to respond passenger’s complain |
|    |             | 14.  | Ticketing speed                               |
|    |             | 15.  | Confidence Operator                           |
| 4  | Assurance   | 16.  | Operator knowledge on route and shelter        |
17. Bus safety
18. Shelter safety
19. Price versus services suitability
20. Safety insurance
21. Operator’s Communication ability
22. Operator honesty
5. Empathy
23. Safety First
24. Operator’s Patiently
25. Complain Services Box

Source: Supranto, 1997 (with little modification) [6]

It can be simplified that effectiveness as the level of achieving a goal, an effort can be said to be effective if the effort is to achieve its objectives, within the framework of achieving all the expected goals. A public service is categorized to be effective if it is able to reach its destination as a mainstay of public transportation for the people.

The criteria for measuring effectiveness are three approaches that can be used, as suggested by Lubis and Martani [8], namely:

1. The resource approach, which measures the effectiveness of inputs. The approach prioritizes the success of the organization to obtain resources, both physical and non-physical according to the needs of the organization.
2. The process approach is to see the extent to which the effectiveness of program implementation of all internal process activities or organizational mechanisms.
3. The goal approach (goals approach) where the centre of attention on output, measures the success of the organization to achieve results (output) in accordance with the plan.

In this study, the three approaches are used by using scoring and weighting techniques.

3. Results and Discussion
Geography is the study of geosphere phenomena using spatial, environmental and complex approaches [9]. Geography has the concepts of location, distribution, pattern, agglomeration, affordability, interaction, distance, area differentiation, morphology, and utility value. In certain regions have a variety of natural resources and different human resources [10]. One of the object of geography research is transportation. Transportation is the movement of people, goods, ideas from the place of origin to the destination that requires transportation media.

Ullman’s theory explains that transportation can occur because there are complementary functions, transferability, and intervening opportunities. Complementary shows the complementary relations between regions to meet the regional development factors. Transferability shows the level of ease of goods, resources, information, and people that can be transported to other regions. Intervening Opportunity shows the opportunity to change the destination in its journey. Transportation can occur well if combined with geographic approaches to transportation geography.

Transportation recognizes 6 important elements, namely:
1. Movement
2. Subjects undergoing displacement
3. Physically displacement of goods and passengers to another place
4. Use of facilities and infrastructure
5. The existence of a transfer system
6. The purpose of the move

Mass public transportation is a transportation service that has a fixed route and schedule. The role of public transportation is to serve the interests of community mobility in carrying out its activities. Another
aspect of public transportation services is its role in traffic control, energy saving, and regional development [11].

One of the public transportation modes is the bus. A bus is a vehicle for transporting people who have a seat of more than eight people, including for drivers or who weigh more than 3,500 kilograms [2]. The Government of Yogyakarta City in year 2008 launched a public bus for urban transportation called "Trans Jogja". In 2017 there were 105 bus fleets with 15 routes connecting various important points in Yogyakarta City.

The trip and pull transportation system is caused by people's needs that must be fulfilled everyday (Figure 2). Movement generation is a modelling stage that estimates the amount of movement originating from a zone or land use. Movement pull is the number of movements that are attracted to a land use [1]. The distribution of this movement depends on land use.

![Figure 2. Determinant Factor of Trip Decision](source: Marnheim (1979) [12])

Trip attraction is an interesting factor in the movement of humans to travel. Factors that affect trip attraction, namely:

1. Education
2. Office space
3. Industry
4. Health
5. Entertainment and recreation

The total number of trips in a certain area and time period can be used as an indicator of transportation needs. From the trip data can be made the origin destination matrix (O/D Matrix). The pattern of travel in a transportation system is usually depicted in the form of currents moving from the original location to the destination point. The DCGR model is the trip generation and the pull must always be the same as that produced by the trip generation stage. Furness method is to develop an existing method that is the distribution of movements now repeated to the total movement in the future [13][2].

Service level is a concept that focuses on aspects of customer satisfaction [14]. The level of service is often considered a relative measure of the perfection of a service. The level of a service can be demonstrated through the level of customer satisfaction. Satisfaction is the level of one's feelings after comparing the perceived service with the expected service [6]. Two main factors affect the quality of service, namely:

1. Expected service
   Expectations of the quality of existing services are influenced by past experience, personal needs, communication, experience of others, company marketing communication.
2. Perceived service
Customer perceptions of services are the result of a series of decisions on the internal activities of service providers. Integration between expected service and appropriate perceived service will indicate a good and positive level of service, conversely if expected service with perceived service is not appropriate then it shows a bad or negative level of service [5]. Servqual Model (service quality) is one of measurement method that can use to measure level of service, which is developed by Parasuraman et al during 1985-1994 [5]. The criteria on which consumers are evaluated for services are a result of 5 dimensions of service level, namely:

1. Direct evidence (tangible), including the attractiveness of physical facilities, equipment, materials used, and employee performance.
2. Reliability is the ability to provide the promised service quickly, accurately and satisfactorily.
3. Responsiveness, regarding the willingness and ability of staff to help customers and provide services responsively.
4. Guarantee (assurance), including the behaviour of staff and companies to foster trust and a sense of security for customers.
5. Empathy (empathy), the company understands customer problems and act in the interests of customers.

In this paper, some terms are specific as follows.

a. Public Transportation is a transportation service that has a fixed route and schedule
b. Movement generation is a modelling stage that estimates the amount of movement originating from a zone or land use.
c. Movement pull is the number of movements that are attracted to a land use [15]
d. Service level is a concept that focuses on customer satisfaction [14].

Table 4. Reliability Test Result of Service Quality

| Cronbach's Alpha | N of Items |
|------------------|------------|
| 0.810            | 25         |

Source: Primary data analysis (2019)

Based on reliability test (Table 4), it can be concluded that research instrument is reliable, and data as well. In the other hand, based on intensity to use Trans Jogja Bus, it can be stated that students are the most intensive users. Some of them use Bus 1-2 time a months, and some use more then 10 time a months (Table 5).

Table 5. Intensity of Trans Jogja Bus Utilization (in a month)

| Employment          | 1-2 times | 3-6 times | 7-10 times | >10 times |
|---------------------|-----------|-----------|------------|-----------|
| Students            | 32,3      | 33,3      | 17,6       | 37,8      |
| Civil/Private Servant| 6,4       | 6,7       | 17,6       | 10,8      |
| Entrepreneur        | 16,1      | 33,3      | 35,3       | 16,2      |
| Others              | 45,2      | 26,7      | 29,4       | 35,1      |
| Total               | 100       | 100       | 100        | 100       |
| Relative percentage | 31        | 15        | 17         | 37        |

Source: Primary data analysis (2019)

Dominantly, the destination of Trans Jogja Bus passenger are recreation places (Table 6). It mean that tourist prefer to use bus as their transport mode in order to go to some recreational places in Yogyakarta. Offices also quite dominated the destination of bus passengers. This condition is caused
especially by the route of bus. Trans Jogja Bus is designed to prioritize serving tourists that come to Yogyakarta City.

Table 6. Passenger’s Destination Trans Jogja Bus

| Destination       | Route          | Sample 1 | Sample 2 | Sample 3 | Sample 4 | Total |
|-------------------|----------------|----------|----------|----------|----------|-------|
|                   |                | %        | %        | %        | %        | %     |
| Office            |                | 20.0     | 16.7     | 25.0     | 27.3     | 22.2  |
| School/Campus     |                | 10.0     | 27.8     | 5.6      | 9.1      | 13.3  |
| Traditional Market|                | 16.7     | 13.9     | 13.9     | 3.0      | 11.9  |
| Mall              |                | 6.7      | 8.3      | 8.3      | 6.1      | 7.4   |
| Recreation        |                | 13.3     | 22.2     | 41.7     | 48.5     | 31.9  |
| Others            |                | 33.3     | 11.1     | 5.6      | 6.1      | 13.3  |
| Total             |                | 100      | 100      | 100      | 100      | 100   |

Source: Primary data analysis (2019)

Regarding to the reason, mostly, Trans Jogja Bus passengers choose the bus because the price is perceived cheap (Table 7). The price of bus is Rp.3,500 only, for one trip. But, this is also supported by the accessibility of bus route. Mostly, passengers assume that bus route is accessible for them.

Table 7. Reason to Use Trans Jogja Bus

| Destination    | Route          | Sample 1 | Sample 2 | Sample 3 | Sample 4 | Total |
|----------------|----------------|----------|----------|----------|----------|-------|
|                |                | %        | %        | %        | %        | %     |
| Cheap Price    |                | 40.0     | 44.1     | 51.2     | 51.4     | 47.2  |
| Safe           |                | 10.0     | 14.7     | 11.6     | 17.1     | 13.4  |
| Accessible     |                | 20.0     | 38.2     | 34.9     | 17.1     | 28.2  |
| Others         |                | 30.0     | 2.9      | 2.3      | 14.3     | 11.3  |
| Total          |                | 100      | 100      | 100      | 100      | 100   |

Source: Primary data analysis (2019)

Based on service quality judgement, passengers stated that all of the attribute are in good condition (Table 8). But contrary, bus occupation is very low. It means, there are other factor that more decisive the preference of Trans Jogja Bus utilization out of services attributes.

Table 8. Trans Jogja Bus Service Quality Judgement by Passengers

| Attribute                | Judgement          | Average Score | Criteria |
|--------------------------|--------------------|---------------|----------|
| **Tangibles**             |                    |               |          |
| 1. Bus Facility Completeness |                  | 3.12          | Good     |
| 2. Bus Cleanness         |                    | 3.22          | Good     |
| 3. Shelter Facility Completeness |               | 2.86          | Good     |
| 4. Shelter Cleanness     |                    | 2.87          | Good     |
| 5. Operator Performance  |                    | 3.22          | Good     |
| **Reliability**          |                    |               |          |
| 6. Waiting Time          |                    | 2.65          | Good     |
| 7. Fixed Schedule Information |                | 2.77          | Good     |
| 8. Accessibility to shelter |                  | 3.05          | Good     |
| 9. Functionality of Bus facilities |           | 3.17          | Good     |
| 10. Suitability of Bus Schedule |               | 2.80          | Good     |
Responsiveness

11. Operator Sprightly to give Information 3.23 Good
12. Operator speed to respond emergency condition 3.12 Good
13. Operator speed to respond passenger’s Complain 3.06 Good
14. Ticketing speed 3.19 Good
15. Confidence Operator 3.04 Good

Assurance

16. Operator knowledge on bus route and shelter 3.38 Very Good
17. Bus safety 3.09 Good
18. Shelter safety 2.91 Good
19. Price versus services suitability 3.22 Good
20. Safety insurance 2.62 Good

Empathy

21. Operator’s Communication ability 3.12 Good
22. Operator honesty 3.14 Good
23. Safety First 3.19 Good
24. Operator’s Patiently 3.09 Good
25. Complain Services Box 2.93 Good

Source: Primary data analysis (2019)

Regarding to Supranto [6], level of a service have positive correlation with level of customer satisfaction. Therefore, if perceived service be in accordance with the expected service, it will resulting consumer satisfaction. But in this research facts, even expected service and perceived service be in line, that indicate a good and positive level of service, consumer are not interested to use Trans Jogja Bus. By this research, there is no answer why it was happen.

4. Conclusion

Based on this study, it can be concluded as follows.
1. All of Trans Jogja Bus route actually have potential trip generation, as well as trip destination, however
2. The occupancy level of Trans Jogja Bus is still little bit low eventhough service level is quite good. It is very interesting to conduct next research to answer why the Trans Jogja Bus consumer are very satisfied with level of services but not interest to use it.

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Appendix

Figure A. Routes line of Trans Jogja Bus Lane 1A

Figure B. Routes line of Trans Jogja Bus Lane 3A

Figure C. Routes line of Trans Jogja Bus Lane 8

Figure D. Routes line of Trans Jogja Bus Lane 10