

Analysis of Accessibility to City Transport Performance Based on Passenger Perception with Case Study: Tambak Osowilangun Terminal Route

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Abstract. Large urban areas certainly require transportation facilities and infrastructure that reach all corners of the city administration area. Inequality in the number of passengers is unavoidable due to differences in accessibility of each region. One example of the imbalance in the number of passengers is very clearly seen in two large terminals serving Surabaya city routes, namely the Purabaya terminal and the Tambak Osowilangun terminal. This study aims to describe the effect of accessibility factors on the performance of urban transportation with the Osowilangun Pond Terminal route based on passenger perceptions. The method used in this study was a questionnaire survey with 120 respondents. The survey was conducted at the Osowilangun Pond Terminal as a lonely route location for passengers. The results of the study showed that the indicator of the lack of public transportation modes serving the route resulted in the lack of access to the Tambak Osowilangun's terminal and its impact on the lack of passengers going to the terminal.

1. Introduction

Transportation is a prime driving system in various aspects of human activities. Therefore it is necessary to have the right arrangement so that the system can run optimally. A good transportation system can provide easy interaction between the centers of community activities with land use or commonly called accessibility. Accessibility index can be used as the best measurement tool for predicting passenger interest in a transportation system[1].

Surabaya is the second largest city in Indonesia with a fairly rapid development. Urban growth certainly must be followed by the provision of mobility to serve community activities in a region. According to van Wee et al., Land use and accessibility are two influential things in supporting community activities. A region is said to have a good level of accessibility, if there are facilities available in the region in the transportation network system[2].

The problem that often occurs in big cities is the imbalance in the number of passengers between a sub-city and another sub-city. One of the causes of this inequality is the lack of equal accessibility in each region, so that activities between regions cannot be properly connected. The imbalance in the number of passengers is evident in two large terminals which serve the Surabaya city route, namely Purabaya terminal and Osowilangun Tambak Terminal. Osowilangun Tambak Terminal, located in the western part of Surabaya, is expected to reduce density at Purabaya terminal, located in the eastern part of Surabaya. In fact, the Osowilangun Tambak terminal is quite empty, access to the Purabaya

terminal which is easier to reach than access to the Osowilangun Tambak terminal is one of the causes of the inequality in the number of passengers. The public transport transportation network towards the city spatial structure is very influential on the terminal location. A good terminal access can affect the interest of passengers to go to the terminal as a node, so that the city layout can be adjusted to the activities around the terminal. The terminal is not only the gate of the public transport system, but also as an important node that connects access to in the city[3]. This has resulted in reduced public interest in the use of public transportation that is already available. The decline in interest was followed by a decline in the performance of public transport services[4].

In the transportation system the use of public transport is one alternative to serving urban transportation[1]. Reducing the number of private transportation use and increasing the number of users of public transportation are two major challenges for the government in solving urban transportation problems [5].

Previous studies more assess the performance of public transport, in this study analysis will be conducted to assess satisfaction based on passenger ratings

2. Accessibility

The size of the assessment of the convenience of public transportation can be seen from the quality standards represented by many variables. Services in public transportation evaluate the level of passenger satisfaction on various factors such as comfort, accessibility, information, time or duration, customer service, driving comfort, safety and environmental effects[6]. The main purpose of the transportation system is to maximize accessibility[7]. The reformation approach of a sustainable transportation system, is an improvement of accessibility. Accessibility as a form of assessment of the ease of transportation systems that allow individuals to achieve activities and objectives through modes of transportation[8]. Accessibility is a concept related to the ease of achieving goals or accessing services from an area[9]. Accessibility is a measure of the distance between a house and a public transport stop or a long distance from the house to the office using public transportation[10].

3. Service quality

Service quality is a medium that is often used to assess customer satisfaction. Service quality can be defined as the process of identifying quality in a service that determines the assessment to meet consumer expectations. Satisfaction is also considered a relationship between behavior and service quality. Some references to the literature show that service quality has a direct effect on behavior in the context of public transport use. Passengers also use servant quality to assess the effectiveness of public transport satisfaction. Previous research shows that there are several other aspects that are used such as service interruptions, public services, and the costs of changing modes that can affect service performance. In addition, researchers also measured the involvement of public transport passengers for the assessment of service quality[5]. In this study the variables used to measure service quality are accessibility, because accessibility is considered to be the main factor in achieving convenience in achieving public goals or services in a region. Another reason is the use of accessibility variables, because accessibility is the main factor that influences the opportunity of individuals to do mobility from the initial point of travel to the location of individual activities[11]. Accessibility can also affect activity schedules different individuals based on available means of transportation[12].

4. Customer Satisfaction Theory

Satisfaction is the feeling of being happy or disappointed someone who appears after comparing between perceptions / impressions of the performance (results) of a product / service and expectations. Satisfaction = f (PerformanceExpectation)

This equation produces three possibilities, namely:

4.1. *Performance < Expectation*

If this happens, consumers say that the service provided is bad, not satisfying consumers.

4.2. *Performance = Expectation*

If this happens, then for consumers there is nothing special, the service provided is mediocre, because it has not satisfied consumers.

4.3. *Performance > Expectation*

If this situation is achieved, then consumers feel that the service provided is good and pleasant.

Satisfaction in the form of a definition of feelings of pleasure or disappointment felt by customers when comparing performance with expectations of a product. Customer satisfaction has a positive impact on company valuation. From these assessments, companies can take steps to make continuous management improvements, so they can increase profits and provide maximum quality in the company's service quality competition. Service quality and customer satisfaction are interrelated, although both are concepts that compare the expectations of quality and service performance received by customers in the field[13].

5. Method

The method used in this study is a survey method that is carried out by collecting information through questionnaires and interview respondents.

5.1. *Questionnaire Design*

In this study the variables used to measure the level of satisfaction of users of services are accessibility variables which will later be divided into several indicators. To quantify the answers to the variables used, then five levels of the Likert scale are used for weighted satisfaction and expectations. Scale to describe satisfaction and weighting starting from: Not good = 1, Poor = 2, Good enough = 3, Good = 4, Very good = 5, while the scale to describe expectations and weighting starts from: Not important = 1, Less important = 2, Quite important = 3, Important = 4, Very important = 5

Table 1. Variables and service quality indicators for Tambak Osowilangun terminal passengers

Aspect	Variable	Indicator
Quality services	Accessibility	Availability of public transportation route for public transport
		Ease of intermodal liaison services
		Easy access to terminal locations
		Public transport waiting time

5.2. *Quadrant Analysis*

Based on the results of the questionnaire the satisfaction and expectation assessment scores will be known, then the calculation will be carried out to determine the suitability between satisfaction and expectations for each variable that exists. The level of conformity is the result of a comparison of expectations and passenger satisfaction with accessibility in Osowilangun Pond Terminal. The formulas used are as follows:

$$Tki = \frac{xi}{yi} \times 100\%(1)$$

Information :

- Tki: Respondent's level of compatibility
- Xi: Performance Assessment Score
- Yi: Score of Assessment of the Interest of Service Users

Then the horizontal axis (X) will be filled by the score of the implementation level, while the upright axis (Y) will be filled by the score of importance. In simplifying the formula, for each factor that affects customer satisfaction by:

$$\bar{X} = \frac{\sum Xi}{n} \quad \bar{Y} = \frac{\sum Yi}{n} (2)$$

Information :

- $\bar{X}$: Average Performance / Satisfaction Assessment Level Indicator -i
- $\bar{Y}$: Average Level of Interest / Hope Indicator-i
- n : Number of respondents

Next is to calculate the average level of importance and performance for the whole indicator, with the following formula:

$$\bar{\bar{X}} = \frac{\sum_{i=1}^n \bar{X}_i}{k} \quad \bar{\bar{Y}} = \frac{\sum_{i=1}^n \bar{Y}_i}{k} (3)$$

Information :

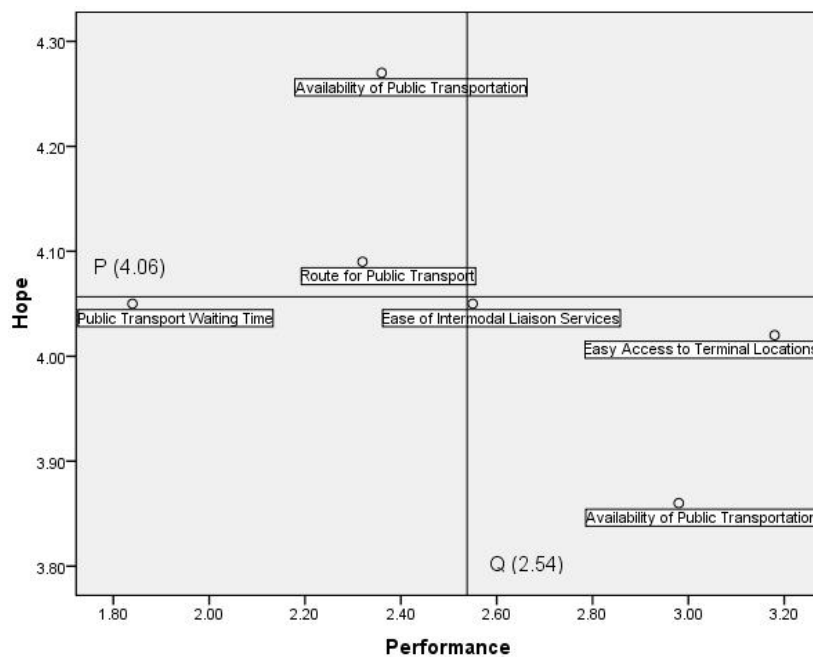
- $\bar{\bar{X}}$: Total Average Rate of Appraisal of Performance / Satisfaction of -i
- $\bar{\bar{Y}}$: Total Average Level of Interest Assessment / Expectation Attribute i
- K : Number of Questions in the questionnaire

6. Results and Discussion

The following is the end of the assessment of the accessibility service dimensions of the results of the questionnaire for respondents to the city transport passengers on the terminal route of the Tambak Osowilangun:

Table 2. Expectation level and passenger satisfaction performance level

No	Factors affecting satisfaction of passengers at Tambak Osowilangun terminal	Performance level assessment	Assessment of hope level	$\bar{x}$	$\bar{y}$
1	Availability of public transportation	104	188	2.36	4.27
2	Route for public transport	102	180	2.32	4.09
3	Ease of intermodal liaison services	112	178	2.55	4.05
4	Easy access to terminal locations	140	177	3.18	4.02
5	Public transport waiting time	81	178	1.84	4.05
6	Availability of public transportation	131	170	2.98	3.86
Average				2.54	4.06

**Figure 1.** Cartesian diagram of expectation levels and level of passenger performance each factor of dimensions of service quality

Based on the picture 1, it is known that the factor in quadran A is the factor of the availability of public transportation and the route of public transport routes. From the results of the assessment analysis for each dimension, it will be analyzed again by grouping the characteristics of the respondents based on the choice of modes to go to the Osowilak Tambak terminal to the passenger satisfaction factor. Previous research states that the evaluation of indicators for each variable is different for each traveler, thus the inclusion of the characteristics of the traveler allows the mapping of travelrequests [14] Travel behavior is a major factor that can affect many dimensions such as mode choice, vehicle ownership, choice of vehicle type, vehicle use, driver behavior, etc[15].

Table 2.Indicators of availability of public transportation

Mode	Number of responden	Score		$\bar{x}$	$\bar{y}$
		Performance	Expectations		
Public transportation	94	432	213	2.3	4.6
Car	3	15	8	2.7	5.0
Motorcycle	19	88	39	2.1	4.6
Taxi	4	16	9	2.3	4.0

Table 3.Public Transportation Route Indicators

Mode	Number of responden	Score		$\bar{x}$	$\bar{y}$
		Performance	Expectations		
Public transportation	94	406	212	2.3	4.3
Car	3	12	8	2.7	4.0
Motorcycle	19	83	39	2.1	4.4
Taxi	4	17	8	2.0	4.3

Table 4.Public transport waiting indicators

Mode	Number of responden	Score		$\bar{x}$	$\bar{y}$
		Performance	Expectations		
Public transportation	94	433	144	1.5	4.6
Car	3	12	4	1.3	4.0
Motorcycle	19	91	22	1.2	4.8
Taxi	4	19	9	2.3	4.8

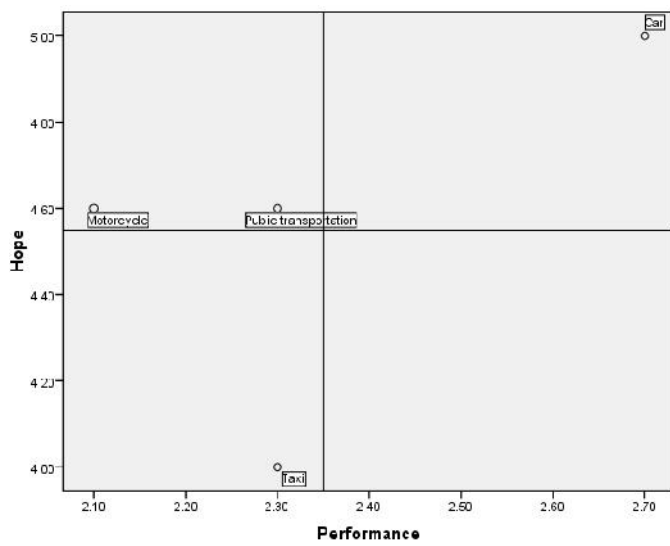


Figure 2.Cartesian diagram of hope levels and performance levels for availability of public transportation

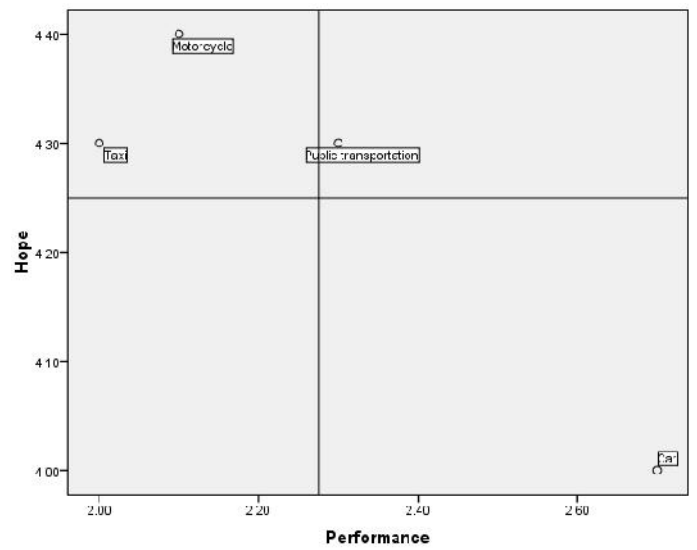


Figure 3.Cartesian diagram of expectation levels and performance levels for routes of public transport

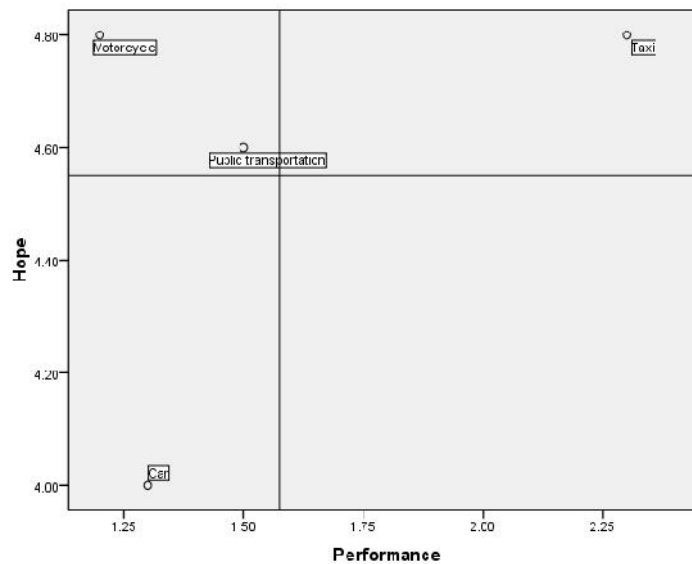


Figure 4.Cartesian diagram of hope levels and performance levels for public transport waiting times

Based on the cartesian 1 diagram, it is known that for modes in quadrant A are motorbikes and public transportation. This means that respondents who use motorbike mode and public transportation to get to the terminal assume that the factor of availability of public transport is very important and service in the field is still very poor. Therefore some respondents prefer motorbikes to get to the terminal, while some other respondents still choose to use public transportation, because there are no other choices.

Based on the Cartesian 2 diagram, it is known that the modes in quadrant A are motorbikes and taxis, this means that respondents who choose the mode assume that public transport routes are an important factor and their services in the field are less satisfactory, therefore respondents prefer motorbikes and taxi to get to the terminal. Based on the results of the interview survey, many

respondents complained about inappropriate public transport routes, and the routes were too long, so the travel time was very long.

Based on the cartesian diagram 3, it is known that the modes in quadrant A are motorbikes and public transportation, this means that respondents who choose the mode assume that the waiting time of public transport is an important factor and its service in the field is not satisfactory therefore some respondents are more choose to use motorcycle mode to get to the terminal.

7. Conclusion

Based on the assessment of the satisfaction of the city transportation passengers, the osowilangun pond route to the service dimensions of accessibility dimensions is an important factor, but the service is still unsatisfactory, namely the availability of public transport and public transport route routes. The lack of available modes of public transportation serving these routes has resulted in minimal access to the Ososwilangun Tambak Terminal.

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