

Mode Choice And Service Integration Analysis To The Service Attributes Of Public Transportation At Kaliurang Street

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Abstract. Economic growth increases people's mobility which results in the increase in the need of transportation infrastructure, exceeding current capacity. This research aims to identify the factors affecting citizen's choice of service attributes of the proposed public transport along Kaliurang Street, to give service attribute scenario, and to analyze trip pattern and to analyze the service integration of public transport along Kaliurang Street. The route that will be used in this research starts from Ring Road Kentungan intersection and ends at Kaliurang Tourism Object. The data was analyzed using technical correlation and crosstabs technic. The significant factors obtained are: monthly income, trip urgency, passenger capacity, service intensity, the use of shelter, availability of AC and service integration. Service integration with Trans Jogja bus is located at Condong Catur bus station and Kentungan Intersection, and with using feeder service operating around Kaliurang Street. Keywords: public transportation, service integration, Jogja-Kaliurang route.

1. Introduction

Transportation has a very important role in the development of an area, which is facilitating inter-area interaction in a hope of bringing economic and social benefit to the concerned area. According to Tamin (2008), transportation is a process of moving goods and living beings from one place to another. This activity needs a place which is called transportation infrastructure. If this fast movement is not supported by the transportation system, in which interaction happens beyond control, there will be an imbalance condition. This imbalance happens because of the mismatch between the transportation demand and transport supply.

These kind of problems mostly happen in the developing area which most of the citizens use private vehicle, i.e. motorcycle or private car, to reach their destination. This problem may look simple. However, if the condition happens continuously without any intervention, it will decrease the citizens' interest to use public transportation. Along with the current development, Daerah Istimewa Yogyakarta (Special Region of Yogyakarta) encounters a quite vast development. Yogyakarta have some predicates, i.e. the City of Students, the City of Culture, and Tourism City, which makes Yogyakarta becomes favorite destination for many people. This condition causes the development of economic activity at Sleman District, especially Kaliurang Street.

Service integration gives the prospective passengers an ease to use public transportation to make a trip. According to Miro (2005), The provision of feeder service to the nearest shelter will bring a big impact to people's interest to use public transportation. The feeder will be operated around the area that potentially be an influential trip generator. In order to anticipate the increase of passengers' trip in the future, in accordance with the increase of economic activity around the area, the enhancement in the quality of transportation mode is needed.

1.1 Problems Formulation

1. How is the response of the citizen about the service attribute of public transportation along Kaliurang Street?
2. How is the model of public transportation choice based on the planned service attribute?
3. How is the route development and the shelter location design as a support to public transportation operation along Kaliurang Street?
4. How is the development of service integration as a support to public transportation operation along Kaliurang Street?

1.2 Research Objectives

1. To identify the factors affecting citizens' choice to the planned service attribute of public transportation along Kaliurang Street
2. To analyze the choice of planned service attribute scenario of public transportation along Kaliurang Street
3. To analyze the prediction of passengers' travel pattern to the proposed public transportation service along Kaliurang Street
4. To analyze the service integration of public transportation along Kaliurang Street

2. Research Methodology

2.1 Research Scope

The research object is human being. Asusanto et.al (2014) ,a good cooperation between the researcher and the research object is needed to obtain a valid and relevant data. The route belongs to the research starts

from Ring Road Kentungan Intersection to Kaliurang Tourism Object. The locations which include in this research are Pakem District, Ngemplak District, Ngaglik District, and Depok District.

2.2 Number of Sample

The research population is the citizen of four district around Kaliurang Street with the number of 376.996 persons. Based on the formula to determine the number of sample by Sevilla (1960), with 10% significance level, the number of sample is as follow:

$$n = \frac{376996}{1 + (376996 \cdot 0,1^2)}$$
$$= 99.97 \text{ persons} \sim 100 \text{ persons}$$

2.2 Survey Design

2.2.1 Research Variables

In this research, the foundation of attribute determination and attribute value is based on the result of previous research related to this research. Besides, the actual condition and the phenomena happens on the area are also considerations to determine the attribute and attribute value. The attributes or variables used in this research described on Table.

Table 1. Research Variables

No	Variable	Value	
1	Fare	Rp. 3000,-	Rp. 5000,-
2	Passenger Capacity (Standing + Seating)	16 persons	24 persons
3	Service Intensity	10 minutes	20 minutes
4	Ease of Access (Shelter Availability)	Yes	No
5	Comfort (In-vehicle AC availability)	Yes	No
6	Service Integration	Yes	No

2.2.2 Data Source

Based on thhe source, the data is divided into two parts, which are:

a. Primary data

Primary data is the data that is obtained directly from the research object on the research location. The primary data needed in this research are:

- 1) Socio-economic attributes of respondents
- 2) Transport service attributes
- 3) Determination of shelter location
- 4) Location of service integration

b. Secondary Data

Secondary data is the data that is not obtained directly by the researcher. The data is indirectly collected from the research object by other party.

2.2.3 Data Processing

From the data processing, these outputs below will be obtained:

- a. The characteristics of passengers
This is obtained by distributing the questionnaire to the respondents. The characteristics is obtained by name, sex, age, and occupation section on the questionnaire.
- b. Public's perception on the public transportation operation at Kaliurang Street. This is obtained by giving an experimental design questionnaire that content comfort, accessibility and fare.
- c. Travel pattern and shelter location. The determination of shelter locations are based on the standard of shelter service that was obtained from literature review.

Before doing other tests, normality test should be carried out to test the data that was obtained from the survey. This aims to analyze whether the data is normally distributed. Variable input on SPSS v.22 can be seen Table as follow.

Table 2. Variable Input Value

No	Variable	Nilai	
1	Fare	Rp. 3000,-(=1)	Rp. 5000,-(=2)
2	Passenger Capacity (Standing + Seating)	16 persons (=1)	24 persons (=2)
3	Service Intensity	10 minutes (=2)	20 minutes (=1)
4	Ease of Access (Shelter Availability)	Yes (=2)	No (=1)
5	Comfort (In-vehicle AC availability)	Yes (=2)	No (=1)
6	Service Integration	Yes(=2)	No (=1)

3. Results And Discussions

3.1 Factor Analysis of Service Attribute Choice

Data of service attribute scenario was obtained from 150 sets of questionnaire that had been answered by the respondents. The data comprised: passenger capacity, the necessity of AC, the necessity of shelter, service intensity, and service integration. The service integration was included on the questionnaire because to achieve a better transportation system, the existence of service integration is essential. Later on, the data was processed by using SPSS software.

3.2 Correlation Analysis

According to Widyanti et.al (2014) the data that was obtained from the result of this correlation analysis was used to find out the impact of the socio-economic factors and service attribute factors to the choice scenario which was determined by the respondents. Socio-economic variables (X) are sex, age, occupation, monthly income, trip destination, trip characteristics, mode that was used, and walking distance to the shelter. While, service attribut variables (X) are passenger capacity, service intensity, shelter availability, in- vehicle AC availability, and service integration. Those variables (X) will be correlated with the scenario that was chosen by the respondents. The analysis result by using SPSS v.18 software can be seen on table. Based on table, the correlation between social-economics and service attribute variable with the public transportation service scenario is obtained. Therefore, a conclusion can be drawn: income, trip characteristics, passenger capacity, service intensity, shelter availability, in-vehicle AC availability and service integration have a significant impact to the public transport service scenario.

3.3 Service Attribute Scenario Choice

The service attribute scenario data, which was obtained from the questionnaire, consists of passenger capacity, the necessity of in-vehicle Air Conditioner (AC), the necessity of shelter, service intensity and service integration. The scenarios that were offered to the respondents can be seen in table.

Table 3. Public Transport Service Attribute Scenario

Type of Service	Skenario 1	Skenario 2	Skenario 3	Skenario 4
Passenger Capacity	16 persons	24 persons	16 persons	24 persons
Service Intensity	10 minutes	10 minutes	20 minutes	20 minutes
Shelter Availability	Yes	Yes	No	No
Comfort (AC Availability)	Yes	Yes	No	No
Service Integration	Yes	Yes	No	No

Illustration of Vehicle Type



Out of 150 respondents, 72 choose Scenario 2 as their choice of service they desire to have. Further data can be seen on table.

Table 4. Choice of Scenario Recapitulation

Skenario	Number of Respondent	Percentage (%)
1	53	35.3
2	72	48
3	10	6.7
4	15	10
Total	150	100

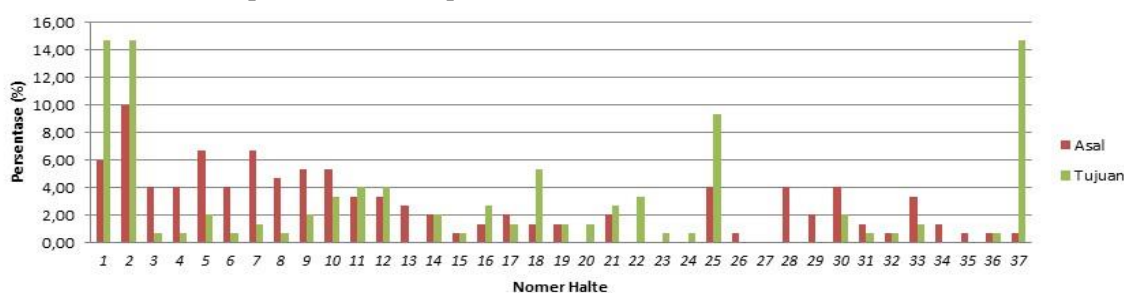
Table 5. Correlation Analysis Calculation Using SPSS

		Type of Choice	
Spearman's rho	Sex	Correlation Coefficient	,009
		Sig. (2-tailed)	,915
		N	150
Age	Correlation Coefficient	-,002	
	Sig. (2-tailed)	,979	
	N	150	
Occupation	Correlation Coefficient	-,022	
	Sig. (2-tailed)	,792	
	N	150	
Income	Correlation Coefficient	,206*	
	Sig. (2-tailed)	,012	
	N	150	
Destination	Correlation Coefficient	,063	
	Sig. (2-tailed)	,443	
	N	150	
Trip Characteristics	Correlation Coefficient	-,167*	
	Sig. (2-tailed)	,041	
	N	150	
Transportation Mode	Correlation Coefficient	-,123	
	Sig. (2-tailed)	,133	
	N	150	
Walking Distance	Correlation Coefficient	,084	
	Sig. (2-tailed)	,306	
	N	150	
Passenger Capacity	Correlation Coefficient	,101	
	Sig. (2-tailed)	,217	
	N	150	
Service Intensity	Correlation Coefficient	,140	
	Sig. (2-tailed)	,086	
	N	150	
Shelter Availability	Correlation Coefficient	,140	
	Sig. (2-tailed)	,086	
	N	150	

In-vehicle AC Availability	Correlation Coefficient	,140
	Sig. (2-tailed)	,086
	N	150
Service Integration	Correlation Coefficient	,140
	Sig. (2-tailed)	,086
	N	150
Type of Choice	Correlation Coefficient	1,000
	Sig. (2-tailed)	.
	N	150

3.4 Trip Origin and Destination

The aim of the origin and destination data collection was to discover the location of shelter, if shelter will be available along Kaliurang Street. The data was collected by having the respondents choose the origin and destination shelter provided on the questionnaire.



Explanation :

- | | | | |
|-----------------------------|--------------------------|----------------------------|-----------------------------------|
| 1. Front Gudug Bu Puji | 11. Batik Huza | 21. Yakum Hospital | 31. Grahasia Psychiatric Hospital |
| 2. Superindo | 12. District Office | 22. Intan Sarana Market | 32. SMAN 1 Pakem |
| 3. Warung Steak | 13. Penggadaian | 23. GPW Settlement | 33. Settlements |
| 4. Sanata Dharma University | 14. BANK BPD | 24. Bank BRI | 34. Settlements |
| 5. Colombo Market | 15. Resto Pondok Laras | 25. UII | 35. Hotel Disaster Oasis |
| 6. Chapel | 16. Dragon Fruit Garden | 26. Degolan Street | 36. Settlements |
| 7. PLN | 17. Shop Matters KM 10,5 | 27. Resto Mr. Balngkon | 37. Wisata Kaliurang |
| 8. POM Bensin KM 7 | 18. Ganesha Operation | 28. Resto Mbok Berek | |
| 9. Damai Street | 19. Candi Gebang Street | 29. Panti Nugroho Hospital | |
| 10. Kelurahan Dayu | 20. Besi Street | 30. Pakem Market | |

Picture 1. The Diagram of Respondents Characteristic Comparison Based on the Trip Origin and Destination

The most preferred trip origin is the shelter no. 2 which is located near Superindo Kentungan. This shelter was chosen by 15 out of 150 total respondents. While, for the trip destination, the most preferred shelter is the shelter no. 1 that is located at Kentungan Intersection. This shelter was chosen by 22 out of 150 total respondents.

3.5 Analysis of Service Integration

To integrate the service, Department of Transportation of Sleman Regency and Department of Transportation of Yogyakarta City need to establish a cooperation. The integration needs to be carried out towards a better transportation at Special Region of Yogyakarta, reckoning the rapid economic development in Yogyakarta. The integration that will be carried out are as follows:

1. The integration with currently-existing public transportation, Trans Jogja located at CondongCatur Bus Station and Trans JogjaBRT shelter near Kentungan Intersection.
2. The integration with feeder transport that will be operated at the areas that is identified as a significant trip attraction. The feeder transport service will be moving in a quite short route and escorts the passenger to the main public transportation shelter which is located at Kaliurang Street. The vehicle to be operated as a feeder transport could be the currently-operated Mitsubishi Elf at Kaliurang Street. While, the areas at which the feeder transport will be operated are:

Harjuno Street to Timor-Timur Street, Banteng 3 Street, Banteng Raya Street, Damai Street, Pelem Raya Street to PasarGentan Street, Dayu Alley, KaptenHaryadi Street, Mawar Alley, PondokPandanaran Alley, Besi Street, GriyaPerwitaWisata (GPW) Housing, Pamungkas Street, Melati Alley, Degolan Street, Pakem-Turi Street, Pakem-Cangkringan Street, Disaster Oasis Resort Entrance. The feeder transport will be managed either by Department of Transportation of Sleman Regency or each district concerning the service area of the feeder transport. The operational hour of the feeder transport shall adhere to the operational hour of the main public transportation that is operated at Kaliurang Street. While, the service intensity of the feeder transport is adjusted to the operational areas of the feeder transport.

4. Conclusion

- a. Based on the analysis that is done by relating the choice of service type with the socio-economic characteristic and the service attributes with the service scenario, the most significant factors are obtain. Those factors are: monthly income, trip characteristic, passenger capacity, service intensity, shelter usage, AC availability and service integration.
 - b. The most preferred plan of service scenario by the citizen around Kaliurang Street is the second scenario with the Trans Jogja-like type of bus, 24 passenger bus capacity, service intensity in every 10 minutes, availability of shelter, availability of AC on the bus, and availability of service integration with other transportation modes.
 - c. The trip pattern prediction that will be done by the passenger for the future transportation service operating at Kaliurang Street are as follow:
 - a. The most preferred departure shelter is the shelter no. 2 which is located near Superindo Kentungan. This shelter is chosen by 15 out of 150 respondents.
 - b. The most preferred arrival shelter is the shelter no. 1 which is located around Kentungan-Ring Road Intersection. This shelter is chosen by 22 out of 150 total respondents.
- 4.1 The service integration plan for the future public transportation at Kaliurang Street are:
- a. The service integration to Trans Jogja BRT will be located at Condong Catur Bus Station and at Kentungan-Ring Road Intersection.
 - b. The service integration around Kaliurang Street is done by using feeder transportation that is operated around Kaliurang Street. The service areas of the feeder bus are: Banteng Raya Street, Damai Street, KaptenHaryadi Street, Besi Street, Pamungkas Street, Degolan Street, Pakem-Turi Street and Pakem-Cangkringan Street.

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