CUSTOMER SATISFACTION ANALYSIS ON THE INTEGRATION OF BUS TRANSIT SYSTEM IN SEMARANG

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Abstract: Trans Semarang and Trans Jateng are the service providers of Semarang bus transit system. Both services still operate independently and are not fully integrated. In addition, previous research has shown that multi-services integration in Semarang bus transit system is a necessity and considered important by customers. Therefore, an improvement of multi-services integration in Semarang bus transit system based on customer satisfaction is needed. The survey method used is questionnaire containing integration attributes that describe the satisfaction and expectations of customers. This research uses Importance-Performance Analysis, Kano model, and Quality Function Deployment method to obtain improvement priorities based on 150 respondents which have traveled with Trans Semarang and Trans Jateng in one trip. The result of this research indicates that 10 improvement that can be implemented in Semarang bus transit system multi-services integration which are prioritized from integration of multi-services information technology, provision of single ticket, and re-adjustment of timetables.

Keywords: *Bus transit system, public transport integration, customer satisfaction, quality function deployment, sustainable development goal point 11*

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INTRODUCTION

Semarang is one of metropolitan cities in Indonesia that operates public transportation using bus transit system. Semarang bus transit system is jointly served by Trans Semarang and Trans Jateng. Trans Semarang is a service provided by the Semarang City Government since 2009, while Trans Jateng is provided by the Central Java Provincial Government since 2017. Both services together have connected various areas of Semarang City and to the surrounding regencies, including Bawen in Semarang Regency, Weleri in Kendal Regency, and Gubug in Grobogan Regency. However, both services still operate separately and are not yet fully integrated. This can be seen from separate bus stops, ticket that cannot be used on another service, unavailability of multi-services information in maps and application, and asynchronous departures and arrivals.

Previous studies have indicated that the integration of Trans Semarang and Trans Jateng is a necessity and should be improved [1][2]. The implementation of multi-services integration is considered important by Semarang bus transit system customers. It can be seen from the relatively low customer satisfaction. even though they have relatively high expectations [3]. This is also supported by the percentage of users, who travel with Trans Semarang and Trans Jateng in one trip, reaching 15 to 50 percent users of Trans Semarang which have corridors connected to Trans Jateng [2]. Therefore, an improvement of multi-services integration from the point of view of customer is needed. With integration, customers can transfer faster, easier, and more affordable [4]. Multi-services integration as a form of Semarang bus transit system development is in line with Sustainable Development Goal point 11.2. This point mandates the development of transportation that is sustainable and accessible to all [5].

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RESEARCH SIGNIFICANCE

This research aims to find improvement priorities of the multi-services integration based on customer satisfaction. Customer satisfaction is reviewed from satisfaction and expectations level based on existing conditions and potential for providing satisfaction. This study continues previous research about Semarang bus transit system multi-services integration [1][2] by taking the point of view of customer satisfaction. In addition, this research can be a reference for implementing integration on bus transit systems that have more than one service in another metropolitan city in Indonesia.

METHODOLOGY

A. DATA COLLECTION

The survey method used for this research is a questionnaire to obtain customer satisfaction data. Respondents as sample of this research are customers who have traveled with Trans Semarang and Trans Jateng in one trip, from Semarang to Bawen, Kendal, or Gubug, or vice versa. Survey is conducted offline and online. Offline distribution is carried out by meeting respondent inside bus and at bus stops. Sample size is determined by Slovin formula as stated in Equation 1. Sample size according to Slovin formula is calculated based on margin of error (e) used, that is between 96 respondents for e = 10% and 344 respondents for e = 5%. The decision to use margin of error of 5% and 10% was due to time and budget constraints in this research. The data obtained is 150 respondents in this research, with details of 131 respondents from online questionnaire and 19 respondents from offline questionnaire.

$$n = \frac{N}{1 + Ne^2} \quad (1)$$

Note:
n = Sample size
N = Population
e = Margin of error

Multi-services integration in this research is represented by 15 integration attributes shown in Table 1. These attributes are compiled based on previous researches and Indonesian bus transit system regulations. Then, they have been adapted to the context of Semarang bus transit system multi-services integration. The preparation of each attribute is reviewed based on forms of integration and utilize five dimension of service quality (Servqual) approach. Forms of integration examined is integration received directly by customer, including physical, information, fare, and schedule integration [6]–[9].

Integration attributes in questionnaire are contained in the form of several parts. The first part is customer satisfaction and expectation level part based on existing conditions. The next part is a pair of functional and dysfunctional. Functional is a condition when an attribute is fulfilled and vice versa for dysfunctional [10]. Respondent must choose one of the options on each parts shown in Table 2.

B. DATA ANALYSIS

This research uses customer satisfaction method, including Importance-Performance Analysis, Kano model, and Quality Function Deployment. These methods are integrated with each other based on method proposed by Tan and Pawitra [11].

The first stage is Importance-Performance Analysis. This method aims to obtain customer satisfaction and expectation level to existing condition of multi-services integration implementation. The data used is the answer of satisfaction and expectation part of questionnaire. This paper presents the gap of satisfaction and expectation level which is calculated using formula shown in Equation 2 [12]. Each customer and expectation level use average value shown in Equation 3 and Equation 4 [13].

$$Q = P - E \tag{2}$$

Note :
Q = Service quality gap
P = Customer satisfaction level (X)
E = Customer expectation level (Y)

$$\overline{X} = \frac{\sum X_i}{n} \tag{3}$$

$$\overline{Y} = \frac{\sum Y_i}{n} \tag{4}$$

Note:
$\overline{X}$ = Average customer satisfaction level
$\overline{Y}$ = Average customer expectation level
n = Sample size

The next stage is Kano model. This method aims to identify the potential of multi-services integration in providing customer satisfaction in each attribute. Those potential is represented by one of six Kano's categories. The categories in Kano model are : 1) Must be (fulfilment of attribute would not reach good customer satisfaction), 2) One dimensional (fulfilment of attribute is linear with customer satisfaction), 3) Attractive (fulfilment of attribute can increase very high customer satisfaction), 4) Indifferent (Fulfilment of attribute make no differences on customer satisfaction), 5) Reverse (fulfilment of attribute is inversely linear with customer satisfaction), 6) Questionable (Mistake in answering) [14]. Functional dan dysfunctional answer from questionnaire is used in this method. The pair's answers were evaluated using Table 3 to obtain the Kano's category of attributes for each respondent.

Table 1 Multi-services integration attribute

No	Form of Integration	Attribute	Servqual Dimension
F1	Physical Integration	Ease of reaching destination with corridor connectivity	Reliability
F2		Compatibility of multi-services bus capacity	Tangible
F3		Distance of multi-services boarding and alighting at transfer stops	Tangible
F4		Convenience of multi-services transfers at transfer stops	Assurance
F5		Ease of multi-services transfers at transfer stops	Empathy
I1	Information Integration	Availability of multi-services direction on signage at transfer stops	Tangible
I2		Availability of multi-services information at transfer stops	Assurance
I3		Availability of inside bus	Assurance
I4		Ease of multi-services transfers at transfer stops	Assurance
T1	Fare Integration	Uniformity of cashless payment instruments	Tangible
T2		Availability of multi-services single ticket	Responsiveness
T3		Affordability of combined fare	Empathy
J1	Schedule Integration	Synchronization of the before and next bus	Reliability
J2		Waiting time for the next bus	Responsiveness
J3		Synchronization of multi-services operational hours	Empathy

Table 2 Options for each part in questionnaire

Scale	Satisfaction	Expectation	Functional and Dysfunctional
5	Very satisfied	Very expected	Very helpful to me
4	Satisfied	Expected	A basic requirement
3	Quite satisfied	Quite expected	Would not affect
2	Dissatisfied	Unexpected	A minor inconvenience
1	Very dissatisfied	Very unexpected	Major problem for me

Table 3 Kano evaluation table [10]

Respondent Answer	Dysfunctional					
	No	1	2	3	4	5
Functional	1	Q	A	A	A	O
	2	R	I	I	I	M
	3	R	I	I	I	M
	4	R	I	I	I	M
	5	R	R	R	R	Q

Note:
M = Must be; O = One dimensional; A = Attractive; I = Indifferent; R = Reverse; Q = Questionable

Kano's category for each attribute is based on the accumulated Kano's category from all respondents. These category is determined by Blauth Formula under condition if (One dimensional + Attractive + Must be) greater than (Indifferent), then grade is maximum of (One dimensional, Attractive, Must be), else grade is maximum of (Indifferent, Reverse, Questionable) [10].

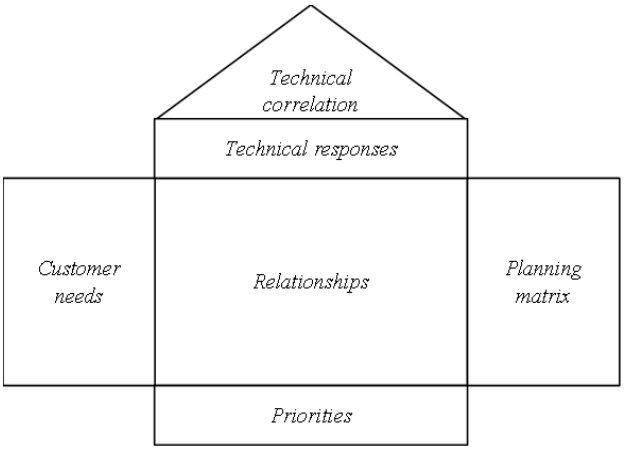


Figure 1 House of quality [15]

The last stage is Quality Function Deployment is a product development planning method that refers to customer needs in order to achieve customer satisfaction. In this method, priorities determination uses House of Quality. House of Quality, shown in Figure 1, consists of customer needs, technical responses, relationships, technical correlation, planning matrix, and priorities.

Integration of Importance-Performance Analysis and the Kano model with Quality Function Deployment is carried out in customer needs part. In this integrated method, an attribute must have a negative gap value and a Kano category that has the potential to increase customer satisfaction, including Must Be (M), One Dimensional (O), or Attractive (A) [11]. If an attribute does not have either of these two conditions, the attribute is not considered.

RESULTS AND DISCUSSIONS

Customer satisfaction analysis is carried out first. First, gap of satisfaction and expectation level is calculated using Eqn(2) shown in Table 4. The table shows that all integration attributes have negative gap. This result indicates that existing condition of Semarang bus transit system multi-services integration through 15 attributes still do not meet customer expectation. Then, Determination of the Kano category is carried out for each integration attribute with the Blauth Formula shown in Table 5. From Table 5, it can be seen that 7 attributes are categorized as one dimensional, 7 attributes as attractive, and 1 attribute as indifferent.

Table 4 Gap of satisfaction and expectation level

No	Average Satisfaction Level	Average Expectation Level	Gap
F1	3.88	4.39	-0.51
F2	3.32	4.24	-0.92
F3	3.66	4.28	-0.62
F4	3.71	4.41	-0.70
F5	3.52	4.29	-0.77
I1	3.33	4.27	-0.94
I2	3.53	4.27	-0.74
I3	3.51	4.31	-0.80
I4	3.47	4.23	-0.76
T1	3.68	4.19	-0.51
T2	3.17	4.43	-1.26
T3	3.90	4.40	-0.50
J1	3.38	4.28	-0.90
J2	3.13	4.36	-1.23
J3	3.37	4.38	-1.01

Table 5 Kano's Category Determination

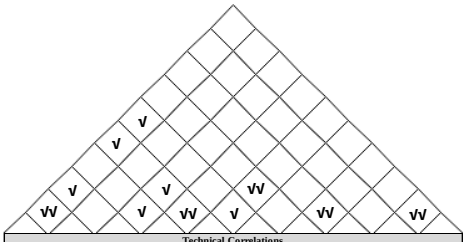
No	M	O	A	I	R	Q	(M+O+A)	(I+R+Q)	Kano's Category
F1	8	50	45	2	42	3	103	47	One dimensional
F2	20	41	36	4	48	1	97	53	One dimensional
F3	14	39	48	4	44	1	101	49	Attractive
F4	13	42	39	2	52	2	94	56	One dimensional
F5	24	31	31	3	60	1	86	64	One dimensional
I1	10	37	43	0	57	3	90	60	Attractive
I2	15	34	42	1	56	2	91	59	Attractive
I3	15	44	40	1	49	1	99	51	One dimensional
I4	9	29	52	0	59	1	90	60	Attractive
T1	4	13	57	2	73	1	74	76	Indifferent
T2	8	23	77	0	41	1	108	42	Attractive
T3	9	38	64	1	37	1	111	39	Attractive
J1	16	32	49	2	49	2	97	53	Attractive
J2	15	44	43	3	44	1	102	48	One dimensional
J3	7	48	40	1	52	2	95	55	One dimensional

House of Quality of Semarang bus transit system multi-services integration is shown in Figure 2. Integration attributes are selected to be included as customer needs in House of Quality. Based on the results of previous analysis in Table 4 and Table 5, 14 of 15 attributes are chosen because they meet the requirements, including negative gap and one dimensional or attractive Kano's category. One attribute that does not meet these requirements is uniformity of cashless payment instruments (Attribute T1). This attribute is not considered in further analysis because having Kano's category of indifferent.

Formulation of forms of improvement will answer customer needs. The results of this formulation are used as technical responses. Technical responses are obtained based on the results of literature study and discussions with service provider stakeholders, including the Head of Badan Layanan Umum Unit Pelaksana Teknis Dinas (BLU UPTD) Trans Semarang representing Trans Semarang and the Head of Balai Transportasi Jawa Tengah representing Trans Jateng. Ten improvements are obtained as follows : 1) Re-arrangement of routes, 2) Establishment of transportation authority, 3) Addition of joint transfer stops, 4) Provision of physical wayfinding at transfer stops, 5) integration and provision of multi-services passenger information physically at bus stops and online, 6) Provision of multi-services information inside vehicle, 7) Integration of multi-services information technology, 8) Provision of single ticket, 9) Re-adjustment of time tables, 10) Extension of Trans Jateng operating hours until the last Trans Semarang bus arrival.

The relationship between customer needs and technical responses and between technical responses is determined based on the results of literature study. Relationship between technical responses and customer needs is described through relationships matrix. The strength level of relationship between customer needs and technical responses is represented by a value of 9, 3, or 1 [16]. Then, the relationship between technical responses is described through technical correlation matrix. The relationship is given a certain symbol that describes how much influence can be given in its implementation.

Improvement priority is determined based on the weight given by customer needs and technical responses. The weight of the customer needs is represented by the normalized raw weight in planning matrix. Gap and Kano score are one of the determinants of normalized raw weight. The Kano category is converted to a number using a score of 1 for must be, 2 for one dimensional, and 4 for attractive [11]. In addition, satisfaction goal score and sales points from Trans Semarang and Trans Jateng representatives are also provided as complement in calculation of the planning matrix. Then, normalized raw weight value is multiplied by relationships value to obtain the normalized contribution value for each technical



		Technical Correlations										Planning Matrix								
		Technical Responses																		
		Re-arrangement of routes	Establishment of transportation authority	Addition of joint transfer stops	Provision of physical wayfinding at transfer stops	Integration and provision of multi-services passenger information physically at bus stops and online	Provision of multi-services information inside vehicle	Integration of multi-services information technology	Provision of single ticket	Re-adjustment of time tables	Extension of Trans Jateng operating hours until the last Trans Semarang bus arrival	Gap	Kano's Category	Score of Kano's Category	Absolute Adjust Importance to Customer	Goal	Improvement Ratio	Sales Point	Raw Weight	Normalized Raw Weight
No	Customer Needs	Technical Responses																		
F1	Ease of reaching destination with corridor connectivity	◎	◎									-0.51	O	2	4.45	4.5	1.16	1.35	6.96	0.027
F2	Compatibility of multi-services bus capacity	○	○									-0.92	O	2	7.80	4.0	1.20	1.2	11.28	0.044
F3	Distance of multi-services boarding and alighting at transfer stops			◎								-0.62	A	4	10.61	4.5	1.23	1.35	17.62	0.069
F4	Convenience of multi-services transfers at transfer stops			◎								-0.70	O	2	6.17	4.5	1.21	1.35	10.11	0.040
F5	Ease of multi-services transfers at transfer stops			◎								-0.77	O	2	6.57	4.0	1.14	1.2	8.96	0.035
I1	Availability of multi-services direction on signage at transfer stops				◎							-0.94	A	4	16.07	4.5	1.35	1.2	26.03	0.102
I2	Availability of multi-services information at transfer stops					◎						-0.74	A	4	12.65	4.5	1.27	1.2	19.33	0.076
I3	Availability of inside bus						◎					-0.80	O	2	6.90	4.5	1.28	1.2	10.61	0.042
I4	Ease of multi-services transfers at transfer stops					◎		◎				-0.76	A	4	12.85	4.5	1.30	1.35	22.52	0.088
T2	Uniformity of cashless payment instruments							◎	◎			-1.26	A	4	22.31	4.5	1.42	1.35	42.80	0.168
T3	Availability of multi-services single ticket								◎			-0.50	A	4	8.80	4.5	1.15	1.35	13.71	0.054
J1	Affordability of combined fare									◎	◎	-0.90	A	4	15.41	4.5	1.33	1.35	27.69	0.109
J2	Synchronization of the before and next bus									◎		-1.23	O	2	10.75	4.5	1.44	1.35	20.90	0.082
J3	Waiting time for the next bus									○	◎	-1.01	O	2	8.88	4.5	1.34	1.35	16.02	0.063
	Priorities																			
	Contribution	0.379	0.379	1.297	0.920	1.480	0.375	2.310	1.998	1.907	1.546									
	Normalized Contribution	0.030	0.030	0.103	0.073	0.118	0.030	0.183	0.159	0.151	0.123									
	Priority	9	8	6	7	5	10	1	2	3	4									

Figure 2 House of quality of Semarang bus transit system multi-services integration

Table 6 Improvement priorities of Semarang bus transit system multi-services integration

Priority	Improvement
1	Integration of multi-services information technology
2	Provision of single ticket
3	Re-adjustment of timetables
4	Extension of Trans Jateng operating hours until the last Trans Semarang bus arrival
5	Integration and provision of multi-services passenger information physically at bus stops and online
6	Addition of joint transfer stops
7	Provision of physical wayfinding at transfer stops
8	Establishment of transportation authority
9	Re-arrangement of routes
10	Provision of multi-services information inside vehicle

response. The first priority of technical responses is determined based on the largest value of normalized contribution. Thus, improvement priorities are obtained which can be seen in Table 6.

CONCLUSIONS

An improvement is needed because Trans Semarang and Trans Jateng service are not yet fully integrated. Quality Function Deployment method is used and integrated with Importance-Performance Analysis and model Kano results is used to find improvement priorities.

The are several improvements that can be implemented, which are prioritized from : 1) Integration of multi-services information technology, 2) Provision of single ticket, 3) Re-adjustment of time tables, 4) Extension of Trans Jateng operating hours until the last Trans Semarang bus arrival, 5) Integration and provision of multi-services passenger information physically at bus stops and online, 6) Addition of joint transfer stops, 7) Provision of physical wayfinding at transfer stops, 8) Establishment of the transportation authority, 9) Re-arrangement of routes, and 10) Provision of multi-services information inside vehicle. Therefore, improvement of multi-services integration in Semarang bus transit system, between Trans Semarang and Trans Jateng, can be implemented immediately because customer satisfaction level in all integration attributes still does not meet expectations. This is confirmed by the potential for providing customer satisfaction if integration is improved. However, this research still does not provide technical details of integration implementation, especially in each of integration attributes. Therefore, further research with more detail analysis is needed.

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