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SERVICE QUALITY ANALYSIS IN INDONESIAN HIGHWAYS

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Abstract

Highways require a minimum service quality that can be measured by following government issued standards. As stated in the Ministry Regulation No. 392 Year 2005, the Government of Indonesia generally describes the service quality parameters as road conditions, average travelling speed, mobility, accessibility, safety, rescue unit, and rest area. In this study, these six parameters are elaborated into 33 more parameters which were incorporated into a questionnaire prepared by the Indonesian Toll Road Authority. The questionnaire was then distributed among highway users. There were 11 highway segments observed in this study. The result was analyzed based on Structural Equation Models (SEM), which also used Partial Least Squares (PLS) model. The analysis showed that while safety is the parameter that users are mostly satisfied with, they expect better road condition.

Keywords: Highway; Satisfaction; Expectation; Partial least square; Structural equation models;

1.0 INTRODUCTION

Along with the rapid economic growth in Indonesia, the need for connecting lines between regions is increasing rapidly as well. Economic growth across regions will be developed with available transport lines to connect these areas. Transportation is therefore essential to support such development.

Ground transportation is a process of moving people or goods from one place to another via landlines. In this process the path uses land lines to be traversed by a wide variety of vehicles in accordance with the needs of people who are connected by those lines. This can be seen in most big islands in Indonesia that require high mobility activities, especially in city centers. Hence, ground transportation is an important aspect where service quality should be improved.

Following the discovery of the problems regarding unmet satisfaction and service level expectations by highway users, there have been several research on the issue. For example, Ardhika [1] described the level of customer satisfaction towards Jagorawi motorway services as provided by PT. Jasa Marga (Persero) as "quite satisfying". In addition, Zuna [2] carried out a Service Quality Model Development Toll Road analysis via Neural Network Analysis to measure users' perception of toll road service quality. In this study, the author mapped 11 toll roads in operation in Indonesia and focused on identifying the dimensions and service

quality using Minimum Service Standards (MSS) as the output index.

Both studies by Ardhika and Zuna presented their results in the form of satisfaction index but there has been no analysis of the relationship between the variables within the toll road service. Thus, it does not give a clear picture of the satisfaction and expectations level measured by toll road users in Indonesia.

2.0 RESEARCH METHOD

In this research, the analysis was conducted on secondary data obtained in the previous questionnaires. This study emphasizes the analysis of service quality attributes as described in the questionnaires to see the relationship between these attributes with the help of SmartPLS and the SPSS statistical software. In this chapter, the author will discuss the methods used to analyze the attributes. The study began with questionnaire responses and performed statistical tests to obtain the projected value of the relationship between the highway service quality attributes conditioned as a statistical variable tested. This research uses the following model as can be seen in Figure 1. There are 33 actively operating highways managed either by the government or by private. In this study, authors examined 11 of the 33 highways operating in Indonesia.

Fig. 1. Modeling SEM Plan in SmartPLS.

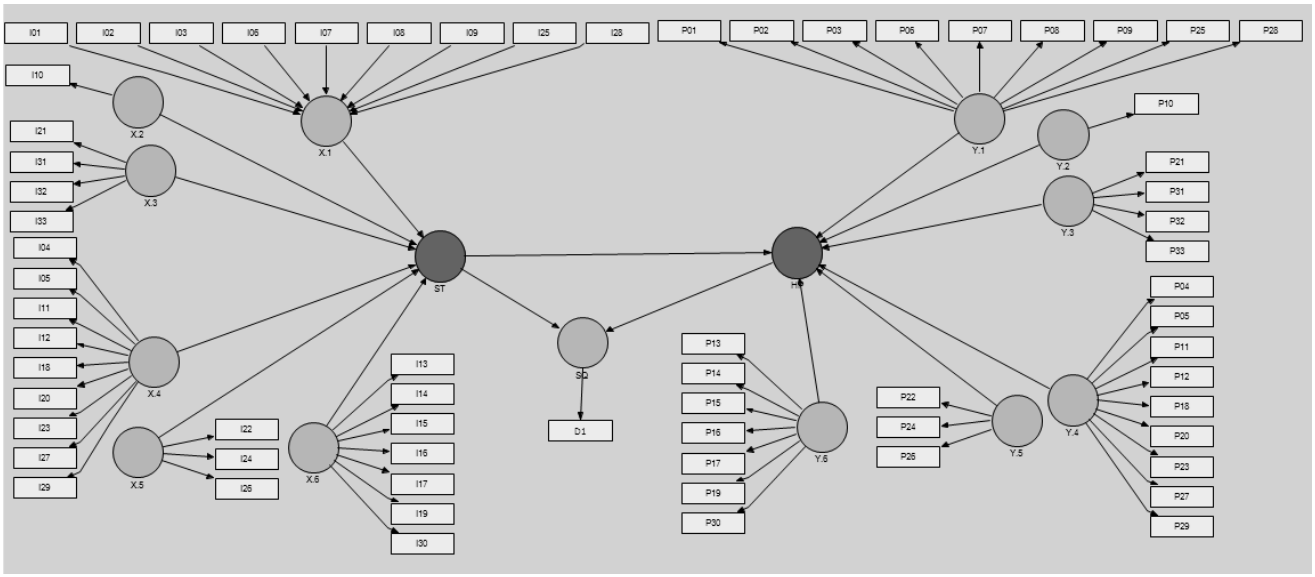

Table 1. Highway area research.

No	Toll Road Sections	Length (km)	Manager
1	Jakarta – Bogor – Ciawi (Jagorawi)	49	PT. Jasa Marga
2	Jakarta – Tangerang (Janger)	33	PT. Jasa Marga
3	Semarang Sections A, B, C	24.75	PT. Jasa Marga
4	Jakarta – Cikampek (Japek)	83	PT. Jasa Marga
5	Serpong – PondokAren (BSD)	7.25	PT. Bintaro Serpong Damai
6	Tangerang – Merak (Merak)	73	PT. Marga Mandalasakti
7	Cikampek – Purwakarta – Padalarang (Cipularang)	58.5	PT. Jasa Marga
8	Padalarang – Cileunyi (Padaleunyi)	64.4	PT. Jasa Marga
9	Palimanan – Plumbon – Kanci (Palikanci)	26.3	PT. Jasa Marga
10	Kanci – Pejagan	35	PT. Semesta Marga Raya
11	Surabaya – Gempol (Surgem)	49	PT. Jasa Marga

This research uses 33 variables obtained from secondary data in the form of a questionnaire study [2] connected with 6 main dimensions in SPM and 3 endogenous variables namely Satisfaction, Expectations, and Quality of Service as outlined in Table 3. The analysis results were placed in comparison with the previous study by Zuna (see Table 2) using a descriptive method.

Table 2. Comparison to the previous study.

Comparison Items	Zuna	This Research
Method	Descriptive by implementing Analysis Neural Network approach to produce user satisfaction index	Quantitative using Structural Equation Models(SEM) and Partial Least Squares (PLS) approach to see the structural connection between tested variables
Model Used	Toll Road Service Quality (TRSQ) with 7 key measurement dimensions	Minimum Service Standards (MSS) using 6 key measurement dimensions

Analysis Results	Ranking of 11 toll roads in Indonesia with Jagorawi section at first place	Connection between measurements dimensions for each toll road section and their resulting gaps

Table 3. Six Dimensions from MSS and Their 33 Manifest Variables.

No	Manifest Variables	Dimension of MSS
1	Comfort while driving along the toll roads	Road Condition [3], [4], [5], [6]
2	Smoothness or flatness of the road surface along the toll roads	
3	The number and quality of the toll road markings	
6	The number and quality of ornamental plants along the side and median road	
7	The number and size of trees on the side of the highway as a shade	
8	Condition of road shoulder for an emergency stop	
9	The cleanliness of the streets and around the motorway	
25	Free of charge crane facilities, patrol, or ambulance	
28	Responsiveness to repair damage to the highway	
10	Smoothness / no barriers / no traffic jams when driving road toll	Mobility [4]
21	The number and quality of service tollbooth	Accessibility [3], [4], [5]
31	Officers' hospitality during substation transactions	
32	Officers' honesty during substation transactions	
33	Quality of service by substation personnel	
4	The number and quality of street lighting along toll roads	Safety [3], [4], [6], [7]
5	The position and location of signs / traffic information boards	
23	Form, size and amount of information indicated in information boards	
11	Safety level (number of accidents) while driving along the toll roads	
12	Visibility without interruption	
18	Free of charge rest areas	
20	Security against criminal acts	Emergency Unit [3]. [5], [8], [9]
27	The speed and accuracy of accident handling	
29	The accuracy of the information provided	
22	Call center quality, convenience and benefits	
24	Free of charge patrol officers, tow, or ambulance services	
26	The ease of getting a tow, patrols and ambulances	
13	Number of rest areas	Rest Area [3], [5], [6], [8], [9]
14	Availability and completeness of rest area facilities	
15	The availability and quality of rest area parking	
16	The number and cleanliness quality of rest area toilets	
17	The number and quality of gas stations	
19	Cleanliness of resting places	
30	Security against crimes along the toll roads	

3.0 RESULTS AND DISCUSSIONS

Below are the results for the general model of 11 toll roads showing the greatest influence on the Minimum Service Standards' (MSS) six dimensions and a maximum loading factor of 33 influencing variables.

Table 4 and 5 show that the respondents generally perceive the 11 toll roads to be good with their quality of services on safety, precision handling of accidents and speed of responses in a few aspects. With regards to future expectations, road condition and more specifically smoothness or flatness of the road surface along the toll roads needs to be improved entirely.

Table 4. Relations between MSS 6 dimensions and 33 variables for Satisfaction.

Code	Variable	Path Coefficient	Code	Manifest Variable	Loading Factor
K.1	Road Condition	-0.2787	1.I28	Responsiveness to repair damage to the highway	0.7124
			1.I07	The number and size of trees on the side of the highway as a shade	0.7105
			1.I08	Shoulder conditions of the road to stop when emergency	0.6795
			1.I25	Crane facilities, patrol, or ambulance without charges	0.6789
			1.I06	The number and quality of ornamental plants along the side and median road	0.6561
			1.I01	Comfort while driving along the highway	0.6455
			1.I02	Smoothness or flatness of the road surface along the highway	0.6223
			1.I03	The number and quality of highway markings	0.5850
			1.I09	The cleanliness of the road and around the highway	0.5612
K.2	Mobility	-0.1642	2.I10	Smoothness / no barriers / no traffic jams when driving	1
K.3	Accessibility	-0.1208	3.I32	Honesty officer when transacting substation	0.8456

Code	Variable	Path Coefficient	Code	Manifest Variable	Loading Factor
			3.I33	Quality of service personnel substation	0.8265
			3.I31	Hospitality services officer when transacting substation	0.7889
			3.I21	Tollbooth number and quality of service	0.7611
K.4	**Safety**	**-0.3166**	**4.I27**	**The speed and accuracy of handling accidents**	**0.7795**
			4.I04	The number and quality of street lighting	0.6985
			4.I29	The accuracy of the information provided	0.6891
			4.I05	The position and location of signs / traffic information boards	0.6873
			4.I23	View form, size, and amount of information that indicated the information board	0.6568
			4.I12	Visibility without interruption	0.6325
			4.I11	The level of safety (number of accident) while driving	0.6120
			4.I18	Rest area without charges	0.5166
K.5	Emergency Unit	-0.1939	5.I24	Free service patrol officers, tow, or ambulance	0.8675
			5.I26	The ease of getting a tow, patrols and ambulance	0.8576
			5.I22	Call center quality, convenience and benefit	0.751
K.6	Rest Area	-0.029	6.I14	The existence and completeness of facilities at a rest area	0.805
			6.I17	The amount and quality of gas station	0.7721
			6.I13	Number of rest area	0.7658
			6.I16	The number and quality of toilet cleanliness	0.7443
			6.I15	The quality and availability of parking at rest area	0.7230
			6.I30	Security from crime	0.5701
			6.I19	Cleanliness resting area	0.5440

Table 5. Relations between MSS 6 dimensions and 33 variables for Expectation.

Code	Variable	Path Coefficient	Code	Manifest Variable	Loading Factor
H.1	**Road Condition**	**0.2548**	**1.P02**	**Smoothness or flatness of the road surface along the highway**	**0.7381**
			1.P01	Comfort while driving along the highway	0.6643
			1.P09	The cleanliness of the streets and around the motorway	0.6563
			1.P28	Responsiveness to repair damage to the highway	0.6452
			1.P03	The number and quality of highway markings	0.6290
			1.P08	Shoulder conditions of the road to stop when emergency	0.6280
			1.P07	The number and quality of ornamental plants along the side and median road	0.6005
			1.P06	Crane facilities, patrol, or ambulance without charges	0.5929
H.2	Mobility	0.2137	2.I10	Smoothness / no barriers / no traffic jams when driving	1
H.3	Accessibility	0.1674	3.P33	Quality of service personnel substation	0.8564
			3.P32	Honesty officer when transacting substation	0.7958
			3.P31	Hospitality services officer when transacting substation	0.7038
			3.P21	Tollbooth number and quality of service	0.5278
H.4	Safety	0.2512	4.P27	The speed and accuracy of handling accidents	0.6611
			4.P20	View form, size, and amount of information that indicated the information board	0.6490
			4.P18	Rest area without charges	0.634
			4.P11	The level of safety (number of accident) while driving	0.6126
			4.P05	The position and location of signs / traffic information boards	0.5904

Code	Variable	Path Coefficient	Code	Manifest Variable	Loading Factor
			4.P04	The number and quality of street lighting	0.5549
			4.P12	Visibility without interruption	0.5253
			4.P29	The accuracy of the information provided	0.5105
H.5	Emergency Unit	0.2365	5.P24	Free service patrol officers, tow, or ambulance	0.8442
			5.P26	The ease of getting a tow, patrols and ambulance	0.8054
			5.P22	Call center quality, convenience and benefit	0.5875
H.6	Rest Area	0.1748	6.P16	The number and quality of toilet cleanliness	0.7746
			6.P15	The quality and availability of parking at rest area	0.7602
			6.P19	Cleanliness resting area	0.7341
			6.P14	The existence and completeness of facilities at a rest area	0.7159
			6.P17	The amount and quality of gas station	0.6256
			6.P13	Number of rest area	0.5361
			6.P30	Security from crime	0.5103

Besides the relations between MSS 6 dimensions and their 33 variables, this study also shows the dominance of variables for each of the 11 toll roads and its satisfaction gap. Toll road managers are expected to fill these gaps as shown in Table 6.

These results show which MSS dimensions are dominant for each road segment and which dimensions are generally dominant for all 11 sample highway used. Dominant dimensions in respondents' satisfaction show variables they considered best available in these toll roads while dominant dimensions in respondents' expectations show variables that highway managers must improve.

Table 6. Dominant measurement variables and their gaps at each of the 11 highway.

No	Toll Road Sections	Satisfaction	Expectation	GAP
1	Jagorawi	Emergency Unit	Accessibility	90.83%
2	Janger	Emergency Unit	Mobility	95.05%
3	Semarang Sections A, B, C	Emergency Unit	Emergency Unit	83.82%
4	Japek	Emergency Unit	Emergency Unit	95.37%
5	BSD	Safety	Mobility	99.97%
6	Merak	Safety	Rest Area	97.10%
7	Cipularang	Accessibility	Mobility	88.54%
8	Padaleunyi	Mobility	Mobility	85.25%
9	Palikanci	Safety	Emergency Unit	96.61%
10	Kanci – Pejagan	Safety	Road Condition	94.11%
11	Surgem	Mobility	Accessibility	93.90%
General Model		Safety	Emergency Unit	89.56%

Comparison between the above analysis results and the previous research by Zuna (2016) [2] using a descriptive method shows the following differences as describe in Table 7.

Within the comparison, the previous research was marked darker shaded on rank 1 and rank 11, while the results of this current study are lighter shaded on rank 1 and rank 11. The previous research ranked 11 toll roads based on satisfaction alone, while this study shows the coefficient of influence resulting from the calculation of overall quantitative analysis per model. The juxtaposed can be seen for several toll roads which have different ratings for the same dimensions in the previous studies because the currently used dimensions have different variables. In this study, the coefficient value generated is the value of the effects of one variable on 6 test variables for each model; therefore, if it is sorted for each model, the values obtained will not describe the comparison. However, this sequence is still applicable as a rough estimate for drawing comparisons to previous studies.

4.0 CONCLUSION

The general models for 11 highways in Indonesia indicate that in terms of satisfaction in 6 Minimum Service Standards (MSS) dimensions, safety variable has the highest path coefficient value while fast and accurate response in accident handling has the highest loading factor. In general, for the 11 toll roads tested using 33 variables, the respondents felt that the safety aspect for speed and accuracy in accident handling was satisfactory. With regards to Expectation, the 6 MSS dimensions show that road condition variable has the highest path coefficient value while smoothness or flatness of road surface along the toll roads variable has the highest loading factor. In general, for the 11 toll roads tested using 33 variables, the respondents expect some

improvement to road surface condition. Hence, it is essential for the stakeholders managing toll roads to make improvements and increase the quality of surface flatness in those 11 toll roads.

Table 7. Comparison results to previous research.

Rank	Section	Total	Information		Accessibility		Accessibility Expectation		Accessibility Satisfaction		Reliability		Road Condition Expectation		Road Condition Satisfaction		Mobility		Mobility Expectation		Mobility Satisfaction	
1	Jagorawi	3.41	4.33	4	3.59	2	0.2758	2	0.0725	7	**1.92**	**1**	0.2905	4	-0.341	2	3.81	8	0.1497	8	-0.276	2
2	BSD	3.29	4.55	2	**4.60**	**1**	0.2553	4	-0.0252	10	1.73	3	0.2301	8	-0.3397	3	3.93	5	**0.0953**	**11**	-0.1322	8
3	Cipularang	3.26	4.55	3	4.47	3	0.2701	3	**-0.2572**	**1**	1.52	7	0.2562	6	-0.1812	8	4.2	2	0.2905	3	-0.123	9
4	Janger	3.20	**4.62**	**1**	4.17	8	**0.3253**	**1**	0.1823	3	1.58	5	0.2067	10	**0.0003**	**11**	**3.23**	**11**	**0.3444**	**1**	-0.1928	4
5	Padaleunyi	3.19	3.87	9	3.92	10	0.1456	10	-0.1179	4	1.81	2	0.2507	7	-0.1348	10	4.17	3	0.2127	6	**-0.2907**	**1**
6	Palikanci	3.12	4.33	5	4.44	4	0.1553	9	-0.064	9	1.46	8	0.2271	9	-0.2028	7	**4.22**	**1**	0.2592	4	-0.1607	6
7	Merak	3.08	4.27	6	4.16	9	0.1670	7	**0.0072**	**11**	1.45	9	0.3249	2	-0.1557	9	4.11	4	0.1573	7	-0.1332	7
8	Surgem	3.03	**3.29**	**11**	4.39	5	0.1621	8	-0.0865	6	1.53	6	0.2994	3	**-0.3575**	**1**	3.82	7	0.1381	9	-0.1986	3
9	Semarang Sections A, B, C	2.98	3.69	10	**3.58**	**11**	0.2089	6	-0.088	5	1.7	4	0.2689	5	-0.2383	6	3.89	6	0.1364	10	-0.1846	5
10	Japek	2.96	4.14	8	4.18	7	0.2234	5	-0.1951	2	1.22	10	0.1872	11	-0.2648	5	3.43	10	0.225	5	-0.0931	10
11	Kanci – Pejagan	2.76	4.19	7	4.33	6	**0.0897**	**11**	-0.0651	8	**1.04**	**11**	0.3446	1	-0.2697	4	3.75	9	0.3173	2	**-0.0684**	**11**
	General Model						0.1674		-0.1208				0.2548		-0.2787				0.2137		-0.1642	

Rank	Section	Total	Safety & Security		Safety Expectation		Safety Satisfaction		Rest Area		Rest Area Expectation		Rest Area Satisfaction		Responsiveness		Emergency Unit Expectation		Emergency Unit Satisfaction	
1	Jagorawi	3.41	4.26	2	0.198	7	**-0.1236**	**11**	4.16	2	0.2179	4	-0.2039	3	4.6	2	0.3533	3	**-0.4496**	**1**
2	BSD	3.29	4.01	4	0.16	8	-0.4216	3	3.82	5	**0.342**	**1**	0.1308	7	4.28	5	0.4173	2	-0.1912	8
3	Cipularang	3.26	3.72	9	0.1357	9	-0.2796	9	4.12	3	0.1283	9	-0.1007	8	4.46	3	0.2148	7	-0.1666	10
4	Janger	3.20	**4.33**	**1**	0.1993	6	-0.3786	4	3.83	4	**0.0392**	**11**	**-0.4436**	**1**	**4.75**	**1**	0.3145	4	-0.3966	2
5	Padaleunyi	3.19	4.07	3	0.2861	2	-0.4269	2	3.31	7	0.1182	10	**0.0225**	**11**	3.95	9	0.2444	6	-0.1972	7
6	Palikanci	3.12	3.73	8	0.2014	5	**-0.4541**	**1**	3.2	10	0.1859	7	0.0687	9	4.04	8	0.2644	5	-0.2623	5
7	Merak	3.08	**3.49**	**11**	0.2342	4	-0.3574	6	3.7	6	0.2017	6	-0.207	2	4.19	6	0.1577	10	-0.2861	4
8	Surgem	3.03	4.01	4	**0.3814**	**1**	-0.3199	8	3.28	9	0.1336	8	-0.1713	5	4.11	7	**0.135**	**11**	**-0.1312**	**11**
9	Semarang Sections A, B, C	2.98	3.83	7	**0.0983**	**11**	-0.3574	5	3.3	8	0.2689	2	0.1325	6	3.6	10	**0.4619**	**1**	-0.3831	3
10	Japek	2.96	3.88	6	0.274	3	-0.267	10	**4.28**	**1**	0.2024	5	-0.0595	10	4.3	4	0.21	8	-0.2284	6
11	Kanci – Pejagan	2.76	3.54	10	0.1073	10	-0.3362	7	**3.08**	**11**	0.2295	3	-0.1798	4	**3.52**	**11**	0.1727	9	-0.1823	9
	General Model				0.2512		-0.3166				0.1748		-0.029				0.2365		-0.1939	

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