

ANALYSIS OF THE MOST SENSITIVE TOLL ROAD SERVICE PERFORMANCE BASED ON USER PERCEPTION AND INFLUENCED FACTORS

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Abstract

This study aims to evaluate the service performance of the Terbanggi Besar–Pematang Panggang–Kayu Agung (TERPEKA) toll road section based on user perceptions and to identify the factors influencing toll road service performance. The analysis employs the Service Quality (SERVQUAL) method and Important Performance Analysis (IPA) to measure the gap between user expectations and perceived performance, complemented by factor analysis to determine the dominant influencing factors. The results indicate that the overall service quality of the TERPEKA toll road remains unsatisfactory, as all SERVQUAL dimensions show quality (Q) values below 1. IPA results reveal several priority attributes requiring immediate improvement, particularly road surface conditions, street lighting, modern toll facilities, road geometry comfort and safety, and rest area comfort and security. Furthermore, factor analysis identifies three main factors influencing service performance—service factors, quality factors, and performance factors—which together explain 77.33% of the total variance. The service factor is the most dominant, contributing 66.131% of the variance, followed by quality and performance factors. These findings highlight the need for targeted improvements in infrastructure quality and service management to enhance user satisfaction on the TERPEKA toll road.

Keywords: *Service Quality; Important Performance Analysis; Toll Road Service Performance; User Satisfaction; Factor Analysis.*

INTRODUCTION

Toll road development is one of the most important infrastructure instruments for land transportation, as it connects one region to another and can serve as an alternative route (Ardiansyah, 2021). Toll road construction is a crucial component of Indonesia's national development process, and this sector plays a vital role in promoting economic growth in affected regions. Road network systems are particularly important, especially the development of the Trans-Sumatra Toll Road. The impacts of infrastructure development on the Trans-Sumatra Toll Road include increased vehicle mobility, improved travel time efficiency, easier accessibility, and the promotion of more equitable infrastructure distribution (Fakhurozi, 2020). The government has placed high connectivity as a top priority to meet these needs. The authority to develop and expand the Trans-Sumatra Toll Road has been granted to the Ministry of Public Works and Housing (PUPR) in accordance with Presidential Regulation No. 117 of 2015 concerning the Acceleration of Toll Road Development in Sumatra (Peraturan Pemerintah Indonesia, 2015).

The Trans-Sumatra Toll Road (JTTS) is a highway network that connects cities across the island of Sumatra, stretching from Lampung to Aceh, with a total length of up to 2,818 km. The Terbanggi Besar–Pematang Panggang–Kayu Agung (TERPEKA) section, which extends from Terbanggi Besar in Lampung to Kayu Agung in South Sumatra, is one of the longest toll road segments, measuring 189 km. The greater the travel distance, the higher the likelihood that travelers will choose to use toll roads (Sulistyorini, 2021). In the development of rest areas, operators are required to manage and provide facilities in accordance with the Minimum Service Standards (MSS) (Setyarini & Linggasar, 2020). Minimum Service Standards for toll road services are essential to ensure user comfort, traffic flow efficiency, and safety (Dina & Amin, 2023). Toll road MSS encompass several service components, including toll road conditions, average travel speed, accessibility, mobility, safety, emergency response units, environmental aspects, and rest areas, as stipulated in the Regulation of the Minister of Public Works No. 16/PRT/M/2014 on Minimum Service Standards for Toll Roads (Kementerian PUPR, 2014).

Toll road services include road conditions, accessibility, mobility, average speed, safety, emergency and rescue units, service assistance, environmental quality, and rest area facilities (Syofa et al., 2024). Increases in toll tariffs tend to reduce the probability of users choosing toll roads and may also affect customer satisfaction (Susanto et al., 2020). On average, regions traversed by toll roads experience increased regional economic growth and improved income distribution, although the effects are relatively moderate (Rinaldi et al., 2023). The Terbanggi Besar–Pematang Panggang–Kayu Agung (TERPEKA) toll road recorded high Average Daily Traffic (ADT) volumes in 2024. Observations suggest that this is largely due to a high number of tourists from South Sumatra traveling to Lampung for holiday purposes. However, this toll road section still faces several challenges, including uneven road surfaces due to ongoing maintenance, low traffic density in certain segments, and insufficient lighting along the route. Several factors also contribute to user dissatisfaction, such as inadequate rest area facilities, relatively high crime rates, and suboptimal emergency response services.

Although the Terbanggi Besar–Pematang Panggang–Kayu Agung (TERPEKA) toll road has been operational since November 15, 2019, no prior studies have specifically examined user satisfaction with the service performance of this toll road section. Similar studies on toll road service performance using the Service Quality (SERVQUAL) and Importance–Performance Analysis (IPA) methods have been identified. Some previous studies applied the same methodological approaches to similar objects with different case studies, or used the same approaches for different research objects. However, several aspects remain underexplored, particularly the identification of factors influencing toll road service performance, which this study seeks to address to ensure its originality and academic validity. Therefore, this research is deemed necessary to analyze the service performance of the Terbanggi Besar–Pematang Panggang–Kayu Agung (TERPEKA) toll road from the perspective of user satisfaction using the Service Quality (SERVQUAL) method to identify gaps between user expectations and perceived performance, and the Importance–Performance Analysis (IPA) method to determine service performance and importance levels. Subsequently, the study identifies the key factors affecting toll road user satisfaction.

METHOD

Problem Identification

In operating toll road infrastructure, particularly the Trans-Sumatra Toll Road, managing companies face the challenge of ensuring that the services provided meet or even exceed user expectations. The Trans-Sumatra Toll Road is a National Strategic Project designed to enhance connectivity and support economic growth on the island of Sumatra. However, the success of this project is not only measured by technical construction aspects but also by how well the services are perceived by toll road users. Along with increasing traffic volumes and rising user expectations, various service performance issues may emerge. Therefore, it is necessary to conduct a study analyzing toll road service performance and the services provided on the TERPEKA toll road section, as well as identifying the factors that influence toll road service performance from the users' perspective.

Research Preparation

At the research preparation stage, the determination of the research location and the types of data to be used in the study of the TERPEKA toll road section were carried out.

Research Location

This research was conducted on the TERPEKA toll road section. This toll road was inaugurated on March 9, 2019, and is located across Lampung Province and South Sumatra Province. The section used as the object of this study covers the route from Terbanggi Besar to Pematang Panggang and Kayu Agung.



Figure 1. Map of the TERPEKA Toll Road Section

Source: Google Maps, 2025

Data Sources

This study uses two types of data: primary and secondary data. Primary data are obtained directly from respondents through observation and questionnaires, while secondary data are collected indirectly from documented records, reports, and official archives.

1. Primary Data

Primary data were collected directly from users of the TERPEKA toll road section. The data consist of variables related to perceived and expected service quality, operationalized into indicators and questionnaire items. A total of 267 respondents were randomly selected and surveyed. Data collection was conducted at rest areas on Lane A (KM 311, KM 277, KM 234, KM 208, and KM 163) and Lane B (KM 307, KM 269, KM 215, and KM 172).

2. Secondary Data

Secondary data include general technical road data, traffic volume, toll facilities, and road equipment on the TERPEKA toll road section, obtained from the Toll Road Regulatory Agency (BPJT). Daily traffic volume data were used to determine the population and sample size. The highest traffic volume was recorded in April 2024 (21,090 vehicles), and therefore April traffic data were used as the basis for sample determination.

Population and Sampling Technique

This study used an accidental sampling technique/method, meaning anyone who happened to meet the researcher at the location could be used as a sample if deemed suitable as a data source. Isaac and Michael (in Sugiyono, 2013) developed a calculation pattern for determining the number of samples needed to represent the population. Simply put, this calculation is shown in table 1. In this study, the highest average daily rate was taken in April 2024, at 21,090, with a sampling error (e) of 10%. Table 1 below yields a total of 267 respondents.

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Table 1. Determination of research samples

N	S			N	S			N	S		
	1%	5%	10%		1%	5%	10%		1%	5%	10%
10	10	10	10	280	197	155	138	2800	537	310	247
15	15	14	14	290	202	158	140	3000	543	312	248
20	19	19	19	300	207	161	143	3500	558	317	251
25	24	23	23	320	216	167	147	4000	569	320	254
30	29	28	27	340	225	172	151	4500	578	232	255
35	33	32	31	360	234	177	155	5000	586	326	257
40	38	26	35	380	242	182	158	6000	598	329	259
45	42	40	39	400	250	186	162	7000	606	332	261
50	47	44	42	420	257	191	165	8000	613	334	263
55	51	48	46	440	265	195	168	9000	618	335	263
60	55	51	49	460	272	198	171	10000	622	336	263
65	59	55	53	480	279	202	173	15000	635	340	266
70	63	58	56	500	285	205	176	20000	642	342	267
75	67	62	59	550	301	213	182	30000	649	344	268
80	71	65	62	600	315	221	187	40000	563	345	269
85	75	68	65	650	329	227	191	50000	655	346	270
90	79	72	68	700	341	233	195	75000	658	346	270
95	83	75	71	750	352	238	199	100000	659	347	270
100	87	78	73	800	363	243	202	150000	661	347	270
110	94	84	78	850	373	247	205	200000	661	347	270
120	102	89	83	900	382	251	208	250000	662	348	270
130	109	95	88	950	391	255	211	300000	662	348	270
140	116	100	92	1000	399	258	213	350000	662	348	270
150	122	105	97	1100	414	265	217	400000	662	348	270
160	129	110	101	1200	427	270	221	450000	663	348	270
170	135	114	105	1300	440	275	224	500000	663	348	270
180	142	119	108	1400	450	279	227	550000	663	348	270
190	148	123	112	1500	460	283	229	600000	663	348	270
200	154	127	115	1600	469	286	232	650000	663	348	270
210	160	131	118	1700	477	289	234	700000	663	348	270
220	165	135	122	1800	485	292	235	750000	663	348	270
230	171	139	125	1900	492	294	237	800000	663	348	271
240	176	142	127	2000	498	297	238	850000	663	348	271
250	182	146	130	2200	510	301	241	900000	663	348	271
260	187	149	133	2400	520	304	243	950000	663	348	271
270	192	152	135	2600	529	307	245	1000000	663	348	271
								∞	664	349	272

Source : (Sugiyono, 2013)

RESULTS AND DISCUSSION

Service Quality Data Analysis

The SERVQUAL analysis shows that user satisfaction across all five service quality dimensions—reliability, responsiveness, assurance, empathy, and tangibles remains below expectations, as indicated by consistently negative

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GAP values. In the reliability dimension, service performance does not meet promised standards. The responsiveness dimension also records negative gaps, reflecting users' dissatisfaction with the speed and accuracy of service delivery. Similarly, the assurance dimension shows an average GAP of -0.74, suggesting that employee competence, courtesy, and trustworthiness are perceived as inadequate. The empathy dimension records an average GAP of -0.55, indicating insufficient personal attention and understanding of user needs. The tangible dimension exhibits the largest negative GAP (-1.13), demonstrating that physical facilities and visible service elements are perceived as significantly below user expectations. Overall, these findings indicate that service performance on the TERPEKA toll road has not yet met user expectations across all service quality dimensions.

GAP Value Recapitulation

GAP values were summarized for all dimensions. For more details, see table 2.

Table 2. GAP Values for All Dimensions

Dimension	Performance (P)	Expectation (E)	GAP
Reliability	4.10	4.45	-0.35
	4.08	4.73	-0.65
	3.88	4.57	-0.69
	4.10	4.64	-0.54
Responsiveness	3.99	4.61	-0.63
	4.05	4.69	-0.63
	3.86	4.50	-0.64
Assurance	3.89	4.51	-0.61
	3.99	4.84	-0.84
	3.79	4.67	-0.88
	3.84	4.55	-0.70
	3.82	4.50	-0.68
Empathy	3.84	4.45	-0.60
	3.97	4.61	-0.64
	4.01	4.23	-0.22
	3.87	4.47	-0.60
Tangibles	3.72	4.41	-0.69
	3.68	4.68	-1.00
	3.28	4.75	-1.47
	3.44	4.76	-1.31
	3.63	4.64	-1.01
	3.90	4.73	-0.83
Overall Average	3.80	4.58	-0.74

Based on the results of the overall gap data processing calculations, the average overall gap value was -0.74, indicating that users were dissatisfied with the service provided by toll road service providers.

Overall GAP Ranking Data

Based on the overall average gap value calculation, the highest gap value was for the toll road surface quality, which was smooth and not slippery (not patched), while the lowest was for the appearance of officers who appeared neat and polite. This can be seen in Table 3.

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Table 3. GAP Ranking

SERVQUAL Attribute	Performance	Expectation	GAP	Ranking
Travel time	4.10	4.45	-0.35	21
Smooth and safe traffic flow performance	4.08	4.73	-0.65	12
Fast and accurate resolution of customer complaints/problems	3.88	4.57	-0.69	9
Reliability of electronic payment systems without technical disruptions or transaction errors	4.10	4.64	-0.54	20
Response speed to emergency calls (operator / police / ambulance / tow truck)	3.99	4.61	-0.63	16
Service speed at toll gates using electronic payment (e-Toll), especially during peak hours	4.05	4.69	-0.63	15
Speed in providing up-to-date traffic information via applications, electronic boards, or other media	3.86	4.50	-0.64	13
Reliability of official towing services	3.89	4.51	-0.61	17
Road conditions safe from criminal activity	3.99	4.84	-0.84	6
Comfort and safety of rest areas	3.79	4.67	-0.88	5
Highway patrol services (PJR) make users feel safe	3.84	4.55	-0.70	8
Toll road hotline provides information and answers to customer inquiries	3.82	4.50	-0.68	11
All toll road personnel are friendly and courteous	3.84	4.45	-0.60	19
Number of toll booths opened during peak hours is sufficient for high traffic volume	3.97	4.61	-0.64	14
Personnel appearance is neat and professional	4.01	4.23	-0.22	22
Strategic location and sufficient number of rest areas	3.87	4.47	-0.60	18
Availability of special facilities for users with special needs (e.g., emergency vehicle lanes or services for persons with disabilities)	3.72	4.41	-0.69	10
Road geometry (curves, slopes, and gradients) is comfortable and safe	3.68	4.68	-1.00	4
Quality of toll road surface is smooth and non-slippery (no patchwork)	3.28	4.75	-1.47	1
Street lighting conditions provide comfort when using the toll road at night	3.44	4.76	-1.31	2
Completeness and modernity of toll road facilities (signs, booths, etc.)	3.63	4.64	-1.01	3
Effectiveness of directional, regulatory, and warning signs in assisting travel	3.90	4.73	-0.83	7

The table shows the factors or attributes that influence service performance on the TERPEKA Toll Road. Table 2 shows several attributes that influence toll road service performance. The first attribute is the quality of the toll road surface, which is smooth and not slippery (not patchy), with a difference score of -1.47. The second attribute is the condition of street lighting, which makes it comfortable to use the toll road at night, with a difference score of -1.31. Furthermore, the third attribute is the completeness of toll road facilities (signs, toll booths, etc.) which are modern, with a difference score of -1.01. The ranking results are derived from the difference scores calculated using the formula Performance (K) minus Expectations (H).

Calculating Service Quality

To analyze the quality of service provided by a company to customers, the following formula can be used:

$$\text{Quality of Service (Q)} = \frac{\text{Performance assessment}}{\text{Expectation Level}} \tag{6}$$

Based on the calculation of equation 6, if $Q \geq 1$, the service quality gap is considered good. If $(Q) < 1$, the service quality gap cannot be considered good or unsatisfactory. Looking at table 4 the reliability dimension shows

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the highest service quality score, at 0.879. Although this score is still below 1, we can conclude that service quality is still inadequate or unsatisfactory. The average service quality calculation is 0.839.

Tabel 4. Service Quality

No	Dimension	Performance	Hope	GAP	Q
1	<i>Reliability</i>	4,04	4,60	-0,558	0,879
2	<i>Responsivness</i>	3,97	4,60	-0,634	0,862
3	<i>Assurance</i>	3,87	4,61	-0,744	0,839
4	<i>Empathy</i>	3,88	4,43	-0,551	0,876
5	<i>Tangible</i>	3,59	4,71	-1,126	0,761
Average		3,87	4,59	-0,722	0,843

If we look at Table 4, the reliability dimension shows the highest service quality score of 0.879, although this score is still below 1, so we can conclude that service quality is still inadequate or unsatisfactory. The average service quality score is 0.839.

Importance Performance Analysis (IPA)

The next step after understanding the overall GAP value is to proceed with an analysis of performance and expectations. This analysis process aims to evaluate the position of each attribute in service to TERPEKA Toll Road users, based on existing performance and expectations. The importance-performance quadrant analysis utilizes a Cartesian diagram; before presenting the results in the diagram, it is necessary to first determine the level of perception and expectation obtained from the average of each perception level (X) and the average level of importance/expectation (Y). The data is then visualized in a Cartesian diagram, which allows for the identification of the quadrant position of each dimension or the overall value. The corresponding ratio between the importance level and the evaluation of the service performance is then calculated, as well as the average weighting of each attribute regarding the importance level and the evaluation of the service performance.

To determine which quadrant the question variable falls into, the correlation value or ratio between service performance and importance is first determined. The diagram is divided into four quadrants: Quadrant I is highly important (high priority), Quadrant II is important (maintain performance), Quadrant III is less important (low priority), and Quadrant IV is less important and tends to be overestimated. Next, the importance and performance levels are mapped onto a Cartesian Importance Performance Analysis (IPA) diagram. The Cartesian Importance Performance Analysis (IPA) diagram can be seen in Figure 2. The question items are divided into four quadrants:

- a. Quadrant I indicates that attributes x3.3, x5.1, x5.2, x5.3, and x5.4 are important factors for users, but users are not yet satisfied with the service performance. The attributes in quadrant I include:
 1. Rest area conditions are very comfortable and safe.
 2. The geometry (bends, inclines, and declines) of the toll road is comfortable and safe to use.
 3. The toll road surface is smooth and not slippery (not patched).
 4. The condition of street lighting makes it comfortable to use the toll road at night.
 5. The completeness of toll road facilities (signs, toll booths, etc.) is modern.

These attributes are also in quadrant I and should be the focus of attention for improving TERPEKA Toll road services.
- b. Quadrant II indicates that attributes x1.2, x1.4, x2.1, x2.2, x3.2, x4.2, x5.5 are considered appropriate by users, successfully providing services that meet user performance standards in areas deemed relevant by TERPEKA Toll road users. Service factors in this quadrant must be maintained or even improved because they represent the main strengths and potential competitive advantages of the TERPEKA Toll Road, which must be maintained or utilized. These attributes are considered important by toll road users and align with their experiences, resulting in a relatively high level of satisfaction. These attributes represent each user's personal perception of the services provided by the TERPEKA Toll Road. Therefore, the performance of these attributes should be maintained. Attributes in quadrant II include:
 1. Smooth and safe traffic flow performance
 2. Reliability of the electronic payment system without technical disruptions or transaction errors
 3. Speed of response to emergency calls (operator/police/ambulance/towing service)

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4. Speed of service at toll gates, for electronic payments (e-Toll), especially during peak hours
 5. Road conditions are safe from crime
 6. The number of toll booths open during peak hours is sufficient for the large traffic volume
 7. The function of directional, instructional, and prohibition signs on the toll road can assist you during your trip
- c. Quadrant III indicates that attributes x3.4, x3.5, x4.1, and x4.5 are not considered important by TERPEKA Toll Road users, and the service performance is also not very good. In quadrant III, improvements to the factors in this quadrant need to be reconsidered because their impact on perceived benefits is very small. Attributes in quadrant III include:
1. Service from highway personnel (PJR) makes you feel safe
 2. The toll road hotline can provide information or answers to customer questions
 3. All officers on duty around the toll road are friendly and polite
 4. Provision of special facilities for users in need, such as special lanes for emergency vehicles or services for the disabled
- d. Quadrant IV indicates that attributes x1.1, x1.3, x2.3, x3.1, x4.3, and x4.4 are not considered important by TERPEKA Toll Road users, but the service provided is excessive. Attributes in quadrant IV include:
1. Travel time
 2. Fast and accurate resolution of customer complaints/issues
 3. Speed in providing up-to-date traffic information via apps, electronic information boards, or other media
 4. Reliable, authorized towing services
 5. Neat and polite appearance of staff
 6. Strategic rest area locations and sufficient number of rest areas
- The Importance Performance Analysis diagram is presented in Figure 2.

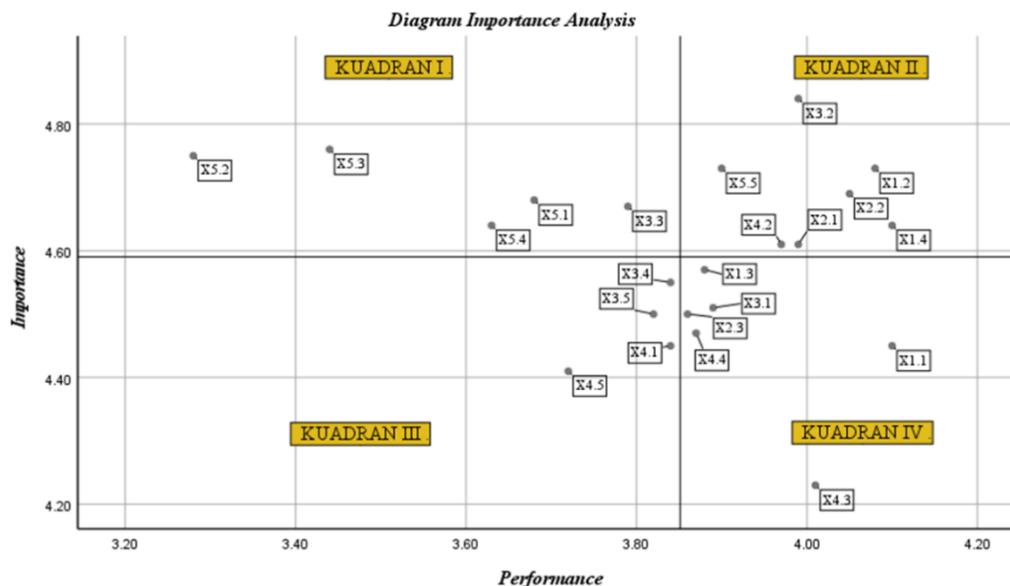


Figure 2. Importance Performance Analysis Diagram

Factor Analysis

Formulating the Problem

The problem in this study is to determine the factors that can impact the assessment of toll roads in user perception. Twenty-two variables were used to address the research questions relevant to this study, which were then analyzed using factor analysis.

Correlation Matrix Creation

The tests conducted in this stage consisted of Barlett's Test of Sphericity, Keiser Meyer Olkin (KMO), and Measure of Sampling Adequacy (MSA).

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Table 5. Values (KMO-MSA)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,950
Bartlett's Test of Sphericity	Approx. Chi-Square	7134,725
	df	231
	Sig.	0,000

The table below explains the Bartlett's Test of Sphericity and Keiser-Meyer-Olkin Measure of Sampling Adequacy (KMO-MSA) values as follows:

a. Bartlett's Test of Sphericity

Data processing using SPSS 25 shows a Bartlett's Test of Sphericity value of 7134.725 with a significance level of 0.000, meaning the Bartlett's Test of Sphericity significance value (p-value) is ≤ 0.05 . This indicates that the variables influencing the toll road performance assessment in user perception meet the requirements for factor analysis.

b. Kaiser Meyer Olkin (KMO)

Based on the data processing results, as shown in Table 24, the Kaiser Meyer Olkin Measure of Sampling Adequacy (KMO-MSA) value is 0.950, meaning the KMO-MSA value is >0.5 . Therefore, it can be concluded that factor analysis is suitable and that there is closeness between variables in the population.

c. Measure of Sampling Adequacy (MSA)

The calculation can be seen in Table 6.

Table 6. Measure of Sampling Adequacy (MSA) Values

No.	Variable Item	MSA Value
1	X1.1	0.881
2	X1.2	0.924
3	X1.3	0.949
4	X1.4	0.934
5	X2.1	0.957
6	X2.2	0.950
7	X2.3	0.978
8	X3.1	0.950
9	X3.2	0.957
10	X3.3	0.962
11	X3.4	0.965
12	X3.5	0.962
13	X4.1	0.942
14	X4.2	0.947
15	X4.3	0.934
16	X4.4	0.958
17	X4.5	0.962
18	X5.1	0.957
19	X5.2	0.952
20	X5.3	0.951
21	X5.4	0.949
22	X5.5	0.929

The table shows that all variables have a Measure of Sampling Adequacy (MSA) value > 0.5 , indicating that they can be used for further analysis.

Factor Extraction

After identifying suitable variables for factor analysis, the next step is factor determination, which is the core step of the factoring process. The purpose of factor extraction is to form one or more factors from a set of existing variables to form multiple factors. The number of components can be determined from the eigenvalues of each

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variable. Eigenvalues represent the total variance explained for each factor. The eigenvalues of the studied variables can be seen in Table 7.

Table 7. Eigenvalues, percentage of variance, and cumulative percentage of variance for the studied variables.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14,549	66,131	66,131	14,549	66,131	66,131	7,8165	35,525	35,525
2	1,431	6,503	72,634	1,431	6,503	72,634	5,4007	24,547	60,072
3	1,034	4,699	77,333	1,034	4,699	77,333	3,7971	17,261	77,333
4	0,606	2,756	80,089						
5	0,507	2,306	82,394						
6	0,485	2,203	84,597						
7	0,476	2,162	86,759						
8	0,439	1,996	88,755						
9	0,335	1,525	90,280						
10	0,292	1,326	91,606						
11	0,252	1,144	92,750						
12	0,241	1,097	93,847						
13	0,223	1,012	94,859						
14	0,182	0,828	95,687						
15	0,176	0,798	96,485						
16	0,148	0,674	97,159						
17	0,136	0,619	97,778						
18	0,119	0,542	98,321						
19	0,105	0,476	98,796						
20	0,102	0,463	99,259						
21	0,082	0,371	99,631						
22	0,081	0,369	100,000						

Based on the table, it can be concluded that of the 22 variables analyzed, there are three factors that can influence the assessment of toll road performance in user perception based on eigenvalues ≥ 1 . These three factors can be seen in Table .8

Table 8. Three factors based on eigenvalues ≥ 1

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14,549	66,131	66,131	14,549	66,131	66,131	7,8165	35,525	35,525
2	1,431	6,503	72,634	1,431	6,503	72,634	5,4007	24,547	60,072
3	1,034	4,699	77,333	1,034	4,699	77,333	3,7971	17,261	77,333

Based on the table, it is concluded that there are three factors that can influence the assessment of toll road performance in user perception based on eigenvalues ≥ 1 . These three factors are able to explain the variation (cumulative percentage of variance) of all data used by 73.333%, while the rest is influenced by other factors outside this study. Factor 1 has the highest eigenvalues of 14.549 with the largest percentage of variance of 66.131% while factor 3 has the lowest eigenvalues of 1.034 with a percentage of variance of 4.699%. Basically, the scree plot diagram has the same function as the total variance explained table, which functions to see the factors formed from the results of the analysis based on the eigenvalues. The way to read the scree plot diagram is by looking at the

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eigenvalues (on the Y axis), which have eigenvalues more than 1 are the factors that are formed. Based on the diagram above, it can be seen that there are 3 points that have eigenvalues >1, this means that there are 3 factors formed as can be seen in Figure 3.

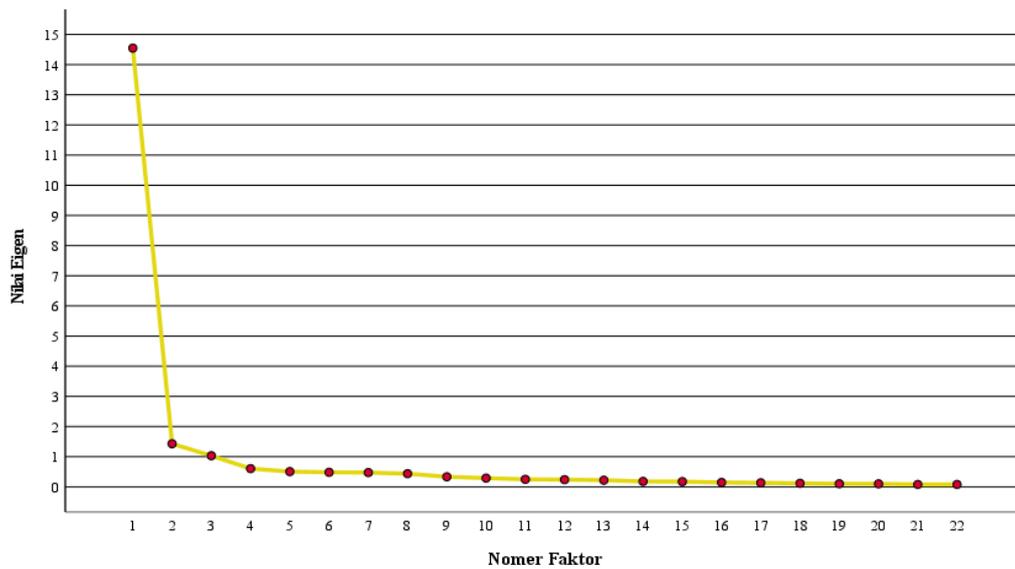


Figure 3. Scree plot

Factor Rotation

After the factors are formed, each consisting of several variables, sometimes a variable is difficult to determine which factor it belongs to, especially if only one factor is formed. There may also be a variable whose inclusion in the formed factor is questionable because it does not have a significant enough matrix component value (its factor loading differs little from the other factors). Therefore, it is necessary to rotate the formed factors (matrix rotation) so that the position of each variable can be clearly determined. The factors influencing the toll road performance assessment in user perception are shown in Table 9.

Table 9. Factors Influencing Road Performance Assessment.

Variabel	Loading Factor	Faktor	Eigenvalues	% of Variance	Cumulative %
X4.1	0,815				
X3.4	0,794				
X3.1	0,789				
X3.5	0,755				
X4.3	0,745				
X2.2	0,740	Faktor 1	14,549	66,131	66,131
X4.5	0,707				
X2.3	0,687				
X4.4	0,684				
X2.1	0,666				
X3.2	0,642				
X3.3	0,633				
X5.3	0,842				
X5.2	0,749	Faktor 2	1,431	6,503	72,634
X5.4	0,749				
X5.5	0,723				
X5.1	0,673				
X1.1	0,857				
X1.2	0,801	Faktor 3	1,034	4,699	77,333
X1.3	0,689				
X1.4	0,645				

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The results of data processing using SPSS 25 and factor rotation using the Varimax method, as shown in table 9 indicate that there are three factors that can influence the assessment of toll road performance in user perceptions, based on the percentage of variance, cumulative variance, percentage of variance, loading factor, and eigenvalues. The variables included in the factors are also visible, making interpretation easier, especially in assigning appropriate factor names.

Factor Interpretation

Factor interpretation can be performed by identifying the variables that form them. The three factors obtained from the reduction will be named. The naming of the factors depends on the names of the variables grouped together, in the interpretation of each analysis, and other aspects. Therefore, naming is subjective and there are no definitive provisions regarding naming. The naming of each factor can be described as follows:

- a. Factor 1 (Service), Based on the results of factor analysis in this study, the first factor, namely the service factor, is 66.131% (percentage of variance) with an eigenvalue of 14.549. The variables included in this factor are: Speed of response to emergency calls (operator / police / ambulance / tow truck) (X4.1), Speed of service at toll gates, in electronic payments (e-Toll), especially during peak hours (X3.4), Speed in providing the latest traffic information through applications, electronic information boards, or other media (X3.1), Official towing services that are always reliable (X3.5), Road conditions are safe from crime (X4.3), Rest area conditions are very comfortable and safe (X2.2), Service from highway officers (PJR) makes you feel safe (X4.5), Toll road hotlines can provide information or answers to customer questions (X2.3), All officers on duty in the toll road environment are friendly and polite (X4.4), The number of toll booths opened during peak hours is sufficient for large traffic volumes (X2.1), The appearance of officers looks neat and polite (X3.2), Strategic rest area locations and the number of rest areas is sufficient (X3.3), Provision of special facilities for users who need them, such as special lanes for vehicles Emergency or disabled services (X4.2).
- b. Factor 2 (Quality). The second factor, quality, influences the toll road performance assessment in user perception by 6.503% (percentage of variance) with an eigenvalue of 1.431. The variables included in this factor are: Comfortable and safe toll road geometry (bends, ascents, and descents) (X5.3), smooth and non-slippery toll road surface quality (X5.2), comfortable toll road lighting conditions at night (X5.4), modern toll road facilities (signs, toll booths, etc.) (X5.5), and the function of guide, instruction, and prohibition signs on the toll road can assist you on your journey (X5.1).
- c. Factor 3 (Performance), The second factor, namely performance, influences the assessment of toll road performance in user perception by 4.699% (percentage of variance) with an eigenvalue of 1.034. The variables included in this factor are travel time (X1.1), Smooth and safe traffic flow performance (X1.2), Fast and accurate resolution of customer complaints/problems (X1.3), Reliability of electronic payment systems without technical disruptions or transaction errors (X1.4).

CONCLUSION

The conclusions of this study are as follows:

1. Based on the overall analysis using Service Quality (Servqual) based on user perceptions, it was found that the service performance of the TERPEKA toll road section remains unsatisfactory. This can be seen from the five dimensions analyzed, with service quality having a Q value below 1. In line with the results of the Important Performance Analysis (IPA) analysis in quadrant 1 (Improvement Priority), the attributes that emerged were a smooth toll road surface that is not slippery when traversed (not patched), street lighting conditions that make using the toll road comfortable at night, modern toll road facilities (signs, toll booths, etc.), comfortable and safe to travel on the toll road geometry (bends, inclines, and declines), and very comfortable and safe rest areas. All attributes in quadrant 1 are ranked among the top five GAPS in the service quality method.
2. The results of the analysis using the factor analysis method regarding the factors that influence the performance of toll road services (TERPEKA) show that there are 3 influential factors, namely service factors, quality factors, and performance factors. These three factors are able to explain the variation (cumulative percentage of variance) of all data used by 77.33%, while the remaining 22.667% is influenced by other factors outside this study. The first factor has the highest eigenvalues of 14.549 with the largest percentage of variance of 66.131%, the second factor has eigenvalues of 1.431 with a percentage of variance of 6.503% and the third factor has the lowest eigenvalues of 1.03 with a percentage of variance of 4.699%.

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