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THE INFLUENCE OF SERVICE QUALITY AND
CUSTOMER SATISFACTION ON CUSTOMER LOYALTY:
A STUDY OF PERUMDAM TIRTA KOMODO,
MANGGARAI REGENCY

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ABSTRACT

This study employs multiple linear regression using data from 398 respondents, systematically sampled from a population of 31,929 active customers, to examine the influence of service quality and customer satisfaction on customer loyalty at Perumdam Tirta Komodo in Manggarai Regency, East Nusa Tenggara, Indonesia. The findings confirm that both service quality and customer satisfaction have significant positive effects on customer loyalty, underscoring the importance of continuous service enhancement, transparent communication, and evidence-based management in sustaining strong customer relationships. As the cross-sectional survey conducted in October 2025 captures customer perceptions at a single point in time, dynamic changes in attitudes and loyalty cannot be assessed. Future research is therefore recommended to adopt longitudinal designs and include additional variables, such as corporate image, price fairness, reputation, engagement, and reliability indicators to more comprehensively explain the drivers of customer loyalty in public water utilities.

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1. INTRODUCTION

As the principal provider of piped water services in Manggarai Regency, Perumdam Tirta Komodo bears the critical responsibility of maintaining service quality, cultivating customer satisfaction, and fostering loyalty to ensure sustained public legitimacy and operational resilience. Although the 2024 audit by the Indonesian Financial and Development Supervisory Agency (BPKP) published in 2025 categorized the Perumdam as "healthy" with a performance score of 3.31, internal technical metrics reveal several significant deficiencies (BPKP, 2025). Specifically, public service coverage remains limited to 39%; water distribution continuity averages 22 hours daily, falling short of the stipulated 24-hour standard; water quality does not fully comply with the requirements mandated by Ministry of Health Regulation No. 2/2023; and the water loss rate is high at 23.77%, primarily attributed to distribution network leaks.

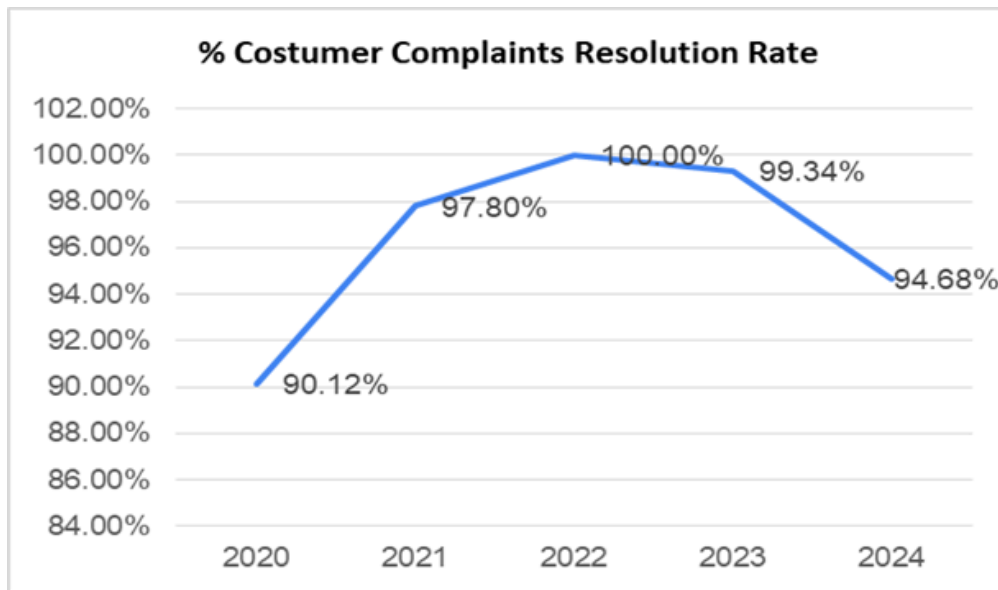


Figure 1. Annual Customer Complaint Resolution Rate (%), 2020–2024

The fluctuating customer complaint resolution rates at Perumdam Tirta Komodo between 2020 and 2024 are depicted in Figure 1, with critical challenges in service responsiveness being revealed as potentially detrimental to customer satisfaction and loyalty. In 2024, the resolution rate was recorded at 94.68%, while a substantial total of 29,667 complaints (approximately 931 per 1,000 customers was documented) indicating an increased risk of declining customer loyalty (BPKP, 2025).

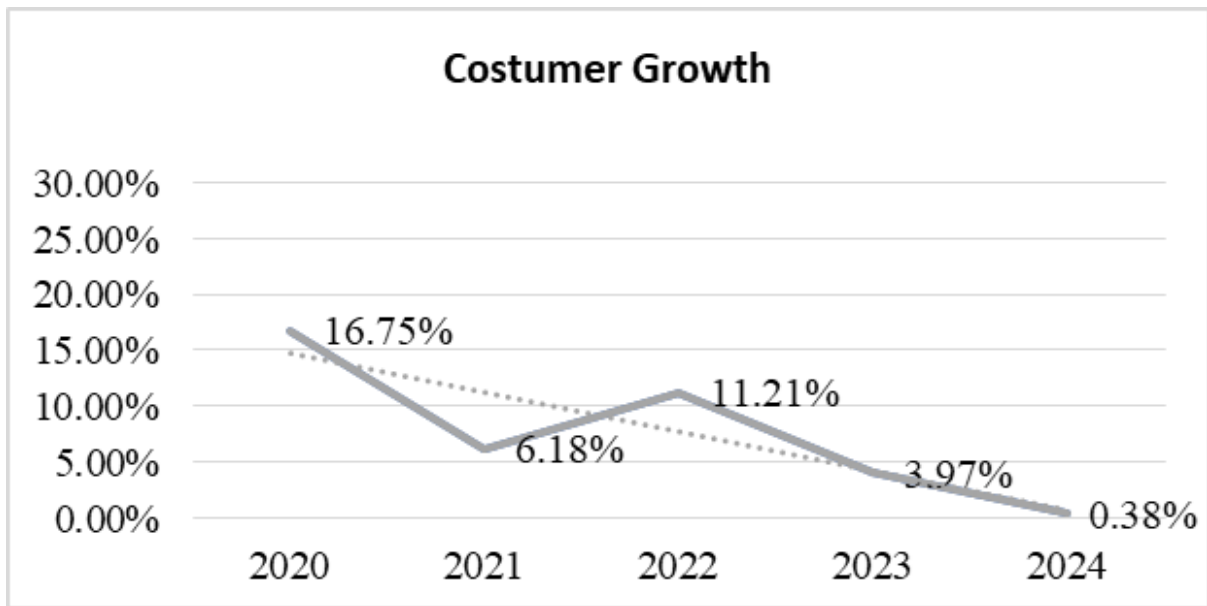


Figure 2. Annual Customer Growth Rate (%), 2020–2024

The significant decline in the annual customer growth rate for Perumdam Tirta Komodo, as shown in Figure 2, is reported to have dropped from 16.75% in 2020 to only 0.38% in 2024. This downward trend is regarded as underscoring the urgent need for examination of service quality, customer satisfaction, and loyalty, since stagnation in growth is often indicated by underlying issues in customer retention and value perception.

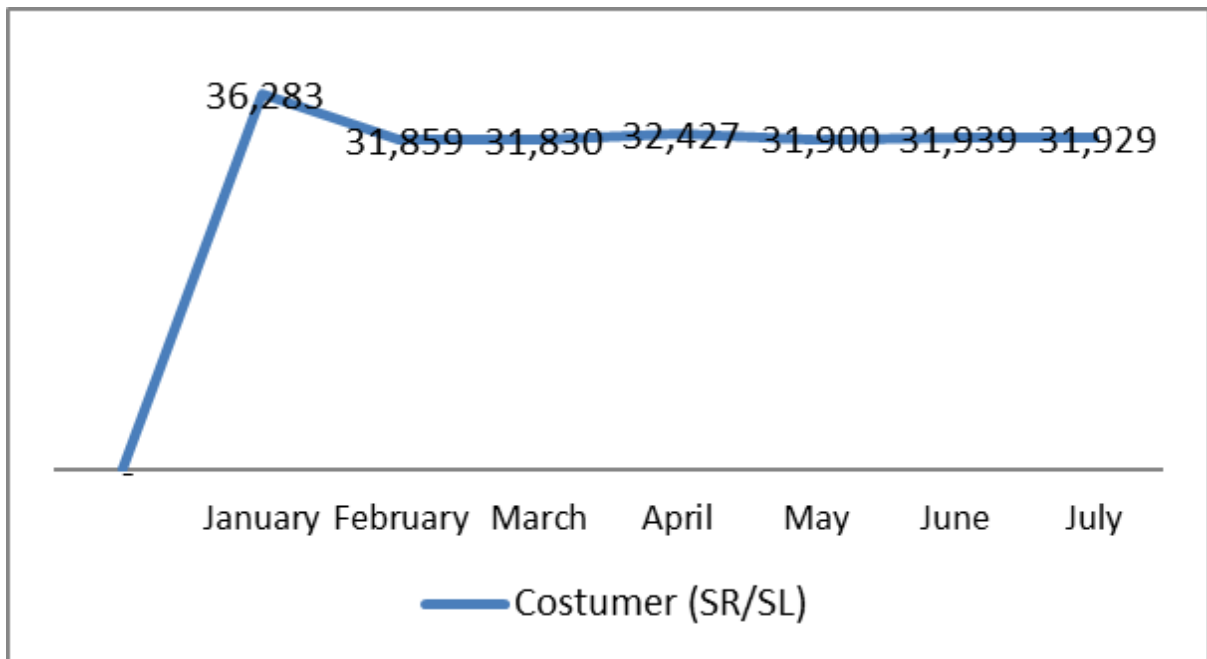


Figure 3. Active Customer January–July 2025

Figure 3 presents the monthly trend in active customer numbers (Sambungan Rumah/SR) for Perumdam Tirta Komodo from January to July. A pronounced peak of 36,283 is recorded in January, after which the count is observed to decline sharply and subsequently stabilize within the 31,900–32,400 range from February through July. This trajectory reflects an initial surge in active connections at the year's start, followed by sustained attrition and

stagnation, suggesting that both customer retention and new account acquisitions have remained limited over the subsequent months.

The urgency for service quality, customer satisfaction, and loyalty at Perumdam Tirta Komodo to be re-evaluated is evidenced by empirical findings and developments in service management literature, in which these factors are identified as essential to organizational sustainability and customer loyalty across sectors. Inactive connection rates and increased complaints have been observed to highlight the gap between technical performance and customer experience, thereby indicating the necessity for targeted research so that data-driven improvements can be implemented, satisfaction can be restored, and long-term loyalty can be reinforced, outcomes recognized as crucial for service continuity and resilience in regionally owned utilities facing operational pressures.

Arising from these preceding issues, the current investigation seeks to address two primary research questions:

- a) Does service quality exert a positive and statistically significant influence on customer loyalty at Perumdam Tirta Komodo in Manggarai Regency?
- b) Do service quality and customer satisfaction collectively wield a positive and statistically significant influence on customer loyalty at Perumdam Tirta Komodo?

The enrichment of applied management literature regarding service quality, customer satisfaction, and loyalty, especially in public sector organizations with unique characteristics, is expected to be achieved through this research. Additionally, data-driven recommendations for enhancing service strategies and customer loyalty at Perumdam Tirta Komodo are anticipated to be provided, thereby supporting the strengthening of the company's reputation as a quality public service provider.

Literature Review

The Service Quality (SERVQUAL) model, as defined by Parasuraman, Zeithaml, and Berry (1985), is a framework used to evaluate service quality, including in public service contexts such as water utilities. Service is assessed according to five dimensions: tangibles, reliability, responsiveness, assurance, and empathy (Parasuraman et al., 1988). Widely applied to evaluate service quality, the effectiveness and utility of the SERVQUAL model have been demonstrated in various sectors (Wider et al., 2024), and it has also served as a key parameter for measuring the performance of water supply companies through its comprehensive set of evaluative indicators (Molinos-Senante et al., 2022).

Customer satisfaction, according to Kotler and Keller (2013), is the result of comparing consumer expectations with perceived performance. Satisfaction increases when performance meets or exceeds expectations and declines when it falls short. It can be measured through complaint systems, satisfaction surveys, ghost shoppers, and lost customer analysis (Kotler & Keller, 2011).

Customer loyalty is conceptualized as a profound, long-term commitment by consumers to consistently patronize a specific product or service, even when confronted with situational pressures or attractive alternatives (Naini et al., 2022). This construct is widely accepted and understood within academic literature as the demonstration of a customer's

consistent repurchasing behavior, underpinned by a positive attitude toward the brand or service even in the presence of competitors or situational influences. Loyalty is not only expressed behaviorally through repeat purchases, but also attitudinally via strong brand preference and advocacy, making it a valuable corporate asset and a central variable for securing sustainable competitive advantage over the long term (Barbosa, Shojaei, and Miranda, 2023).

Previous studies consistently demonstrate that service quality is a key determinant of customer satisfaction, which subsequently serves as a critical mediator in generating customer loyalty across various types of service industries (Naini et al., 2022). In the Italian water utility sector, service quality assessment is approached holistically, including indicators such as water losses, connection time for new customers, and repair time for service interruptions, which collectively reflect operational efficiency and responsiveness to customer demands (D'Inverno, G., Carosi, L., & Romano, G., 2021). Recent findings by Rofiaty and Hidayatinnisa (2024) at Perumdam Tugu Tirta further validate that service quality significantly enhances customer satisfaction and, consequently, customer loyalty, where satisfaction functions as a partial mediator indicating service quality affects loyalty directly and indirectly through satisfaction. Yo et al. (2024) show that higher service quality directly increases customer satisfaction, and together, these factors drive customer loyalty, with satisfaction mediating the effect of service quality on loyalty.

These findings highlight service quality as the main foundation for building loyalty through optimal satisfaction. Improving service quality thus leads to more satisfied and loyal customers.

Hypothetical Framework

Drawing upon the established theoretical review and the empirical findings derived from prior relevant studies, the following research hypotheses are formally proposed:

- **H₁**: Service quality exhibits a statistically significant effect on customer loyalty within Perumdam Tirta Komodo, Manggarai Regency.
- **H₂**: Service quality and customer satisfaction collectively exert a statistically significant influence on customer loyalty at Perumdam Tirta Komodo, Manggarai Regency.

This overarching conceptual framework postulates that service quality not only has a direct effect on customer loyalty but also yields an indirect influence through its impact on customer satisfaction. Consequently, customer satisfaction is positioned as a mediating variable in the relationship between service quality and customer loyalty, a configuration that is fully consistent with established structural models in the service management literature.

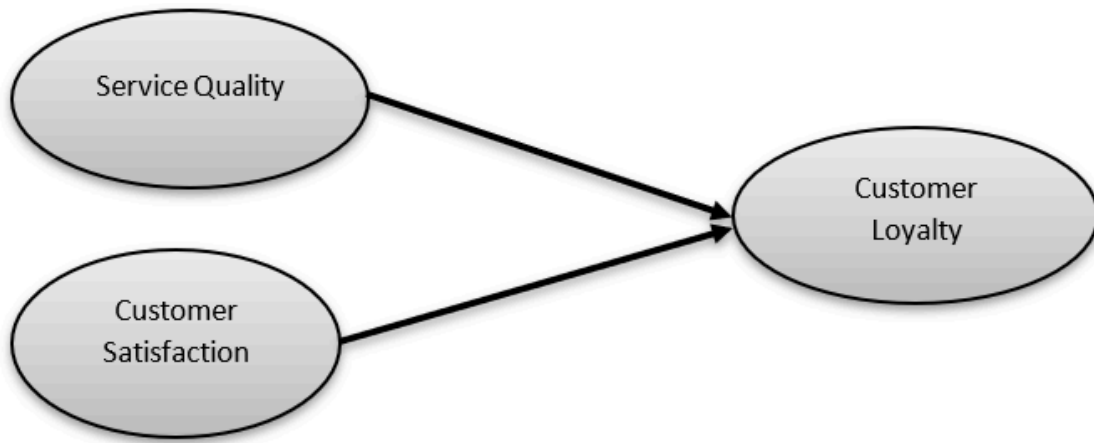


Figure 4. Hypothetical Model (X_1 , X_2 and y)

2. RESEARCH METHODS

This investigation adopts an explanatory quantitative research design, primarily centered on the rigorous testing of hypotheses involving the key variables: service quality, customer satisfaction, and customer loyalty. The subjects of this research comprise the piped water service customers of Perumdah Tirta Komodo in Manggarai Regency, representing a total population of 31,929 active customer connections as recorded in July 2025.

Slovin’s formula is commonly used to determine the minimum sample size required for survey-based studies when the population is homogeneous and manageable, ensuring representativeness and objectivity (Bahri, 2018). The formula is:

$$\frac{N}{1 + Ne^2}$$

where n is the sample size, N is the population size, and e is the margin of error (expressed as a decimal, e.g., 0.05 for 5%). By specifying the population and acceptable margin of error, this formula helps researchers transparently justify their sampling decisions and produce statistically sound results.

$$n = \frac{N}{1 + N(e)^2} \rightarrow n = \frac{31.929}{1 + 31.929(0,05)^2} \rightarrow n = \frac{31.929}{1 + 31.929(0,0025)} \rightarrow n = \frac{31.929}{1 + 79,82} \rightarrow n = \frac{31.929}{80,82} \approx 395,01$$

Figure 5. Sample Size Determination with Slovin’s Formula

A sample size of 395 was determined using Slovin’s formula at a 5% margin of error, which is statistically sufficient for representation. The 5% margin is standard in social science research for balancing accuracy and feasibility, ensuring 95% confidence (Althubaiti, 2022). Choosing a smaller margin requires a larger, more costly sample, so 0.5 is used as a conservative population proportion when unknown, sample size decisions should fit research objectives and analytical needs for reliability.

Primary data acquisition was executed through the distribution of a structured questionnaire administered via both online and offline modalities. This instrument utilized a four-point non-neutral Likert scale (comprising "Strongly Agree," "Agree," "Disagree," and "Strongly Disagree") to effectively mitigate the risks associated with central tendency bias and social desirability bias in the respondent feedback. The use of a Likert scale without a neutral option in this study aims to encourage respondents to take a clearer stance on each statement. This approach is adopted to minimize the potential for central tendency bias and social desirability bias, as supported by Garland (1991) and Chyung et al. (2017), who argue that the presence of a neutral option is often chosen as a form of commitment avoidance rather than substantive consideration.

The questionnaire used in this study was constructed by adapting established instruments from prior research for the service quality and customer satisfaction variables, and by drawing on the work of Mulyono and Pasaribu (2021) for the customer loyalty variable. All items were modified to suit the context of Perumdam Tirta Komodo and were subjected to validity and reliability testing prior to deployment.

This study employed multiple linear regression analysis using SPSS (Statistical Program for Social Science) to examine relationships between variables (Bahri, 2018). Prior to regression, the questionnaire's validity ($r \geq 0.30$) and reliability ($\alpha \geq 0.70$) were confirmed, and Exploratory Factor Analysis (EFA) was conducted to ensure each set of items measured a single construct. Classical assumption tests (normality, multicollinearity, and heteroskedasticity) were performed to verify that the model met the BLUE criteria. Hypothesis testing included F-tests and t-tests to assess the significance of predictors, while the coefficient of determination (R^2) indicated how well independent variables explained the dependent variable.

3. RESULTS

The study successfully collected data from 398 participants, whose demographic profiles were predominantly composed of household customers (85.93%). The remaining segments included institutional (6.53%), social (4.27%), and commercial (3.27%) consumers. In terms of age distribution, the largest cohort was the 26–35 age group (36.68%), followed by respondents over 45 years (26.58%). The majority of the sample were male (59.80%) and held tertiary education qualifications (bachelor's or diploma degrees, totaling 52%).

3.1 Descriptive Analysis

Descriptive analysis of the Service Quality variable shows that the mean scores for all indicators range from 3.17 to 3.87, with an overall mean of 3.53, which falls into the "Strongly Agree" category. This indicates that respondents hold a very positive perception of the service quality provided by Perumdam Tirta Komodo. In other words, the dimensions of reliability, responsiveness, assurance, empathy, and tangibles are perceived as well implemented and aligned with customer expectations.

The second variable in this study is customer satisfaction, which is used to measure the perceptions of Perumdam Tirta Komodo's customers in Manggarai Regency. Descriptive analysis shows that the customer satisfaction variable has a mean score of 58.97, which,

according to the interval criteria, falls into the “Strongly Agree” category. This result indicates that, overall, respondents report a high level of satisfaction with Perumdam Tirta Komodo’s services.

For the customer loyalty variable, the descriptive analysis yields a mean score of 13.81. According to the interval criteria, this mean falls within the “Strongly Agree” category. This very high score indicates that, overall, respondents exhibit a strongly positive level of loyalty toward the services provided by Perumdam Tirta Komodo in Manggarai Regency.

Statistically, all three construct (service quality, customer satisfaction, and customer loyalty) are rated in the “Strongly Agree” category, indicating very favourable customer perceptions.

3.2 Validity Test

The validity of all items within the study's instrument was conclusively established, evidenced by individual correlation coefficients (r) ranging from 0.574 to 0.808 (Sujarweni, 2022). These values substantially surpass the required critical table threshold ($r_{table}=0.098$), thereby negating the need to eliminate any measurement items.

Tabel 1. Item Validity Test Results for Main Variables

Variable	Item number	r calculated	r table	Remark
Service Quality	1	0.661	0.098	Valid
	2	0.703	0.098	Valid
	3	0.706	0.098	Valid
	4	0.742	0.098	Valid
	5	0.692	0.098	Valid
	6	0.734	0.098	Valid
	7	0.748	0.098	Valid
	8	0.792	0.098	Valid
	9	0.753	0.098	Valid
	10	0.731	0.098	Valid
	11	0.8	0.098	Valid
	12	0.768	0.098	Valid
	13	0.804	0.098	Valid
	14	0.777	0.098	Valid
	15	0.794	0.098	Valid
	16	0.802	0.098	Valid
	17	0.783	0.098	Valid
	18	0.792	0.098	Valid
Customer Satisfaction	19	0.808	0.098	Valid
	20	0.777	0.098	Valid
	21	0.758	0.098	Valid
	22	0.808	0.098	Valid

Customer Loyalty	23	0.722	0.098	Valid
	24	0.574	0.098	Valid
	25	0.687	0.098	Valid
	26	0.733	0.098	Valid

The fact that all indicators are valid ($r > 0.098$) implies that each item is a suitable and coherent measure of its respective construct. This means the scales for service quality, customer satisfaction, and customer loyalty are psychometrically sound, so their composite scores can be used with confidence in regression and other inferential analyses.

3.3 Reliability Test

Reliability test was conducted on the valid questionnaire items to assess the consistency of the construct indicators. A variable is considered reliable when Cronbach's alpha is at least 0.70 for exploratory research, with values between 0.80 and 0.90 indicating good to excellent reliability (Sujarweni, 2022).

Table 2. Reliability Test Results Based on Cronbach's Alpha

Variables	Number of Items	Cronbach's Alpha	Remark
Service quality	18	0.967	Highly reliable
Customer satisfaction	4	0.967	Highly reliable
Customer loyalty	4	0.968	Highly reliable

Cronbach's Alpha values above 0.967 indicate that the items measuring each construct are highly consistent with one another, so random measurement error is very low. Theoretically, this strengthens confidence that observed relationships among service quality, customer satisfaction, and customer loyalty truly reflect the underlying constructs rather than noise. Practically, it means the questionnaire can be used to support managerial decisions and repeated surveys with stable, dependable scores, although such very high values may also justify reviewing and possibly shortening overlapping items.

3.4 Classical Assumption Test

Prior to conducting the analysis of the research data output, classical assumption tests were first performed as follows:

3.4.1 Normality Test

Normality testing helps determine whether parametric or nonparametric methods are appropriate for data analysis (Mishra et al., 2019). In this study, the Kolmogorov–Smirnov normality test is used to evaluate whether the sample data come from a normally distributed population by comparing the empirical cumulative distribution with the corresponding theoretical normal distribution. When the Kolmogorov–Smirnov test produces a p-value greater than the chosen significance level (for example, 0.05), the data are considered approximately normal, thereby justifying the use of parametric tests that assume normality.

Table 3. Reliability Test Results Based on Cronbach’s Alpha

One-Sample Kolmogorov-Smirnov Test			
			Unstandardized Residual
N			399
Normal Parameters ^{a,b}		Mean	.0000000
		Std. Deviation	1.48768787
Most Extreme Differences	Absolute		.027
	Positive		.016
	Negative		-.027
Test Statistic			.027
Asymp. Sig. (2-tailed) ^c			.200 ^d
Monte Carlo Sig. (2-tailed) ^e	Sig.		.726
	99% Confidence Interval	Lower Bound	.714
		Upper Bound	.737

The Kolmogorov–Smirnov test on the unstandardized residuals shows a very small test statistic (0.027) and a p-value far above 0.05 (Asymp. Sig. = 0.200; Monte Carlo Sig. = 0.726), indicating no significant deviation from normality. Theoretically, this means the normality assumption for regression residuals is satisfied, so the estimated coefficients, standard errors, and significance tests can be treated as statistically valid under the classical linear model framework. Practically, in this study on service quality, customer satisfaction, and loyalty, these results support the use of parametric regression and strengthen the credibility of conclusions and managerial recommendations drawn from the model.

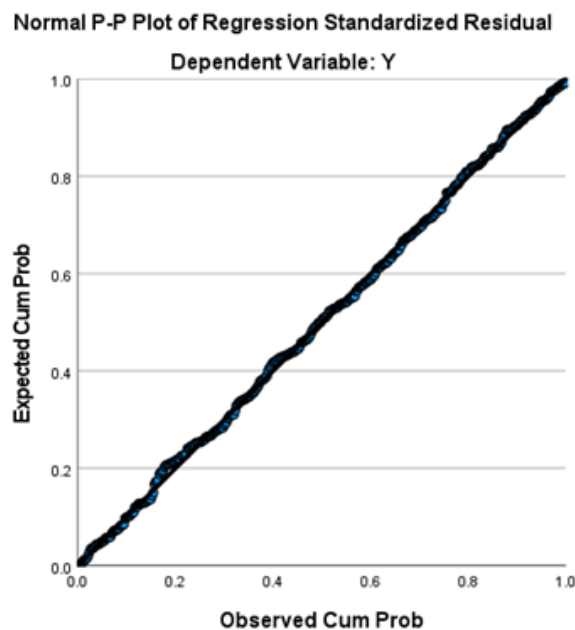


Figure 6. Normal P–P Plot of Regression Standardized Residuals

The consistency of the data points following the diagonal line in the Normal P-P Plot of Regression Standardized Residuals indicates that the distribution of the regression residuals approximates normality. Accordingly, it can be stated that the normality assumption for the residuals has been fulfilled, thereby supporting the validity of employing parametric statistical tests on the data.

3.4.2 Multicollinearity Test

Multicollinearity is a condition in multiple regression where two or more independent variables are highly correlated, making their individual effects on the dependent variable difficult to distinguish. The purpose of testing for multicollinearity is to detect this problem so that unstable coefficients, inflated standard errors, and misleading interpretations can be avoided (Yoo et al., 2014). Diagnostics such as the Variance Inflation Factor (VIF) and inter-predictor correlations are therefore used to ensure that the regression model produces reliable estimates and defensible conclusions.

Table 4. Collinearity Diagnostics

Model		Collinearity Statistics	
		Tolerance	VIF
1	X1	.304	3.290
	X2	.304	3.290

a. Dependent Variable: Y

Table 5 shows that the VIF values for Service Quality (X1) and Customer Satisfaction (X2) are 3.290, which indicates moderate but not severe multicollinearity. Theoretically, these VIFs are below critical thresholds, so the regression coefficients for both variables can be interpreted reliably. Practically, it means both Service Quality and Customer Satisfaction can be validly used to explain Customer Loyalty, and the model’s estimates are stable enough to form the basis for strong managerial decisions in public service organizations.

3.4.3 Heteroskedasticity Test

The heteroskedasticity test aims to examine whether the variance of the regression residuals differs across observations (Feng, Li, Tong, & Luo, 2019). When the residual variance is unequal, the constant-variance assumption is violated and the standard errors become unreliable. Consequently, this test is employed to verify that the residual variance is sufficiently constant so that regression inferences remain valid.

Table 5. Collinearity Diagnostics: Tolerance & VIF

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		

1	(Constant)	1.304	.172		7.565	.060
	X1	.000	.003	-.005	-.104	.917
	X2	-.014	.015	-.046	-.921	.357
a. Dependent Variable: Abs_rES						

The p-values for X1 (0.917) and X2 (0.357), which are both greater than 0.05, indicate that neither variable has a significant effect on the absolute residuals. This result implies that no heteroskedasticity is detected and the residual variance can be treated as constant (homoskedastic). Consequently, the homoskedasticity assumption of the regression model is satisfied, so the standard errors and significance tests remain reliable.

3.5 Hypothesis Test

3.5.1 Partial Test (t Test)

Formulate the decision rule for the t test in active voice as follows. When the p-value is less than 0.05 or the calculated t statistic exceeds the critical t value, treat the independent variable X as having a statistically significant effect on the dependent variable Y. When the p-value is greater than 0.05 or the calculated t statistic is smaller than the critical t value, conclude that X does not have a statistically significant effect on Y.

Table 6. Regression Coefficients

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.205	.285		.718	.473
	Customer Satisfaction	.505	.025	.602	20.396	.000
	Service Quality	.099	.005	.546	18.523	.000
a. Dependent Variable: Customer Loyalty						

A t-table value of 1.966 at a 5% significance level for a two-tailed test means that the critical region lies in both tails of the t-distribution. Any calculated t-statistic greater than +1.966 or less than -1.966 is considered statistically significant, so the null hypothesis is rejected in those cases.

Table 7. t Test Results

Variable	t-count	t-table	Sig.	Decision	Description
Service Quality	20.396	1.966	0.000	Reject H ₀ and accept H ₁	Significant
Customer Satisfaction	18.523	1.966	0.000	Reject H ₀ and accept H ₁	Significant

Both variables have very large t-count values (20.396 and 18.523) that far exceed the t-table value of 1.966, with p-values of 0.000 (< 0.05). This indicates that service quality and customer satisfaction each have a statistically significant effect on customer loyalty. Thus, the null hypotheses for both variables are rejected and the alternative hypotheses, stating a significant effect, are accepted.

3.5.2 Simultan Test (f Test)

The F test evaluates whether all independent variables in a regression model, taken together, have a statistically significant effect on the dependent variable. In practice, if the significance value (Sig.) is less than 0.05, the F test indicates that the X variables jointly influence Y; if Sig. is greater than 0.05, it indicates that the X variables do not have a simultaneous effect on Y and the overall model is not statistically significant.

Table 8. ANOVA Table for the Regression Model

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1676.119	2	838.060	376.759	.000 ^b
	Residual	880.860	396	2.224		
	Total	2556.979	398			
a. Dependent Variable: Customer Loyalty						
b. Predictors: (Constant), Service Quality, Customer Satisfaction						

With an F-table value of 3.02, the ANOVA results show that the obtained F-statistic is much larger and the associated significance value is 0.000, which is below the 0.05 threshold. This indicates that, both simultaneously and individually, the independent variables X_1 and X_2 exert a statistically significant influence on the dependent variable Y. In other words, the overall regression model is statistically significant and the null hypotheses of no effect are rejected.

3.5.3 Linear Regression Analysis

3.5.3.1 Coefficient of Determination Test (R^2 Test)

Table 9. Coefficient of Determination Output

Model Summary				
Model	R	R Square	Adjusted Square	Std. Error of the Estimate
1	.732 ^a	.536	.533	1.39548
a. Predictors: (Constant), Customer Satisfaction, Service Quality				

An adjusted R-squared value of 0.533 suggests that the combined effects of service quality and customer satisfaction account for approximately 53.3% of the observed variability in customer loyalty. The remaining 46.7% of the variance is attributable to other determinants that are not represented in the current specification, such as price, corporate image, or broader contextual conditions. This proportion of explained variance indicates a moderately strong explanatory model that is adequate for inferential purposes, while still permitting further refinement through the inclusion of additional theoretically relevant predictors.

3.5.4 Multiple Linear Regression Analysis

Table 10. Determination Coefficient Output

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.240	.462		9.180	.000
	Kualitas Pelayanan	.113	.014	.500	8.033	.000
	Kepuasan Pelanggan	.223	.053	.261	4.203	.000

a. Dependent Variable: Customer Loyalty

Based on the available regression output (Table 10), the status of hypotheses 1 and 2 can be described as follows:

- a) Variable X1 (service quality) has a positive regression coefficient of 0.113 with a t-statistic of 8.033 and a significance value (Sig.) of 0.000 (< 0.05), indicating strong statistical evidence that an increase in service quality is associated with higher customer loyalty, so H1 is accepted.
- b) Variable X2 (customer satisfaction) has a positive regression coefficient of 0.233 with a t-statistic of 4.203 and a significance value (Sig.) of 0.000 (< 0.05), showing that customer satisfaction also has a significant effect on customer loyalty, so H2 is accepted.

4. DISCUSSION AND CONCLUSION

4.1 Discussion

Perumdam Tirta Komodo operates under strong public pressure to provide high-quality water services, yet the secondary data in this study reveal a clear gap between formal performance ratings and customers' actual service experiences. While audit results classify the utility as "healthy" with a performance score of 3.31, the company still faces low service coverage and suboptimal continuity and quality of water supply, conditions that are difficult to reconcile with a "healthy" label from the perspective of end users. This structural fragility is further highlighted by a high volume of customer complaints, slowing customer and sales growth, and a decline in the number of active customers between January and July 2025, all of which signal mounting pressure on both the sustainability of service delivery and the stability of customer loyalty.

Against this backdrop, the regression results provide a more nuanced picture by showing that service quality and customer satisfaction remain strong primary determinants of loyalty among active customers. The very high t-values for service quality (20.396) and customer satisfaction (18.523), both far exceeding the critical value of 1.966 with p-values of 0.000 (< 0.05), and the fact that these predictors jointly explain more than half of the variance in customer loyalty (adjusted $R^2 = 0.533$), supported by an ANOVA F-statistic well

above the F-table value of 3.02 at the 0.000 significance level, indicate a statistically robust quality, satisfaction, loyalty mechanism operating at the customer level. In other words, despite technical-level weaknesses, customers who remain connected still perceive sufficient quality and satisfaction to sustain their loyalty, at least in the short term.

From a managerial perspective, this tension between technical weaknesses and perceived service suggests that Perumdam Tirta Komodo cannot rely solely on its “healthy” audit status or existing loyalty patterns, but must deliberately manage the experiential drivers of loyalty. Management should focus on service attributes that are directly experienced by customers such as continuity of water distribution, the speed and accuracy of repairs, and responsiveness in handling complaints, because these dimensions most immediately shape satisfaction and are quickly converted into loyalty. In parallel, management needs to prioritize proactive communication, shorten complaint resolution cycles, and strengthen service recovery programs for dissatisfied and at-risk customers to prevent further erosion of loyalty and to create opportunities for reactivating inactive connections.

Finally, the moderate adjusted R^2 indicates that nearly half of the variance in loyalty is driven by factors outside the current model, implying that sustained loyalty will also depend on how Perumdam Tirta Komodo manages tariff fairness, corporate image, and community engagement, particularly in zones where water distribution remains unstable and expectations toward public utilities are increasingly demanding.

4.2 Conclusion

This study strengthens service management literature by confirming perceived service quality and customer satisfaction as primary antecedents of loyalty in public utilities, while showing that satisfaction likely serves as a key pathway through which quality enhances loyalty, even though this mediating role has not yet been tested formally. It contributes by situating the quality, satisfaction, loyalty nexus in a regional owned enterprise (BUMD) with limited coverage and continuity, illustrating that positive customer experience and relational service can temporarily offset structural and technical weaknesses but cannot guarantee long-term growth without broader operational improvements.

This study's conclusions are constrained by several limitations, including a cross-sectional design that cannot capture causal dynamics over time in a volatile service environment, reliance on a single self-reported Likert instrument that risks common method and social desirability bias in a near-monopoly context, and a model that excludes other likely drivers of loyalty such as tariff perceptions, corporate image, reliability incidents, and socioeconomic factors, leaving 46.7% of loyalty variance unexplained.

Future research should therefore employ longitudinal or panel designs, conduct formal mediation analysis (e.g., via structural equation modeling) to test the satisfaction pathway, and expand the model with additional variables such as price fairness, corporate reputation, and reliability indicators, complemented by qualitative methods like interviews or focus group discussion (FGD) to differentiate genuinely loyal customers from those locked in by limited alternatives and to inform more targeted policy interventions.

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