

THE ROLE OF SERVICE INNOVATION AND SERVICE QUALITY IN IMPROVING CUSTOMER SATISFACTION

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Abstract

This research had the objective to determine the impact of innovation on service and service quality on customer satisfaction at the Baleendah Customer Service Unit of PT PLN (Persero). A causal quantitative method was employed. A sample of 125 respondents, all of whom had experienced service innovation, was selected for this study. The analysis was conducted using SmartPLS software, employing validity, reliability, and hypothesis tests to examine the data. The findings of this research indicate that the service innovation variable has a significant direct impact on the expected variable with a value of 0.036. Additionally, both service innovation and service quality significantly influence the customer satisfaction variable at the Baleendah Customer Service Unit of PT PLN (Persero), with an indirect effect of 0.173.

Keywords: *Customer Satisfaction, Service Innovation, Service Quality*

1. INTRODUCTION

PT. PLN (Persero), a state-owned enterprise, is the sole provider of electricity services in Indonesia. The demand for electricity is rising significantly and swiftly, particularly from the industrial sector, driven by higher public satisfaction standards due to increased income and modernization. To fulfill its responsibilities, PT. PLN (Persero) has established a customer service department dedicated to meeting the needs of its customers. Over time, PT PLN (Persero) has introduced service innovations such as the PLN Mobile application. This app allows for online payments and includes an office WhatsApp number to facilitate customer interaction. Service innovation represents improvements implemented by a company to enhance performance and respond to market demands. When a company effectively meets market demands, consumers are likely to purchase its products or services (Owano *et al.* 2014). According to (Commer *et al.* 2018), innovation is a key driver of a company's success, impacting not only the industrial sector but also the service sector. According to (Shetty *et al.* 2022) service innovation forms the foundation of all competitive advantages and is crucial for increasing a company's competitiveness, attracting new customers, and maintaining relevance in the modern business environment. PT. PLN (Persero) Baleendah Customer Service Unit, a State-Owned Enterprise (BUMN), is situated

at Jl. Jaksanaranata No.1, Baleendah District, Bandung Regency, West Java. This company provides services related to electricity bill payments, new connection installations, power setup modifications, temporary lighting services, and handling customer complaints about meter readings, among others. Currently, PT PLN (Persero) Baleendah Customer Service Unit also uses a WhatsApp number to interact with customers. This service innovation aims to assist customers during emergencies when they cannot visit the office. PT PLN (Persero) Baleendah Customer Service Unit places significant emphasis on service quality, as demonstrated by the establishment of specific customer service standards. Despite these standards, some customers remain dissatisfied with the services provided by PT PLN (Persero) Baleendah Customer Service Unit. From this, it is evident that the quality of customer service and service innovation significantly impact overall customer expectations and satisfaction. Customer satisfaction is achieved when customers are pleased with the service quality, service innovation, and products they receive, meeting their needs and desires.

According to researchers' observations, there have been complaints about the service innovation involving the PLN Mobile application. Specifically, customers reported that during a power-up promotion, the payment code did not generate, forcing them to visit the PLN office for assistance. The PLN Mobile application allows customers to make requests from any location; however, if a complaint arises, customers are required to visit the PLN office.

The findings from the second observation indicated persistent issues with service quality, specifically an increase in customer complaints about various problems. These issues include grievances regarding higher monthly electricity bills compared to the previous month, despite no significant change in usage. There were complaints about the prolonged installation time of the MCB (Miniature Circuit Breaker), which exceeded the initially promised timeframe, and issues with electricity tokens not being credited to accounts. These problems compel customers to visit the PLN office to avoid potential losses. To achieve customer satisfaction, it is essential that customers are content with the service quality, service innovations, and the products they receive, ensuring they meet their needs and expectations. According to (Parasuraman 1998a) service quality represents customers' evaluative perceptions of the services they receive at a given time, influenced by the importance of different service dimensions. As per (Nasirin dan Lionardo 2020), service quality is defined as the capability to create and deliver products, whether goods or services, that meet the benefits aligned with customers' expectations and desires. There is a lack of relevant literature specifically addressing service innovation in the security industry, as most existing studies focus on competition strategy, technology development, management, legal systems, and human resource development, leaving gaps in understanding how service innovation impacts customer satisfaction in the sector. (Chen dan Chen 2023) While many studies have explored the relationship between service quality and customer satisfaction, this

study focuses on PT PLN (Persero) Baleendah which examines the combined effects of service innovation and service quality on customer satisfaction, especially in the context of customer satisfaction.

Based on these observations, researchers conducted a pre-survey involving 25 customers who had visited the service counter. The pre-survey results revealed that 17 customers were satisfied due to the friendly service and comfortable facilities. However, 8 customers expressed dissatisfaction because of slow complaint handling and unmet expectations. This impact leads to customer dissatisfaction. According to (Sitinjak dan Ober 2025) ; (Ogbeibu *et al.* 2020) ; (Fakfare 2021) customer satisfaction hinges on the product's performance as perceived by the buyer. If the product falls short of expectations, the customer feels dissatisfied. Conversely, if the product meets expectations, the customer is satisfied. A reputable marketing company ensures its customers remain content. Customer satisfaction arises from comparing the service quality experienced with the service quality expected. If the actual service quality falls short of expectations, customer dissatisfaction occurs. If it meets expectations, customers are satisfied. If the service quality exceeds expectations, customers will be highly satisfied (Chaudhary *et al.* 2025) ; (Ariyantiningasih dan Santoso 2026) The pre-survey results on customer satisfaction indicate that 32% of customers are dissatisfied, while 68% of the 25 respondents are satisfied. This suggests a need for enhanced service innovation and improved service quality to better meet customer expectations.

According to previous research conducted by (Rew *et al.* 2021); (Zhou dan Suh 2025) on the relationships between innovation, quality, productivity, and customer satisfaction in pure service companies, it was found that quality and productivity have a positive correlation when innovation is involved. The research further demonstrated that innovation is a precursor to service quality and productivity, which positively affects customer satisfaction. Another study conducted by (Tarmidi *et al.* 2021) on the "Effect of Service Innovation and Service Quality on Customer Satisfaction during COVID-19 (Tokopedia Application User Survey in Bandung 2021)" found that service innovation and service quality variables simultaneously have a significant impact on customer satisfaction with the Tokopedia application in Bandung, accounting for 37.7%. Research by (Huang *et al.* 2019) on "The Influence of Service Quality on Customer Satisfaction and Loyalty in the B2B Technology Service Industry" indicates that service quality impacts both customer satisfaction and loyalty. Similarly, a study by (Lai *et al.* 2019) titled "Analysis of the Influence of E-service Quality on Customer Satisfaction in Mongolian E-commerce" demonstrates that service quality has a significant effect on customer satisfaction. In this study, the innovation dimension (Delafrooz dan Taghineghad 2013)) is the user dimension of technology, interaction with consumers and development of new service, then in the service quality variable (Parasuraman 1998b) the dimension of reability, responsibility, assurance, empathy,

tangibles and finally the variable Customer Satisfaction (Keller and Kotler, 2012) the dimension of match expectation, interest in revisiting and willingness to recommend.

2. RESEARCH METHOD

This research employed quantitative methods with a causality approach. Data collection involved distributing questionnaires in both hardcopy and digital formats via Google Forms. Responses were scored using a Likert scale. The data was managed using the smartPLS software (Hair *et al.* 2019). The study population consisted of all 181,683 customers of PT PLN (Persero) Baleendah Customer Service Unit. The sample size was calculated using the Slovin formula, which is as follows

$$n = \frac{181.683}{1 + 181.683(0,05)}$$

$$n = 125$$

Applying the Slovin formula, the sample size for this study was determined to be 125 respondents. These respondents are customers of the Baleendah Customer Service Unit of PT PLN (Persero) who have visited the service counter and experienced the service innovations. The questionnaire employed a five-point Likert scale, with 1 indicating "strongly disagree" and 5 indicating "strongly agree." Additionally, secondary data were sourced from books, journals, and other online resources. The study's data analysis included tests for validity, reliability, structural modeling, hypothesis testing, and mediation testing.

Table captions are placed above the table. The title of the table is written in the middle of the space 1. The table should not be an image. An example can be seen in Table 1. If after the illustration is continued with the writing of the next section, then the distance is 2 spaces.

3. RESULT AND DISCUSSION

3.1 Respondent Profile

The following is the respondent's profile in Table 1 below:

Table 1. Respondent profile

Constructs		Frequency	Percentage
Power users	Postpaid	82	54,7%
	Prepaid	68	45,3%
Gender	Male	83	53,9%
	Female	70	46,1%
Age	17-25 year	12	7,9%
	26-35 year	33	21,7%
	36-45 year	49	32,2%

Constructs	Frequency	Percentage
>45 year	58	38,2%
Middle/ high school	107	70,4%
Recent education	Diploma	17
	Bachelor	28
	Master	0
		11,2%
		18,2%
		0%

Source: *Data Processed, 2026*

The total number of respondents in this study was 152, with 125 meeting the criteria. Among these respondents, the majority (54.7%) were postpaid electricity users. Women constituted 53.9% of the respondents. The largest age group was those over 45 years old, making up 38.2% of the sample. Most respondents had a middle school or high school education, comprising 70.4% of the total.

3.2 Measurement Model

The measurement model is the initial step before proceeding with further analysis. This stage includes two tests: validity and reliability, as shown in Table 3.

Table 2. Result Validity and Reliability

Constructs	Loading	Cronbachs	CR	AVE
Service Innovation (X)		0.750	0.857	0.667
SI-1	0.798			
SI-2	0.844			
SI-3	0.807			
Service Quality (Z)		0.892	0.921	0.702
SQ-1	0.824			
SQ-2	0.752			
SQ-3	0.777			
SQ-4	0.926			
SQ-5	0.899			
Customer Satisfaction (Y)		0.851	0.894	0.628
CS-1	0.830			
CS-2	0.782			
CS-3	0.743			

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Constructs	Loading	Cronbachs	CR	AVE
CS-4	0.760			
CS-5	0.843			

Source: Processed by Author, 2026

According to (Hair 2021) the validity and reliability standards are outer loading > 0.70 , composite reliability > 0.70 , Cronbach's alpha > 0.70 , and AVE > 0.50 .

The service innovation variable is evaluated using three valid measurement items, with outer loadings between 0.798 and 0.844, demonstrating that all three items accurately reflect service innovation. The variable demonstrates acceptable reliability, evidenced by Cronbach's alpha and composite reliability both exceeding 0.70. Additionally, convergent validity is confirmed with an Average Variance Extracted (AVE) value of 0.667, which is above the 0.50 threshold for good convergent validity. Overall, the measurement items across the variables account for 66.7% of the variation.

The service quality variable is evaluated using four valid measurement items, with outer loadings between 0.0752 and 0.926, indicating that all items effectively capture the concept of service quality. The variable shows acceptable reliability, as demonstrated by Cronbach's alpha and composite reliability both exceeding 0.70. Convergent validity is established with an Average Variance Extracted (AVE) value of 0.702, which exceeds the 0.50 threshold for good convergent validity. Collectively, the measurement items within the variables account for 70.2% of the variation.

The customer satisfaction variable is evaluated using three valid measurement items, with outer loadings between 0.743 and 0.843, indicating that all items effectively capture customer satisfaction. The variable shows acceptable reliability, as demonstrated by Cronbach's alpha and composite reliability both exceeding 0.70. Convergent validity is established with an Average Variance Extracted (AVE) value of 0.628, which is above the 0.50 threshold for good convergent validity. Overall, the measurement items within the variable account for 62.8% of the variation.

3.3 Structural Model

The results of the structural model in SmartPLS are presented in Figure 1 as follows:

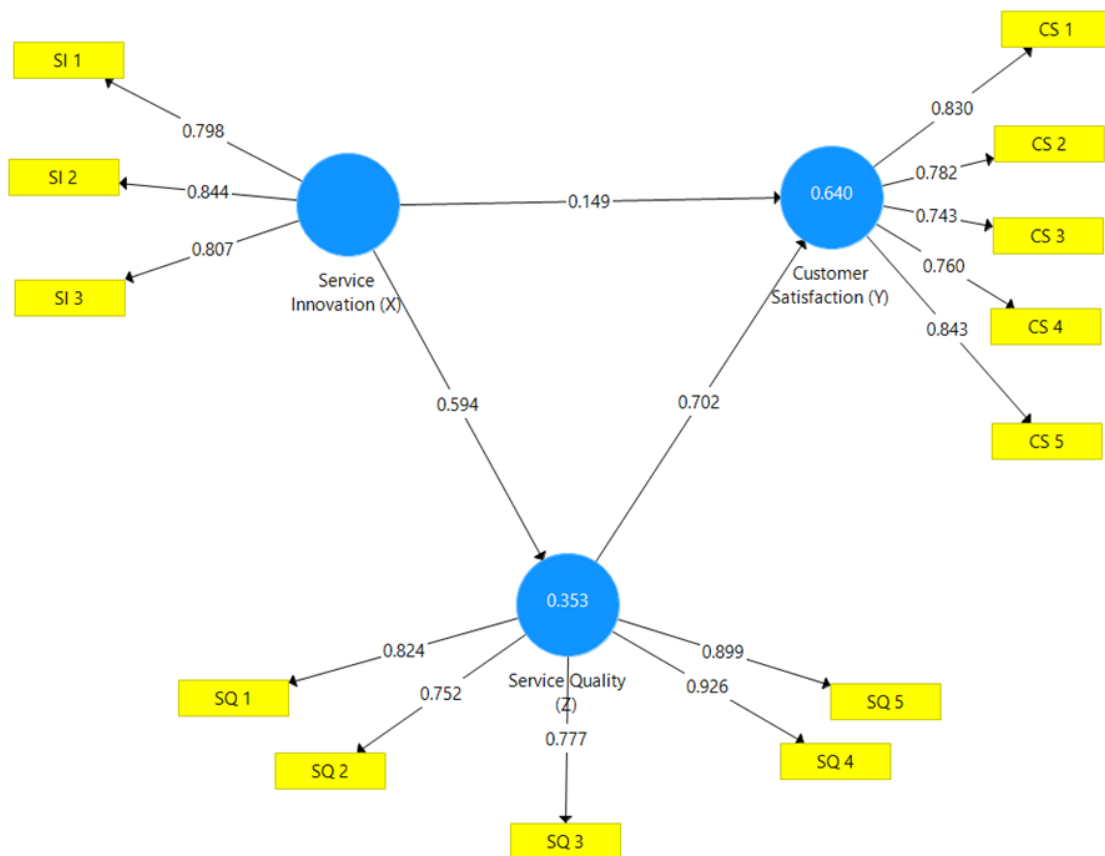


Figure 1. Structural Model
Source: smartPLS data analysis, 2025

Figure 1 is a diagram of the structural model that will be used to test the hypothesis..

3.4 Test Multikolinier Inner VIF

The evaluation of the structural model focuses on testing the hypotheses regarding the influence among the research variables. This evaluation is conducted in three stages. The first stage involves assessing the presence of multicollinearity between variables using the inner Variance Inflated Factor (VIF). Inner VIF values below 5 indicate the absence of multicollinearity between variables. The results of the inner VIF test for multicollinearity are presented in Table 3 as follows:

Table 3 Result Inner VIF

	Customer Satisfaction (Y)	Service Quality (Z)
Customer Satisfaction (Y)		
Service Innovation (Z)	1.545	1.000
Service Quality (Z)	1.545	

Source: processed by author, 2025

Before testing the structural model, it is crucial to check for multicollinearity between variables. This is done using the inner Variance Inflated Factor (VIF), and the estimated results show that the inner VIF value is less than 5. Therefore, the level of multicollinearity between variables is low. This outcome supports the robustness and unbiasedness of the parameter estimation results in SEM PLS.

3.5 Hypothetical Testing

The second step involves testing the hypothesis between variables by examining the p-value. A p-value of less than 0.05 indicates a significant influence between the variables. Additionally, it is essential to present the results and confidence intervals of the estimated parameter of the path coefficient at a 95% confidence level. The third step includes evaluating the effect size, denoted by f squared, which signifies the direct influence of variables at the structural level. The criteria for interpreting f square values are as follows: 0.02 for low influence, 0.15 for moderate influence, and 0.35 for high influence (Hair et al., 2021). Table 4 below presents the direct results of the hypothesis test.

Table 5. Hypothesis Testing

Path	Path Coefficient	p-value	95% interval kepercayaan Path coefficient		f square	Result
			Lower Limit	Upper Limit		
H1 : X → Y	0.149	0.036	0.002	0.283	0.040	Accepted
H2 : X → Z	0.594	0.000	0.447	0.728	0.545	Accepted
H3 : Z → Y	0.702	0.000	0.545	0.838	0.885	Accepted

Source: processed by author, 2025

1. The first hypothesis (H1) reveals a significant impact of service innovation on customer satisfaction, as demonstrated by the path coefficient (0.149) and p-value (0.036 < 0.05). Improvements in service innovation are anticipated to result in increased customer satisfaction. The 95% confidence interval indicates that the maximum influence of service innovation on improving customer satisfaction ranges from 0.002 to 0.283. Additionally, the effect of service innovation on customer satisfaction is classified as having a moderate to high impact at the structural level, with an f square value of 0.040.
2. The second hypothesis (H2) demonstrates a significant impact of service innovation on service quality, as shown by the path coefficient (0.594) and p-value (0.000 < 0.05). Changes in service innovation are anticipated to improve service quality. The 95% confidence interval suggests that the impact of service innovation on improving service quality ranges from 0.447 to 0.728. Additionally, the effect of service innovation on enhancing service quality is classified as moderate to high at the structural level, with an f square value of 0.545.
3. The third hypothesis (H3) shows a significant impact of service quality on customer satisfaction, as indicated by the path coefficient (0.702) and p-value (0.000 < 0.05),

demonstrating statistical significance. This implies that any change in service quality will improve customer satisfaction. Within the 95% confidence interval, the influence of service innovation on enhancing service quality is estimated to range from 0.545 to 0.838. Furthermore, the effect of service innovation on improving service quality is considered moderate to high at the structural level, as indicated by an f square value of 0.885.

3.6 Test Mediation

In Smart PLS 3 and 4, the mediation effect for the mediation test has not yet been issued (f square is not included in the output). (Lachowicz *et al.* 2018) recommends using effect size mediation ϵ^2 instead. Formula $\epsilon^2 = \frac{M^2}{Y^2}$

The interpretation of the statistical value of ϵ^2 is as follows (Ogbeibu *et al.*, 2020) ; 0.0175 indicates high, 0.075 indicates medium, and 0.01 indicates low.

Table 6. Result Test Mediation (Effect Indirect)

Path	Path Coefficient	p-value	95% interval kepercayaan Path		Upsilon v
			coefficient		
			Lower Limit	Upper Limit	
H4 :X \rightarrow Z \rightarrow Y	0.417	0.000	0.297	0.549	0.173

Source: processed by author, 2025

The fourth hypothesis (H4) has been confirmed, demonstrating a substantial impact of service innovation on service quality and, subsequently, on customer satisfaction, with a path coefficient of 0.0417 and a p-value of $0.000 < 0.05$ (Accepted). Within the 95% confidence interval, the influence of service innovation on service quality, and thus on customer satisfaction, is estimated to range from 0.287 to 0.549. Furthermore, the ϵ^2 value indicates a significant influence, registering at a high level of 0.173.

This study aims to evaluate the impact of service innovation on service quality (as an intervening variable) and its subsequent effect on customer satisfaction, specifically within the context of PT PLN (Persero) Baleendah Customer Service Unit.

1. Service innovation has a significant and positive effect on customer satisfaction.

The research findings reveal that service innovation significantly and positively impacts customer satisfaction at PT PLN (Persero) Baleendah Customer Service Unit. Customers are satisfied because PT PLN (Persero) delivers new and effective services and maintains high performance, keeping up with technology through accessible online payment options. Engaging effectively with customers through WhatsApp to address issues and developing new services, such as the PLN Mobile app, which can be accessed anywhere and anytime, are highlighted in this study. The service innovations introduced by PT PLN (Persero) have resulted in increased customer satisfaction, consistent with previous research conducted by (Tarmidi *et al.* 2021) ; (Rew *et al.* 2021) ; (Prasetyo *et al.* 2021)

2. Service innovation has a significant and positive effect on service quality.

The research findings reveal that service innovation has a significant and positive influence on service quality at PT PLN (Persero) Baleendah Customer Service Unit. An

increase service innovation correlates with an improvement in service quality. These results are consistent with earlier research conducted by (Tarmidi *et al.* 2021); (Rew *et al.* 2021).

3. Service quality has a notable and positive effect on customer satisfaction.

The research findings demonstrate that service quality significantly and positively affects customer satisfaction at PT PLN (Persero) Baleendah Customer Service Unit. As service quality improves, customer satisfaction at PT PLN (Persero) Baleendah Customer Service Unit is expected to rise. These results are consistent with previous research conducted by (Lai *et al.* 2019);(Tarmidi *et al.* 2021); (Rew *et al.* 2021); (Huang *et al.* 2019).

4. Service innovation has a significant and positive effect on service quality (acting as an intervening variable), which in turn impacts customer satisfaction.

The research findings show that the service innovation variable significantly and positively impacts service quality through its intervening variables, subsequently influencing customer satisfaction. This implies that as service innovation improves, it enhances service quality, which in turn positively affects customer satisfaction. These results are consistent with previous research conducted by (Rew *et al.* 2021). (Li *et al.* 2021)

The empirical findings in this study indicate that service innovation variables have not been previously examined at PT PLN (Persero) Baleendah Customer Service Unit. Data collection for this study spanned 3 weeks, during which questionnaires were distributed at the customer service counter. A total of 152 responses were received, with 125 qualifying as valid respondents. The analysis was conducted using smartPLS software version 3.0. According to the data analysis results, there exists a positive and statistically significant correlation among service innovation, service quality, and customer satisfaction.

4. CONCLUSION

This research employed a field study approach, distributing questionnaires to 125 customers of PT PLN (Persero) Baleendah Customer Service Unit. Respondents were chosen through purposive sampling, focusing on customers who had visited the service counter. The study aimed to examine the impact of service innovation on service quality and its subsequent effect on customer satisfaction. To analyze the relationships between variables, Partial Least Square (PLS) analysis was conducted using SmartPLS software version 3.0. Using the SmartPLS program for analysis, the hypothesis test results revealed a positive and significant correlation between service innovation, service quality, and customer satisfaction. This highlights the crucial roles that both service innovation and service quality play in determining customer satisfaction. The combination of innovative services and high-quality service provision enhances the overall customer experience, leading to increased satisfaction. Consequently, the study suggests that enhancing service innovation and quality positively impacts customer satisfaction levels.

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