

The Effect of Operational and Service Staff Quality on Customer Loyalty Through Customer Satisfaction: Evidence from SPBG Cililitan

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ABSTRACT

Keywords:

Operational Quality;
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Quality; Customer
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PLS-SEM;

Background: SPBG Cililitan is a compressed natural gas filling station in East Jakarta serving gas-fueled vehicles. In a competitive fuel service industry, understanding factors associated with customer loyalty is important for business sustainability. Previous studies often treat service quality as a single construct, although operational quality and service staff quality represent distinct dimensions.

Research Gap: Limited empirical attention has been given to how operational quality and service staff quality, as experienced at a specific compressed natural gas filling station such as SPBG Cililitan, are differently related to customer loyalty through customer satisfaction. Previous studies in the fuel sector have focused on conventional liquid-fuel stations, while research on SPBG services in Indonesia remains limited.

Novelty: This study distinguishes operational quality from service staff quality rather than treating service quality as a single general construct. It tests these relationships at SPBG Cililitan, a compressed natural gas filling station with operational characteristics that differ from conventional liquid-fuel stations. The separation of quality dimensions allows identification of which aspect has a stronger relationship with customer satisfaction and loyalty.

Method: A quantitative explanatory survey was employed. A purposive sample of 106 SPBG Cililitan customers completed an online questionnaire using a five-point Likert scale. The data were analyzed with Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 3.0.

Results: Service staff quality has a strong positive and statistically significant effect on customer satisfaction ($\beta=0.805$; $p=0.000$), whereas operational quality is not statistically significant ($\beta=0.017$; $p=0.881$). Customer satisfaction has a significant effect on customer loyalty ($\beta=0.605$; $p=0.003$). Customer satisfaction fully mediates the relationship between service staff quality and customer loyalty (indirect effect= 0.488 ; $p=0.004$). The model explains 66.8% of variance in customer satisfaction and 59.3% in customer loyalty.

Conclusion: Improving service staff quality is the main priority for strengthening customer satisfaction and, through satisfaction, customer loyalty at SPBG Cililitan. Operational standards remain a basic service responsibility even though their direct effects are not statistically significant. Trustworthiness, fairness, accountability, transparency, and service excellence should guide service delivery.

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INTRODUCTION

In a highly competitive service environment, developing and maintaining Customer Loyalty is necessary for organizations seeking long-term sustainability and market differentiation (Singh and Singh, 2024). The energy sector, particularly retail fuel station operations, presents a dynamic setting in which customer retention is closely associated with the perceived quality of operational processes and frontline staff interactions (Nie and Sugiyanto, 2025). In this setting, SPBG Cililitan requires a clear understanding of the factors associated with Customer Loyalty.

SPBG Cililitan is a compressed natural gas filling station located in Cililitan, East Jakarta. It serves the energy needs of gas-fueled vehicles as part of the government program supporting a transition to cleaner energy. Its operations differ from those of conventional liquid-fuel stations. Compressed natural gas filling requires specific technical procedures, including safety inspections before refueling, specialized equipment, and waiting times that may vary according to vehicle condition and fuel availability (Kinderis et al., 2023).

SPBG Cililitan also serves a distinct customer profile. Most users own four-wheeled vehicles that have shifted from liquid fuel to gas, including private vehicles and commercial vehicles such as online taxis and public transportation. Customers represent several age groups, dominated by those aged 26-44 years, followed by customers aged above 45 years. Visit frequency varies, with many customers refueling three to eight times per month, reflecting routine energy needs for daily mobility (Al-Mu'ani et al., 2024).

Anecdotal evidence and preliminary observations indicate that differences in refueling efficiency and the interpersonal conduct of service personnel may shape customer perceptions and return decisions (Al-Mu'ani et al., 2024). Previous studies widely recognize the relationship between service quality and Customer Satisfaction (Kinderis et al., 2023). However, limited empirical attention has been given to how Operational Quality and Service Staff Quality, as experienced at a specific compressed natural gas filling station such as SPBG Cililitan, are differently related to Customer Loyalty through Customer Satisfaction.

Operational efficiency remains an essential part of service delivery (Camilleri and Filieri, 2023). For customers who regularly visit SPBG Cililitan, it is reflected in short refueling times, accurate fuel delivery, and smooth payment procedures. Delays, inaccuracies, or technical failures can reduce positive evaluations of the service provider. Service Staff Quality represents the human element of the customer experience, including attentiveness, courtesy, technical competence, and problem-solving ability (Kosasih et al., 2024). Friendly greetings, helpful conduct, and effective responses to customer questions can improve the overall service experience, whereas indifferent or incompetent conduct can create frustration even when operations run smoothly. From an Islamic business ethics perspective, service quality and customer relations may also be understood through *amanah* (trustworthiness and responsibility), *hisbah* (accountability and supervision), *'adl* (justice and fair treatment), *ihsan* (service excellence), honesty, transparency, and customer protection (Soediro et al., 2024; Triwibowo et al., 2022).

The characteristics of the 106 respondents also provide context for the findings. Most respondents were men (64.2%), reflecting the profile of vehicle users in the Cililitan area. The largest age group was 26-34 years (39.6%), followed by 35-44 years (31.1%), indicating that customers were mainly of productive age and had high mobility. In addition, 56.6% of respondents refueled more than five times per month, showing that SPBG Cililitan formed a regular part of their mobility routines. This frequent use gives management an opportunity to develop long-term Customer Loyalty through consistent service improvement (Singh and Singh, 2024).

Previous research has emphasized Customer Satisfaction as an important antecedent of Customer Loyalty (Camilleri and Filieri, 2023; Singh et al., 2021; Kamel and Mansour, 2023). Customer Satisfaction is a post-consumption evaluation in which customers compare their expectations with perceived service performance. When performance meets or exceeds expectations, satisfaction is more likely to develop. Satisfaction then supports positive affective and cognitive evaluations of the provider, increasing the likelihood of repeat visits and positive word of mouth and thereby strengthening loyalty (Kosasih et al., 2024). Service quality frameworks such as SERVQUAL also describe service quality as multidimensional, including tangibility, reliability, responsiveness, assurance, and empathy (Kinderis et al., 2023; Bwachele et al., 2023). In Islamic business ethics, Operational Quality may reflect amanah and hisbah through reliable, safe, accountable, and transparent procedures, while Service Staff Quality may reflect 'adl and ihsan through fair, respectful, competent, and responsive treatment of customers (Soediro et al., 2024; Triwibowo et al., 2022). These relationships require empirical examination in the specific operational and staff-customer context of an Indonesian compressed natural gas filling station, particularly regarding the mediating role of Customer Satisfaction in Customer Loyalty (Kamel and Mansour, 2023; Moreno Menendez and Zacarias-Rodriguez, 2025). The literature review identifies the following research gaps:

1. **Contextual Gap:** Most previous studies of service quality and Customer Loyalty in the fuel sector have focused on conventional liquid-fuel stations (Nie and Sugiyanto, 2025; Al-Mu'ani et al., 2024; Purba et al., 2024). Compressed natural gas filling stations have different operational characteristics, including more specific refueling procedures and potentially different customer profiles. Research on SPBG services in Indonesia remains limited, particularly studies using PLS-SEM (Kinderis et al., 2023; Christopher and Ruslim, 2025).
2. **Quality-Dimension Gap:** Previous studies often treat service quality as a single construct (Al-Mu'ani et al., 2024; Sarstedt et al., 2022a). In practice, Operational Quality, including technical efficiency, service speed, and accuracy, differs from Service Staff Quality, including friendliness, responsiveness, and problem-solving ability. Separating these dimensions helps identify which aspect has a stronger relationship with Customer Satisfaction and Customer Loyalty (Kosasih et al., 2024; Khalufi et al., 2025).
3. **Mediation-Mechanism Gap:** Although many studies examine the direct relationship between service quality and loyalty, few explicitly test the mediating role of Customer Satisfaction in the SPBG context (Nie and Sugiyanto, 2025; Shafiq et al., 2023). Determining whether Customer Satisfaction provides full or partial mediation is relevant to the development of focused management strategies.
4. **Differential-Significance Gap:** Comparative evidence remains limited regarding whether Operational Quality and Service Staff Quality have different effects on Customer Satisfaction at a compressed natural gas filling station. Evidence on these differences can provide practical guidance for management (Singh and Singh, 2024; Ahli et al., 2024).

The contribution of this study is defined within the scope of its research model and setting:

1. **Separation of Quality Dimensions:** Instead of treating service quality as one general construct, this study distinguishes Operational Quality (OQ) from Service Staff Quality (SS). This distinction allows the two dimensions to be tested separately and identifies their different relationships with Customer Satisfaction and Customer Loyalty (Hair et al., 2024).
2. **Specific SPBG Context:** The study tests these relationships at SPBG Cililitan, a compressed natural gas filling station with operational characteristics that differ from conventional liquid-fuel stations (Kinderis et al., 2023). This extends the application of service quality and Customer Loyalty theory to the SPBG context.
3. **Different Effects on Customer Satisfaction:** The results show that Service Staff Quality has a strong and significant relationship with Customer Satisfaction ($\beta = 0.805$; $p = 0.000$), whereas Operational Quality does not have a statistically significant relationship ($\beta = 0.017$; $p = 0.881$). In this research setting, the staff-interaction dimension has a stronger role in shaping Customer Satisfaction than the operational dimension (Nie and Sugiyanto, 2025; Aldarmi, 2024; Moreno Menendez and Zacarias-Rodriguez, 2025).

4. Customer Satisfaction as a Mediating Mechanism: Customer Satisfaction fully mediates the relationship between Service Staff Quality and Customer Loyalty (indirect effect = 0.488; $p = 0.004$). This finding shows that Service Staff Quality is related to Customer Loyalty through Customer Satisfaction rather than through a statistically significant direct path (Li, 2023; Al-Refaei et al., 2024; Singh et al., 2021).

Based on the background and research gaps, this study addresses the following questions:

1. Does Operational Quality have a significant effect on Customer Satisfaction at SPBG Cililitan?
2. Does Service Staff Quality have a significant effect on Customer Satisfaction at SPBG Cililitan?
3. Does Customer Satisfaction have a significant effect on Customer Loyalty at SPBG Cililitan?
4. Does Operational Quality have a significant direct effect on Customer Loyalty at SPBG Cililitan?
5. Does Service Staff Quality have a significant direct effect on Customer Loyalty at SPBG Cililitan?
6. Does Customer Satisfaction mediate the relationships between the two service quality dimensions (Operational Quality and Service Staff Quality) and Customer Loyalty at SPBG Cililitan?

This study aims to:

1. Analyze the effect of Operational Quality on Customer Satisfaction at SPBG Cililitan.
2. Test the effect of Service Staff Quality on Customer Satisfaction at SPBG Cililitan.
3. Examine the effect of Customer Satisfaction on Customer Loyalty at SPBG Cililitan.
4. Test the direct effect of Operational Quality on Customer Loyalty at SPBG Cililitan.
5. Test the direct effect of Service Staff Quality on Customer Loyalty at SPBG Cililitan.
6. Analyze the mediating role of Customer Satisfaction in the relationships between the two service quality dimensions (Operational Quality and Service Staff Quality) and Customer Loyalty.

Theoretical contribution: This study contributes to marketing management and customer behavior research by distinguishing Operational Quality from Service Staff Quality rather than treating service quality as a single general construct (Singh et al., 2021; Sarstedt et al., 2022b; Sarstedt and Liu, 2023; Khalufi et al., 2025). It tests the different effects of these dimensions in the specific context of a compressed natural gas filling station and shows that Service Staff Quality has a stronger role in Customer Satisfaction in this setting (Hair et al., 2024; Cheah et al., 2022). It also confirms Customer Satisfaction as the mechanism through which Service Staff Quality is related to Customer Loyalty (Li, 2023; Al-Refaei et al., 2024). **Practical contribution:** The findings provide direction for SPBG Cililitan management and similar service operations (Kosasih et al., 2024; Singh and Singh, 2024; Al-Mu'ani et al., 2024; Khalufi et al., 2025):

1. **Strategic Focus:** Because Service Staff Quality is the only significant predictor of Customer Satisfaction ($\beta = 0.805$), management should prioritize courteous, responsive, honest, and competent staff-customer interactions.
2. **Satisfaction as the Loyalty Mechanism:** Because Customer Satisfaction fully mediates the relationship between Service Staff Quality and Customer Loyalty, satisfaction monitoring and complaint resolution should be central to customer-retention efforts.
3. **Operational Responsibility:** Although Operational Quality is not statistically significant, safe, accurate, transparent, and consistent operations remain a basic responsibility linked to amanah, hisbah, fairness, and customer protection (Soediro et al., 2024; Triwibowo et al., 2022).

This study provides empirical material for future research in the SPBG context or similar service industries. Its separation of quality dimensions and mediation analysis may be used as a reference for subsequent studies (Hair et al., 2024; Hauff et al., 2024; Lim, 2024).

METHOD

Research Design

This study used a quantitative explanatory survey design to examine the hypothesized relationships among the constructs in the model (Hair et al., 2024). The design was selected to test the specified structural paths rather than only describe current conditions (Ringle et al., 2023). It enabled the simultaneous assessment of five hypothesized direct paths and the indirect effects that form the main mediation analysis.

The explanatory design supports the examination of how the proposed relationships operate within the model (Becker et al., 2022). In the SPBG Cililitan context, the approach tests the relationships between the service quality dimensions and Customer Loyalty and assesses Customer Satisfaction as the mediating construct.

Population and Sample

The population comprised all customers using compressed natural gas refueling services at SPBG Cililitan who had direct experience with operational processes and service staff. The inclusion criteria were: (a) aged above 17 years, (b) had used the SPBG service at least twice during the previous three months, and (c) voluntarily agreed to participate. Purposive sampling was used to select respondents who met these criteria (Becker et al., 2022). This approach ensured that all participants had relevant experience with the service being studied. The sample-size calculation followed the general PLS-SEM guideline of a minimum 10:1 ratio between respondents and the largest number of regression paths directed at a construct (Hair et al., 2024). The largest number of paths in the model was three (OQ → CS, SS → CS, and CS → CL), giving a minimum threshold of 30 participants. The final sample of 106 respondents exceeded this threshold and supported the statistical analysis.

Data Collection Procedure

Primary data were collected through an online questionnaire distributed using Google Forms. The instrument used a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). This scale allowed respondents to express graded evaluations without excessive response complexity (Ringle et al., 2023). The questionnaire consisted of four sections, each measuring one latent construct:

1. Operational Quality (OQ): eight indicators measuring the technical efficiency of the service.
2. Service Staff Quality (SS): four indicators measuring the quality of interpersonal interactions.
3. Customer Satisfaction (CS): one indicator measured as a single item.
4. Customer Loyalty (CL): one indicator measured as a single item.

The instrument contained 14 indicators in total. Before the main distribution, a pilot test was conducted with 30 respondents to assess question clarity, item validity, and reliability coefficients. The results indicated that all items met the stated validity and reliability criteria and were suitable for the main data collection. The main questionnaire was distributed through Google Forms beginning on April 20, 2026, to SPBG Cililitan customers who met the inclusion criteria. Data collection continued for several weeks and produced 106 valid responses for analysis.

Construct Operationalization

The constructs, indicators, and measurement scales are presented in Table 1.

Table 1. Operationalization of Research Variables

No.	Variable	Indicator	Scale
1	Operational Quality (OQ)	OQ1–OQ8	Likert 1–5
2	Service Staff Quality (SS)	SS1–SS4	Likert 1–5
3	Customer Satisfaction (CS)	CS1	Likert 1–5
4	Customer Loyalty (CL)	CL1	Likert 1–5

Operational Quality (OQ): This construct measures customer perceptions of the technical and operational efficiency of SPBG Cililitan. Its eight indicators cover refueling speed, accuracy of the fuel

volume delivered, staff technical ability to operate the equipment, smooth payment procedures, facility cleanliness and comfort, operational safety protocols, consistency across visits, and responsiveness to technical disruptions.

Service Staff Quality (SS): This construct measures the interpersonal dimension of the customer experience. Its four indicators assess staff friendliness and courtesy, response speed to customer requests or questions, competence in resolving problems, and knowledge of products and service procedures.

Customer Satisfaction (CS): This construct represents the customer's overall evaluation of the service experience at SPBG Cililitan (Kinderis et al., 2023). It was measured with one item on a five-point Likert scale, capturing the extent to which the actual experience matched the customer's initial expectations.

Customer Loyalty (CL): This construct represents the customer's intention and commitment to maintain a long-term relationship with SPBG Cililitan (Singh and Singh, 2024; Camilleri and Filieri, 2023). It was measured with one item on a five-point Likert scale that captured willingness to revisit and recommend the service to others.

Statistical Analysis Technique

The data were processed and the hypotheses were tested using Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 3.0. The method was selected for the following reasons (Hair et al., 2024; Becker et al., 2022; Sarstedt et al., 2022b):

1. PLS-SEM does not require multivariate normality and is suitable for survey data that may be non-normally distributed.
2. The method can be applied effectively with a relatively limited sample size.
3. PLS-SEM can accommodate models with several simultaneous paths.
4. The method is compatible with reflective and formative measurement models.

PLS-SEM is a variance-based approach that maximizes the explained variance of dependent constructs (Ringle et al., 2023). It uses an iterative algorithm based on ordinary least squares regression to estimate model parameters.

The analysis followed two sequential stages recommended in the PLS-SEM literature (Hair et al., 2024):

Stage I: Measurement Model Evaluation. This stage assessed whether the indicators adequately reflected their intended latent constructs. The criteria were: (1) outer loading ≥ 0.708 (Hair et al., 2024); (2) convergent validity, with AVE ≥ 0.50 (Ringle et al., 2023); (3) internal consistency, assessed through composite reliability and Cronbach's alpha; and (4) discriminant validity, assessed using the Fornell-Larcker criterion and HTMT < 0.85 (Hair et al., 2024).

Stage II: Structural Model Evaluation. This stage assessed the hypothesized relationships and the model's predictive strength (Hair et al., 2024). The evaluation covered: (1) coefficient of determination (R^2); (2) predictive relevance (Q^2) through blindfolding with CVD = 7 (Ringle et al., 2023); (3) effect size (f^2); (4) hypothesis testing through bootstrapping with 5,000 subsamples (Becker et al., 2022); and (5) mediation testing through indirect effects (Li, 2023).

Model Specification

The model contains four latent variables connected by five hypothesized direct paths. All constructs were specified as reflective, meaning that each indicator reflects its underlying latent construct. The model includes:

- Two predictor variables: Operational Quality (OQ; eight indicators) and Service Staff Quality (SS; four indicators).
- One mediating variable: Customer Satisfaction (CS; one single-item indicator).
- One outcome variable: Customer Loyalty (CL; one single-item indicator).

The tested paths were: (1) $OQ \rightarrow CS$, (2) $SS \rightarrow CS$, (3) $CS \rightarrow CL$, (4) $OQ \rightarrow CL$ (direct effect), and (5) $SS \rightarrow CL$ (direct effect). The two indirect paths were $OQ \rightarrow CS \rightarrow CL$ and $SS \rightarrow CS \rightarrow CL$ (Hair et al., 2024). The research framework is presented in Figure 1.

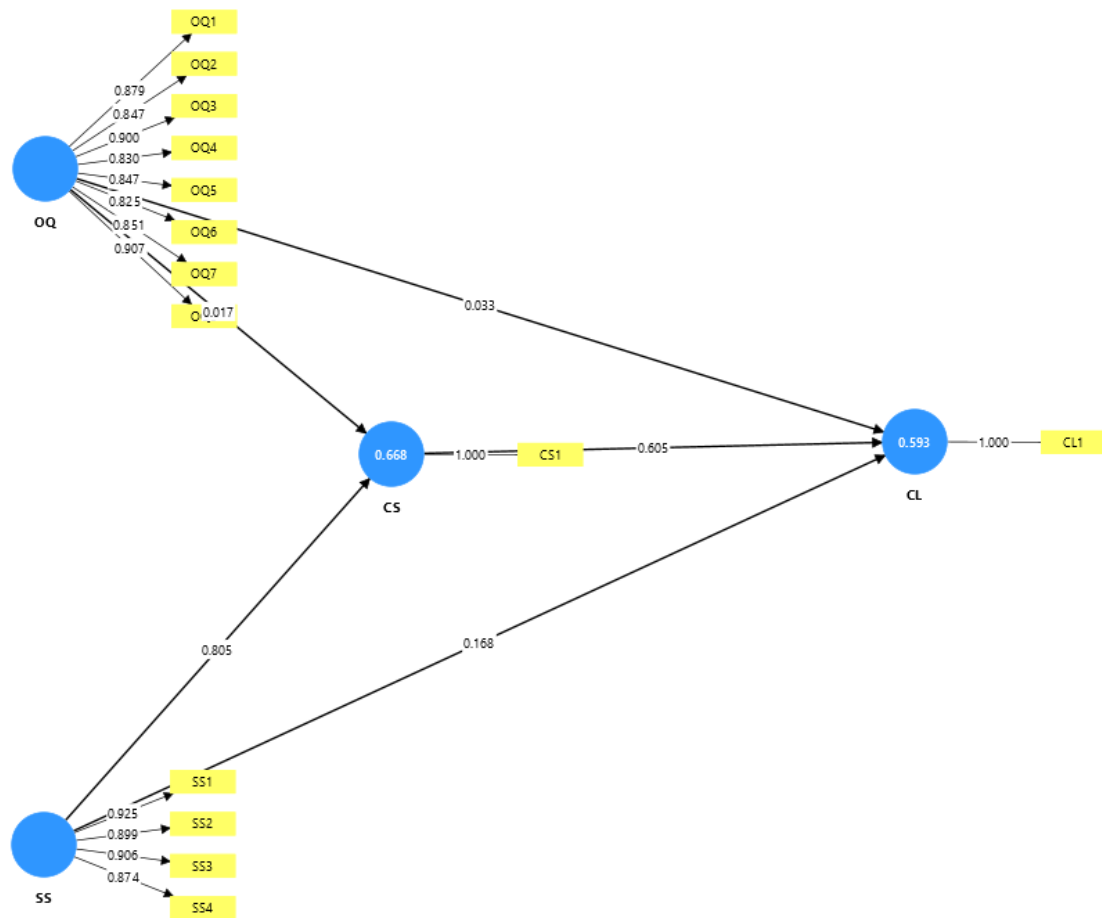


Figure 1. Research Framework (PLS-SEM Path Model)

RESULTS

Sample Description

Data were collected from 106 SPBG Cililitan customers. Their demographic characteristics are presented in Table 2.

Table 2. Description of the Research Sample

Variable / Category	Frequency	%
Gender		
Male	68	64.2
Female	38	35.8
Age		
18–25 years	14	13.2
26–34 years	42	39.6
35–44 years	33	31.1
45+ years	17	16.0
Monthly Use Frequency		
1–2 times	14	13.2
3–5 times	30	28.3
6–8 times	30	28.3

> 9 times	32	30.2
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Descriptive Statistics

Descriptive statistics for all indicators are presented in Table 3. All items have mean values above 4.00 on a five-point scale, indicating that respondents generally gave positive evaluations of the measured aspects.

Table 3. Descriptive Statistics of the Indicators

Item	Mean	Median	SD	Min–Max
OQ1	4.70	5	0.779	1–5
OQ2	4.67	5	0.786	1–5
OQ3	4.68	5	0.784	1–5
OQ4	4.72	5	0.697	1–5
OQ5	4.59	5	0.888	1–5
OQ6	4.43	5	0.890	1–5
OQ7	4.39	5	0.947	1–5
OQ8	4.51	5	0.871	1–5
SS1	4.67	5	0.640	2–5
SS2	4.72	5	0.595	2–5
SS3	4.68	5	0.667	1–5
SS4	4.68	5	0.667	2–5
CS1	4.73	5	0.637	2–5
CL1	4.39	5	1.015	1–5

Measurement Model Evaluation (Outer Model)

The measurement model was evaluated to determine whether the indicators validly and reliably reflected their intended latent constructs (Hair et al., 2024; Lim, 2024; Sarstedt et al., 2022b).

The indicator correlation matrix shows that indicators within the same construct generally have stronger correlations with one another than with indicators from other constructs, providing an initial indication of discriminant validity.

Table 4. Correlation Matrix of the Indicators

	OQ1	OQ2	OQ3	OQ4	OQ5	OQ6	OQ7	OQ8	SS1	SS2	SS3	SS4	CS1	CL1
OQ1	1	0.793	0.784	0.624	0.723	0.692	0.657	0.768	0.481	0.447	0.431	0.54	0.461	0.446
OQ2	0.793	1	0.885	0.691	0.592	0.582	0.552	0.659	0.59	0.506	0.572	0.644	0.535	0.515
OQ3	0.784	0.885	1	0.801	0.667	0.659	0.625	0.723	0.597	0.534	0.598	0.724	0.561	0.5
OQ4	0.624	0.691	0.801	1	0.699	0.593	0.637	0.703	0.552	0.535	0.454	0.637	0.463	0.341
OQ5	0.723	0.592	0.667	0.699	1	0.664	0.803	0.791	0.445	0.372	0.386	0.545	0.354	0.279
OQ6	0.692	0.582	0.659	0.593	0.664	1	0.763	0.749	0.549	0.481	0.521	0.584	0.459	0.409
OQ7	0.657	0.552	0.625	0.637	0.803	0.763	1	0.858	0.599	0.512	0.495	0.555	0.55	0.423
OQ8	0.768	0.659	0.723	0.703	0.791	0.749	0.858	1	0.623	0.588	0.557	0.639	0.557	0.471
SS1	0.481	0.59	0.597	0.552	0.445	0.549	0.599	0.623	1	0.82	0.747	0.747	0.819	0.632
SS2	0.447	0.506	0.534	0.535	0.372	0.481	0.512	0.588	0.82	1	0.747	0.651	0.791	0.619
SS3	0.431	0.572	0.598	0.454	0.386	0.521	0.495	0.557	0.747	0.747	1	0.788	0.682	0.644
SS4	0.54	0.644	0.724	0.637	0.545	0.584	0.555	0.639	0.747	0.651	0.788	1	0.637	0.574
CS1	0.461	0.535	0.561	0.463	0.354	0.459	0.55	0.557	0.819	0.791	0.682	0.637	1	0.762
CL1	0.446	0.515	0.5	0.341	0.279	0.409	0.423	0.471	0.632	0.619	0.644	0.574	0.762	1

The outer loading estimates show that all indicators for OQ and SS exceed the threshold of 0.708; therefore, no indicators were removed (Hair et al., 2024). CS and CL each have one indicator, so their loadings are 1.000 by construction.

Table 5. Outer Loading Results

Construct	Indicator	Loading
Operational Quality	OQ1	0.879
	OQ2	0.847
	OQ3	0.9
	OQ4	0.83
	OQ5	0.847
	OQ6	0.825
	OQ7	0.851
	OQ8	0.907
Service Staff Quality	SS1	0.925
	SS2	0.899
	SS3	0.906
	SS4	0.874
Customer Satisfaction	CS1	1
Customer Loyalty	CL1	1

Convergent validity was evaluated using Average Variance Extracted (AVE). Each multi-item construct was required to have an AVE of at least 0.50 (Ringle et al., 2023). For the single-item constructs, CS and CL, AVE is 1.000 by construction.

Table 6. Convergent Validity (AVE)

Construct	AVE
Operational Quality (OQ)	0.742
Service Staff Quality (SS)	0.812
Customer Satisfaction (CS)	1.000
Customer Loyalty (CL)	1.000

All constructs have AVE values above 0.50; therefore, the convergent validity criterion is met (Hair et al., 2024).

Internal consistency reliability was evaluated using composite reliability (CR) and Cronbach's alpha. These measures were applied to the multi-item constructs (Hair et al., 2024).

Table 7. Internal Consistency Reliability

Construct	Cronbach's α	CR	Description
Operational Quality (OQ)	0.937	0.951	
Service Staff Quality (SS)	0.927	0.949	
Customer Satisfaction (CS)	—	—	Single-item
Customer Loyalty (CL)	—	—	Single-item

OQ and SS have Cronbach's alpha and composite reliability values above 0.70, indicating high internal consistency. Cronbach's alpha and composite reliability are not applicable to CS and CL because each construct was measured with one item.

Discriminant validity was evaluated using the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT) (Hair et al., 2024; Lim, 2024).

Under the Fornell-Larcker criterion, the square root of each construct's AVE should exceed its correlations with the other constructs (Hair et al., 2024).

Table 8. Discriminant Validity: Fornell-Larcker Criterion

	OQ	SS	CS	CL
OQ	0.861			
SS	0.550	0.901		
CS	0.493	0.732	1.000	
CL	0.423	0.617	0.762	1.000

The bold diagonal values represent the square roots of AVE. All inter-construct correlations are lower than the square root of AVE for the corresponding construct; therefore, the Fornell-Larcker criterion is met. HTMT was used to confirm discriminant validity with a threshold of 0.85 (Hair et al., 2024).

Table 9. Discriminant Validity: HTMT

	OQ	SS	CS	CL
OQ	–			
SS	0.612	–		
CS	0.547	0.805	–	
CL	0.471	0.682	0.842	–

All HTMT values are below 0.85, further confirming discriminant validity among the constructs in the model (Lim, 2024).

Structural Model Evaluation (Inner Model)

R^2 measures the proportion of variance in a dependent construct explained by its predictors. The assessment used the following criteria: substantial (≥ 0.75), moderate (0.50), and weak (0.25) (Hair et al., 2024).

Table 10. Coefficient of Determination (R^2)

Dependent Variable	R^2	Category	Interpretation
Customer Satisfaction (CS)	0.668	Moderate	Substantial
Customer Loyalty (CL)	0.593	Moderate	Substantial

The model explains 66.8% of the variance in Customer Satisfaction and 59.3% of the variance in Customer Loyalty. Both R^2 values are in the moderate category, indicating adequate explanatory strength (Hair et al., 2024; Sarstedt et al., 2022b).

Predictive relevance was evaluated through blindfolding with a cross-validation distance (CVD) of 7. A Q^2 value above zero indicates predictive relevance (Hair et al., 2024; Guenther et al., 2023; Sarstedt and Liu, 2023).

Table 11. Predictive Relevance (Q^2)

Dependent Variable	Q^2	Criterion	Interpretation
Customer Satisfaction (CS)	0.452	> 0	Relevant
Customer Loyalty (CL)	0.381	> 0	Relevant

Both dependent constructs have Q^2 values above zero, confirming that the model has predictive relevance for the data (Hair et al., 2024; Guenther et al., 2023).

Effect size (f^2) indicates the magnitude of a predictor's contribution to a dependent construct. The criteria are large (≥ 0.35), moderate (0.15), and small (0.02) (Hair et al., 2024; Hauff et al., 2024).

Table 12. Effect Size (f^2)

Independent Variable	Dependent Variable	f^2	Assessment
Operational Quality (OQ)	Customer Satisfaction (CS)	0.001	Not Significant
Service Staff Quality (SS)	Customer Satisfaction (CS)	1.711	Large
Customer Satisfaction (CS)	Customer Loyalty (CL)	0.441	Large

Service Staff Quality has a very large effect size on Customer Satisfaction ($f^2 = 1.711$), indicating that SS is the main contributor to the explained variance in Customer Satisfaction (Aly, 2025). Customer Satisfaction also has a large effect size on Customer Loyalty ($f^2 = 0.441$). By contrast, Operational Quality has a very small effect size on Customer Satisfaction ($f^2 = 0.001$) (Hair et al., 2024; Sarstedt and Liu, 2023; Adeyemi et al., 2025).

Hypothesis Testing

The hypotheses were tested using bootstrapping with 5,000 subsamples to obtain t-statistics and p-values (Becker et al., 2022; Hauff et al., 2024). The results are presented in Table 13.

Table 13. Hypothesis Testing Results

Path	H	β	t	p	Decision
OQ $\rightarrow$ CS	H1	0.017	0.150	0.881	Rejected
SS $\rightarrow$ CS	H2	0.805	8.246	0.000	Accepted
CS $\rightarrow$ CL	H3	0.605	2.959	0.003	Accepted
OQ $\rightarrow$ CL	H4	0.033	0.332	0.740	Rejected
SS $\rightarrow$ CL	H5	0.168	0.859	0.391	Rejected

H1: Operational Quality $\rightarrow$ Customer Satisfaction. Operational Quality does not have a statistically significant effect on Customer Satisfaction ($\beta = 0.017$; $t = 0.150$; $p = 0.881 > 0.05$); therefore, H1 is rejected. Technical aspects such as refueling speed, fuel-volume accuracy, and smooth payment procedures were not primary predictors of Customer Satisfaction in this sample (Nie and Sugiyanto, 2025; Aldarmi, 2024; Purba et al., 2024; Sarstedt et al., 2022a). This result does not imply that Operational Quality is unimportant. Reliable operations remain part of amanah and hisbah because management is responsible for accuracy, safety, transparent transactions, and customer protection even when the direct statistical effect is not significant (Soediro et al., 2024; Triwibowo et al., 2022).

H2: Service Staff Quality $\rightarrow$ Customer Satisfaction. Service Staff Quality has a strong positive and statistically significant effect on Customer Satisfaction ($\beta = 0.805$; $t = 8.246$; $p = 0.000 < 0.01$); therefore, H2 is accepted. The magnitude is very large in the context of customer behavior research (Singh and Singh, 2024; Wulandari et al., 2024; Aldarmi, 2024; Aly, 2025). Friendly, responsive, competent, honest, and respectful service reflects ihsan, amanah, fair treatment, and responsibility in Islamic business practice (Soediro et al., 2024). The finding indicates that the quality of direct staff-customer interactions is central to Customer Satisfaction at SPBG Cililitan.

H3: Customer Satisfaction $\rightarrow$ Customer Loyalty. Customer Satisfaction has a positive and statistically significant effect on Customer Loyalty ($\beta = 0.605$; $t = 2.959$; $p = 0.003 < 0.01$); therefore, H3 is accepted. This result supports the theoretical view that positive post-transaction evaluations are an important basis for customer commitment (Camilleri and Filieri, 2023; Singh and Singh, 2024; Suchanek and Bucicova, 2025). Satisfaction is more likely to support loyalty when customers consistently receive fair treatment, clear information, and responsible service.

H4: Operational Quality $\rightarrow$ Customer Loyalty. Operational Quality does not have a statistically significant direct effect on Customer Loyalty ($\beta = 0.033$; $t = 0.332$; $p = 0.740 > 0.05$); therefore, H4 is rejected. Together with H1, this result shows that the direct and mediated paths from Operational Quality to Customer Loyalty are not statistically significant in this study (Al-Mu'ani et al., 2024; Zaidan, 2025). Operational standards must nevertheless be maintained as a basic service responsibility involving safety, accountability, transparency, and equal customer protection.

H5: Service Staff Quality $\rightarrow$ Customer Loyalty. Service Staff Quality does not have a statistically significant direct effect on Customer Loyalty ($\beta = 0.168$; $t = 0.859$; $p = 0.391 > 0.05$); therefore, H5 is rejected. Its relationship with Customer Loyalty operates through Customer Satisfaction as the mediator (Li, 2023; Shafiq et al., 2023; Gazi et al., 2024).

Mediation Effect Testing

The indirect effect was calculated as the product of the path coefficient from X to M and the path coefficient from M to Y (Li, 2023).

Table 14. Mediation Analysis Results

Path	β	t	p	Decision
OQ $\rightarrow$ CS $\rightarrow$ CL	0.010	0.148	0.882	Not Significant
SS $\rightarrow$ CS $\rightarrow$ CL	0.487	2.874	0.004	Full Mediation

Mediation of the OQ $\rightarrow$ CL Path by CS: The indirect effect of Operational Quality on Customer Loyalty through Customer Satisfaction is 0.010, with $t = 0.148$ and $p = 0.882$. The effect is not statistically significant; therefore, no mediation is identified for this path (Li, 2023; Rantung and Harianto, 2024).

Mediation of the SS $\rightarrow$ CL Path by CS: The indirect effect of Service Staff Quality on Customer Loyalty through Customer Satisfaction is 0.487, with $t = 2.874$ and $p = 0.004$. Because the direct SS $\rightarrow$ CL effect is not statistically significant ($\beta = 0.168$; $p = 0.391$), Customer Satisfaction provides full mediation (Al-Refaei et al., 2024; Pratomo et al., 2023)

Total Effect Analysis

A total effect is the sum of the direct effect and indirect effect for a relationship (Hair et al., 2024; Hauff et al., 2024).

Table 15. Total Effects

Path	Total Effect
CS $\rightarrow$ CL	0.605
SS $\rightarrow$ CS	0.805
SS $\rightarrow$ CL	0.655
OQ $\rightarrow$ CS	0.017
OQ $\rightarrow$ CL	0.043

Table 15 shows that Service Staff Quality has the largest total effect on Customer Loyalty (0.655). This total consists of a statistically nonsignificant direct effect (0.168) and a significant indirect effect through Customer Satisfaction (0.488). Customer Satisfaction has a total effect of 0.605 on Customer Loyalty, consisting entirely of its direct effect. Operational Quality has a total effect of 0.043 on Customer Loyalty, which is not statistically significant.

DISCUSSION

Theoretical Interpretation of Findings

Overall, the PLS-SEM model explains 66.8% of the variance in Customer Satisfaction and 59.3% of the variance in Customer Loyalty. Two of the five hypotheses are accepted (H2 and H3), while three are rejected (H1, H4, and H5). The principal findings are summarized as follows:

1. Service Staff Quality is the only significant predictor of Customer Satisfaction ($\beta = 0.805$), whereas Operational Quality is not statistically significant ($\beta = 0.017$).
2. Customer Satisfaction is a significant predictor of Customer Loyalty ($\beta = 0.605$).
3. Customer Satisfaction fully mediates the relationship between Service Staff Quality and Customer Loyalty (indirect effect = 0.488; $p = 0.004$).
4. Service Staff Quality has the largest total effect on Customer Loyalty (0.655), with the indirect effect (0.488) larger than the direct effect (0.168).
5. The Operational Quality $\rightarrow$ Customer Loyalty path does not produce a significant mediation effect (indirect effect = 0.01; $p = 0.882$).

The findings indicate that SPBG Cililitan should give primary attention to the quality of staff-customer interactions because these interactions shape Customer Satisfaction, which in turn is associated with Customer Loyalty (Kosasih et al., 2024; Indriastiningsih et al., 2023; Pratomo et al., 2023; Ly, 2025). Operational Quality remains a basic requirement but was not a direct predictor of Customer Satisfaction or Customer Loyalty in this sample. Theoretically, the results support the distinction between

Operational Quality and Service Staff Quality, show their different effects in a compressed natural gas filling station, and confirm Customer Satisfaction as the mechanism through which Service Staff Quality is related to Customer Loyalty.

Study Limitations

Customer Satisfaction and Customer Loyalty were each measured with one indicator. A single item provides a concise overall evaluation, but it may not capture the full multidimensional nature of satisfaction or loyalty. It also prevents the assessment of internal consistency reliability for these constructs. Future studies should use multiple indicators to measure different dimensions of Customer Satisfaction and Customer Loyalty.

CONCLUSION

This study examined the effects of Operational Quality and Service Staff Quality on Customer Loyalty through Customer Satisfaction at SPBG Cililitan. PLS-SEM analysis of data from 106 respondents produced the following conclusions:

1. Operational Quality does not have a statistically significant effect on Customer Satisfaction at SPBG Cililitan ($\beta = 0.017$; $p = 0.881 > 0.05$). Refueling speed, fuel-volume accuracy, and smooth payment procedures were not direct predictors of Customer Satisfaction in this sample (Nie and Sugiyanto, 2025; Kamel and Mansour, 2023). This result does not reduce management's responsibility to maintain safe, accurate, and transparent operations.
2. Service Staff Quality has a strong positive and statistically significant effect on Customer Satisfaction at SPBG Cililitan ($\beta = 0.805$; $p = 0.000 < 0.01$). Staff friendliness, responsiveness, problem-solving ability, and service knowledge substantially contribute to a satisfactory customer experience (Singh and Singh, 2024; Gonu et al., 2023).
3. Customer Satisfaction has a positive and statistically significant effect on Customer Loyalty at SPBG Cililitan ($\beta = 0.605$; $p = 0.003 < 0.01$). This result is consistent with research indicating that satisfied customers are more likely to revisit and provide positive recommendations (Camilleri and Filieri, 2023; Singh and Singh, 2024). Sustained satisfaction supports a long-term relationship between customers and the service provider.
4. Operational Quality does not have a statistically significant direct effect on Customer Loyalty ($\beta = 0.033$; $p = 0.740 > 0.05$). The study therefore provides no empirical support for a direct Operational Quality $\rightarrow$ Customer Loyalty path (Al-Mu'ani et al., 2024; Aljohani, 2024).
5. Service Staff Quality does not have a statistically significant direct effect on Customer Loyalty ($\beta = 0.168$; $p = 0.391 > 0.05$). Although Service Staff Quality has a strong effect on Customer Satisfaction, its effect on Customer Loyalty is fully mediated by Customer Satisfaction (Li, 2023; Shafiq et al., 2023).

Customer Satisfaction fully mediates the relationship between Service Staff Quality and Customer Loyalty (indirect effect = 0.488; $p = 0.004$). Service Staff Quality has the largest total effect on Customer Loyalty (0.655), consisting of a direct effect of 0.168 and an indirect effect of 0.488 through Customer Satisfaction. No mediation is found for the Operational Quality $\rightarrow$ Customer Loyalty relationship because the OQ $\rightarrow$ CS path is not significant. By distinguishing Operational Quality from Service Staff Quality, the study extends the application of service quality and Customer Loyalty theory to a compressed natural gas filling station and identifies Customer Satisfaction as the mechanism linking staff quality with loyalty. Customer Satisfaction and Customer Loyalty can be strengthened when service delivery is supported by trustworthiness, fairness, accountability, transparency, customer protection, and service excellence. Based on the findings, the following recommendations are directed specifically to SPBG Cililitan management:

Strengthen Service Staff Quality: Conduct regular training on courteous communication, responsiveness, honest explanations, technical competence, problem resolution, and respectful treatment. Establish clear service standards for greeting customers, answering questions, handling complaints, and completing transactions. These standards should reflect amanah, 'adl, and ihsan by requiring responsible, fair, and excellent service for every customer.

Manage Customer Satisfaction as the Main Loyalty Mechanism: Provide transparent information on service procedures, expected waiting times, safety requirements, and transactions. Establish an accessible complaint mechanism through a short survey, suggestion channel, or digital platform, and require prompt follow-up. Apply the same service standards to all customers and use customer feedback in regular staff performance evaluations. Management supervision should function as *hisbah* by ensuring accountability and consistent ethical conduct.

Maintain Operational Quality as a Basic Service Responsibility: Although Operational Quality does not have a statistically significant direct effect in this study, SPBG Cililitan should consistently implement safety inspections, fuel-delivery accuracy checks, equipment maintenance, clear payment procedures, and transparent communication during delays or technical disruptions. Regular supervision should document compliance and corrective action. These measures support *amanah*, accountability, transparency, and customer protection.

Recommendations for Future Research: Future studies may examine other factors associated with Customer Loyalty, such as brand image, intrinsic product or service quality, and price (Rather et al., 2022; Saputra et al., 2024; Ahli et al., 2024; Khalufi et al., 2025). Replication at other SPBG locations may assess the generalizability of the findings (Purba et al., 2024; Christopher and Ruslim, 2025; Rantung and Harianto, 2024). Multiple indicators should be used for Customer Satisfaction and Customer Loyalty to capture their different dimensions and permit internal consistency assessment (Hair et al., 2024; Sarstedt and Liu, 2023). Qualitative or mixed-method approaches may also provide deeper evidence on customer perceptions of Service Staff Quality, Customer Satisfaction, and Customer Loyalty (Ardhana et al., 2024; Zaidan, 2025; Wulandari et al., 2024; Suchanek and Bucicova, 2025).

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AUTHOR CONTRIBUTION STATEMENT

Conceptualization, research design, methodology development, and the formulation of the theoretical framework were carried out by Muhammad Iqbal Syafarie and Yudi Nur Supriadi. Data collection, including questionnaire administration and field data gathering at SPBG Cililitan, was conducted by Muhammad Iqbal Syafarie. Formal analysis, including measurement model assessment, structural model evaluation, and hypothesis testing using PLS-SEM with SmartPLS 3.0, was performed by Muhammad Iqbal Syafarie and Yudi Nur Supriadi. Original draft preparation and writing were conducted by Muhammad Iqbal Syafarie, while review, editing, and revision were performed by Yudi Nur Supriadi. Both authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of this work.

AI DISCLOSURE STATEMENT

During the preparation of this work, the author(s) used AI-assisted tools, such as grammar checkers and language enhancement software, solely for the purpose of improving readability and refining the language of the manuscript. No generative AI tools were used for statistical data analysis using PLS-SEM, interpretation of results, conceptual development, or core scientific writing. The authors take full responsibility for the originality, accuracy, and integrity of the research findings and the final content of this article.

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CONFLICTS OF INTEREST

The authors declare that there are no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The research was conducted independently, and the results are presented objectively and without bias. The authors have no affiliation with or financial interest in SPBG Cililitan or any related organization that could be perceived as influencing the analysis or conclusions of this study.

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