International Journal of Education, Business and Economics Research (IJEBER)

ISSN: 2583-3006

Vol. 6, Issue 1, January-February 2026, pp 43-61

To cite this article: Erwin Dwiyanto, Satria Wiga Trenggana, Dediek Isqak and Ahmad Syamil (2026). How Service Quality Shapes Customer Satisfaction and Loyalty in B2B Construction Services: A PLS-SEM Study of PT Brantas Abipraya. International Journal of Education, Business and Economics Research (IJEBER) 6 (1): 43-61

HOW SERVICE QUALITY SHAPES CUSTOMER SATISFACTION AND LOYALTY IN B2B CONSTRUCTION SERVICES: A PLS-SEM STUDY OF PT BRANTAS ABIPRAYA

Erwin Dwiyanto[1], Satria Wiga Trenggana[2], Dediek Isqak[3] and Ahmad Syamil[4]

[1]Management Department, BINUS Business School Master Program
Bina Nusantara University Jakarta,
Hang Lekir I No. 6, Senayan Jakarta 10270, Indonesia

[2] Management Department, BINUS Business School Master Program
Bina Nusantara University Jakarta,
Hang Lekir I No. 6, Senayan Jakarta 10270, Indonesia

[3]Management Department, BINUS Business School Master Program
Bina Nusantara University Jakarta,
Hang Lekir I No. 6, Senayan Jakarta 10270, Indonesia.

[4]Management department, BINUS Business School Doctor of Research in Management,
Bina Nusantara University, Jakarta,
Hang Lekir I No. 6, Senayan Jakarta 10270, Indonesia

https://doi.org/10.59822/IJEBER.2026.6104

ABSTRACT

State owned construction enterprises face intensifying competitive pressure and budget efficiency constraints that necessitate effective customer retention strategies. Accordingly, this study aims to examine the effects of SERVQUAL dimensions on customer satisfaction and their subsequent impact on customer loyalty within the Precast and Equipment Division of PT BrantasAbipraya. Prior literature confirms the relevance of SERVQUAL in explaining customer satisfaction, yet evidence regarding the translation of satisfaction into loyalty in tender based B2B contexts remains inconclusive. This research adopts a quantitative explanatory design with a cross sectional survey strategy. The population comprises external customers of heavy equipment rental services, with convenience sampling applied to an indefinite population. Of 190 responses collected, 160 valid observations were analyzed using PLS SEM with SmartPLS 4. The findings indicate that all SERVQUAL dimensions exert positive and significant effects on customer satisfaction, with tangibles emerging as the strongest determinant, followed by reliability, empathy, assurance, and responsiveness. Customer satisfaction also has a positive and significant effect on customer loyalty. Future research is encouraged to employ longitudinal designs, multigroup analysis, and incorporate contextual variables such as pricing and tender mechanisms.

KEYWORDS: SERVQUAL, Customer Satisfaction, Customer Loyalty.

1.0 INTRODUCTION

The state-owned construction industry plays a strategic role in Indonesia's national economy. According to [1], the construction sector recorded a growth rate of 7.68% in 2023, while the Quarterly Construction Enterprise Survey (2025) reported a 10.43% contribution to Gross Domestic Product in 2024. Nevertheless, since early 2025, national economic conditions, political dynamics, and government budget efficiency policies have exerted substantial pressure on construction activities. Quarterly growth fluctuations indicate a deceleration trend, reflecting the sector's increasing vulnerability to external macroeconomic shocks. Beyond macro-level pressures, state-owned construction firms face intense competitive rivalry. [1] Identifies fierce competition as the most critical challenge perceived by construction industry players, largely driven by the homogeneity of construction products and services including precast components and heavy equipment rental which are offered by numerous firms with relatively comparable quality and pricing structures [2]. Under such conditions, firms are compelled to develop sustainable differentiation and competitive advantage, as emphasized by [3], [4], [5], who underscore competitive advantage as a fundamental prerequisite for success in Indonesia's increasingly saturated construction market.

One of the most critical strategic pathways to achieving such advantage lies in cultivating customer loyalty. Within B2B business models, loyalty holds substantial strategic value, as partner selection in construction projects is heavily influenced by project managers and operational team recommendations [6]. In B2B contexts, customer loyalty is manifested through resistance to competitors and a willingness to provide favorable recommendations [7]. Consequently, firms that successfully foster customer loyalty are more likely to secure recurring projects without engaging in intense tender-based competition. However, a contrasting phenomenon is observed within the Precast & Equipment Division of PT BrantasAbipraya. Revenue data and new customer acquisition from 2021 to 2024 reveal a significant downward trend, despite consistently high customer satisfaction levels ranging between 75% and 91%. From a theoretical standpoint, customer satisfaction is expected to translate into increased loyalty [6], [8], [9], [10], yet this relationship does not materialize in the observed case. This discrepancy signals a practical knowledge gap concerning the satisfaction–loyalty. [11], [12], suggest that satisfaction does not invariably lead to loyalty, particularly within B2B environments.

SERVQUAL theory has long served as a dominant framework for explaining customer satisfaction through five core dimensions: Tangibles, Reliability, Responsiveness, Assurance, and Empathy. Through continuous service improvement initiatives, the Precast & Equipment Division of PT BrantasAbipraya has demonstrated strong performance across all SERVQUAL dimensions, as reflected in customer evaluations. Tangibles encompass workforce readiness, equipment condition, and spare-part availability [13]. Reliability is reflected in operator efficiency, adherence to project

schedules, and the implementation of quality management and occupational safety standards [14]. Responsiveness is evident in proactive efforts to enhance work quality and adopt innovative operational methods [15]. Assurance relates to customer confidence in quality assurance systems, occupational health and safety compliance, and organizational experience [16]. Empathy is demonstrated through effective communication and sensitivity to project-site and community conditions [6]. Collectively, these dimensions have been empirically validated as antecedents of customer satisfaction [6], [17]. Nevertheless, despite strong SERVQUAL performance, customer loyalty continues to decline, as evidenced by revenue and customer acquisition trends. This phenomenon suggests that the relationship between service quality, satisfaction, and loyalty is not strictly linear.

Such observations are consistent with the mixed findings in prior research. For instance, [18] reported that SERVQUAL dimensions do not significantly affect customer satisfaction, while there is a negative effect of responsiveness on satisfaction. [19] Found assurance to exert a positive influence in logistics services, whereas [13] reported no significant assurance effect in the heavy equipment industry. These inconsistencies underscore the necessity of re-examining SERVQUAL relationships within the specific context of Indonesia's construction sector. The heterogeneity of empirical evidence reinforces the urgency of reassessing the influence of SERVQUAL dimensions on customer satisfaction and the subsequent impact of satisfaction on customer loyalty. This need is particularly salient given the limited empirical attention devoted to Indonesia's precast and heavy equipment construction segments [2], [20]. Furthermore, decision-making authority in construction projects is predominantly centralized at the project manager level, rendering customer loyalty a critical determinant of long-term business sustainability. Accordingly, this study aims to empirically examine the effects of responsiveness, assurance, tangibles, empathy, and reliability on customer satisfaction and to analyze how customer satisfaction influences loyalty within the Precast & Equipment Division of PT BrantasAbipraya.

2.0 THE THEORY OF SERVQUAL

Service quality, as conceptualized by [21], assesses service excellence through the gap between customer expectations and perceptions across five dimensions which are tangibles, responsiveness, empathy, assurance, and reliability [22]. In competitive environments, service quality plays a strategic role in improving customer acquisition efficiency, retention, market share, and profitability, thereby enabling sustainable competitive advantage [22], [23]. Although various service quality scales have been developed [24], [25], SERVQUAL [21] remains the most widely applied framework and has informed derivative models such as RESERV [26], SERVPERF [27], and PROPERTYQUAL [28]. This study adopts the construction-specific SERVQUAL parameters proposed by [6] to examine heavy equipment rental and precast services. While SERVPERF focuses solely on perceived performance [27], SERVQUAL is comprehensive evaluation of service quality in construction contexts where responsiveness, assurance, tangibles, empathy, and reliability are critical [21], [27].

2.1 Responsiveness on Customer Satisfaction

Responsiveness, as a SERVQUAL dimension [21], refers to the service provider's promptness in responding to complaints, delivering services, and ensuring timeliness ([6]. Fulfillment of this

dimension encourages customers to perceive service performance as exceeding their expectations, thereby enhancing customer satisfaction [29]. Responsiveness has even been identified as the strongest determinant of customer satisfaction in certain contexts [30], although studies in other sectors, such as logistics, report a positive yet less dominant effect [31]. Conversely, [32] found that inadequate responsiveness and limited accessibility hinder problem resolution on construction sites, reduce project performance, and ultimately lead to customer dissatisfaction. Despite its theoretical importance, empirical evidence on the direct effect of responsiveness on customer satisfaction within Indonesia's construction industry remains limited, necessitating further examination of this relationship. The following hypothesis is proposed:

H1: Responsiveness has a positive effect on customer satisfaction.

2.2 Assurance on Customer Satisfaction

Customer satisfaction represents an effective response arising from the discrepancy between prior expectations and perceived service performance [23] and is strongly influenced by service quality [33]. Within the SERVQUAL framework, assurance has been extensively examined and is generally found to exert a positive effect on customer satisfaction, as evidenced in logistics services [19], and in some contexts has even emerged as the most dominant determinant of satisfaction [34]. However, [34] argue that the influence of assurance is inherently contingent upon customers' knowledge levels, suggesting that it does not universally function as the primary driver of satisfaction. This ambiguity is further reinforced by the findings of [13], who report that assurance constitutes the only service quality dimension that does not significantly affect customer satisfaction within Myanmar's heavy equipment industry. Consequently, a re-examination of the relationship between assurance and customer satisfaction is warranted. Based on this reasoning, the following hypothesis is proposed:

H2: Assurance has a positive effect on customer satisfaction.

2.3 Tangible on Customer Satisfaction

The tangible dimension constitutes a core SERVQUAL factor that has been shown to exert a strong influence on customer satisfaction, particularly within the real estate sector, where physical form, construction quality, and spatial layout serve as primary evaluative criteria; when these elements meet or exceed customer expectations, satisfaction is consequently reinforced [35]. This finding is consistent with [34], who demonstrate a positive effect of tangibility on customer satisfaction, as customers assess a range of physical attributes such as external structures, spatial environments, facility cleanliness, physical equipment, and employee appearance as key indicators of service quality. Similar evidence is provided by [36], confirming that tangible elements directly contribute to customer satisfaction, in line with [14], who report that cleanliness as a tangible attribute positively affects customer satisfaction in the retail industry. Based on this body of evidence, the following hypothesis is proposed:

H3: Tangibles have a positive effect on customer satisfaction

2.4 Empathy on Customer Satisfaction

[36] Conceptualize empathy as the service provider's ability to comprehend customers' specific needs, deliver individualized attention, and clearly communicate service procedures. Their findings indicate that when empathy is demonstrated through personal attention, friendliness, and a deep understanding of customer needs, customers perceive service quality more favorably, which ultimately enhances customer satisfaction. This perspective is consistent with [37], who asserts that fulfilling customer expectations including the provision of prompt and efficient services directly contributes to satisfaction. Furthermore, [34] emphasize that empathy also entails the capacity to establish emotional connections through warm attitudes and effective communication, enabling customers to experience not only functional service delivery but also a sense of emotional attachment that further strengthens satisfaction. Based on these prior studies, the following hypothesis is proposed:

H4: Empathy has a positive effect on customer satisfaction

2.5 Reliable on Customer satisfaction

Reliability constitutes one of the core SERVQUAL dimensions introduced by [21] and refers to the service provider's ability to deliver promised services accurately and consistently. [38] demonstrate that reliability exerts a positive effect on customer satisfaction across firms in Slovenia, Serbia, and Austria, as customers derive satisfaction from confidence in a provider's dependability in fulfilling commitments. This finding is further supported by [39], who emphasize that reliability encompasses timely and precise service delivery; when service providers consistently perform their duties in accordance with agreed commitments, customer satisfaction is directly enhanced. Based on this reasoning, the following hypothesis is proposed:

H5: Reliability has a positive effect on customer satisfaction.

2.6 Customer Satisfaction on Customer Loyalty

Customer satisfaction represents customers' evaluative judgment of product or service performance relative to their expectations, as well as the degree of pleasure derived from the consumption experience [40]. Satisfaction is a critical construct because it fosters customer loyalty through positive word-of-mouth, greater price tolerance, and repurchase intentions [22], while loyalty itself emerges as an outcome of sustained and satisfactory relational exchanges [20], [41]. Substantial empirical evidence further demonstrates the robustness of the satisfaction–loyalty linkage, as observed in studies conducted in Malaysia and Iran [42], [43], and reinforced by [8], [22], who emphasize customer satisfaction as a key determinant of customer loyalty. Based on this reasoning, the following hypothesis is proposed:

H6: Customer satisfaction has a positive effect on customer loyalty.

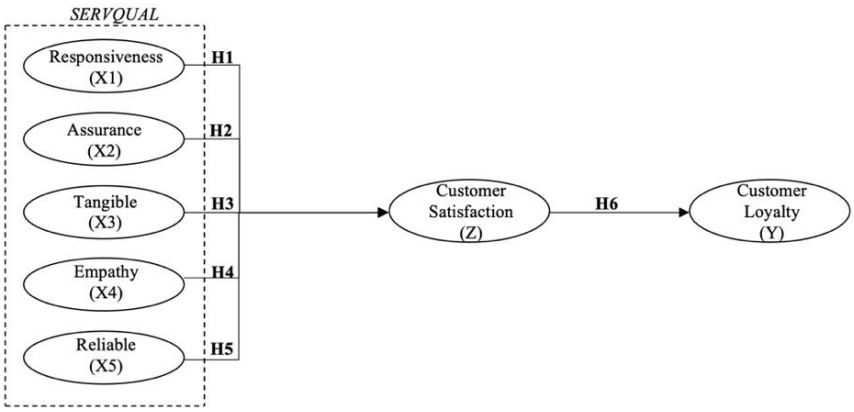

Figure 1: Research Conceptual Model
Source: Adopted from Parasuraman et al. (1985)

3.0 METHODS

This study adopts a quantitative, positivist research paradigm to examine causal relationships among variables through systematic theory development and hypothesis testing [44]. A survey strategy was employed using a digital questionnaire distributed via Google Forms, selected for its efficiency, measurement accuracy, and ability to minimize researcher interference within a non-contrived research setting involving customers of the Precast & Equipment Division of PT BrantasAbipraya. The unit of analysis comprises construction projects, represented by project managers who serve as the primary decision-makers in heavy equipment rental arrangements [44]. Data were collected using a cross-sectional design through an online questionnaire encompassing all study variables and measured on a five-point Likert scale. To ensure instrument clarity and suitability, a pre-test was conducted with 5–10 respondents, followed by a pilot test involving approximately 10% of the minimum sample size (±30–40 respondents) to assess validity and reliability prior to the main data collection.

The study population consists of customers of the Precast & Equipment Division of PT BrantasAbipraya whose project managers originate from outside the firm, and is classified as an indefinite population due to the absence of an exact population frame [44]. A non-probability sampling technique employing convenience sampling was adopted to facilitate respondent access and enhance data collection efficiency [44], [45]. In line with Partial Least Squares Structural Equation Modeling (PLS-SEM) requirements, sample size determination followed the recommended observation-to-variable ratio of 5:1 [46], [47]. Given 32 measurement indicators, a minimum sample size of 160 respondents was deemed sufficient to ensure the reliability of model estimation [46].

Measurement of SERVQUAL dimensions was adapted from [6], while instruments for customer satisfaction and customer loyalty were adapted from [8], [15], respectively. Following data collection, the dataset was cleaned and tabulated before being analyzed using SEM-PLS with SmartPLS 4, selected for its capability to handle complex models, non-normal data distributions, multicollinearity, and relatively small sample sizes [44], [46]. Model evaluation encompassed both measurement and structural models, with hypothesis testing conducted through a bootstrapping

procedure. Reflective measurement models were assessed by examining indicator reliability using outer loadings ≥ 0.708, internal consistency reliability via Cronbach's Alpha, rho_c, and rho_a with threshold values of ≥ 0.70 (or ≥ 0.60 for exploratory research), convergent validity through Average Variance Extracted (AVE) ≥ 0.50, and discriminant validity using the Heterotrait–Monotrait ratio (HTMT) ≤ 0.85 [46]. The structural model was evaluated by testing multicollinearity using Variance Inflation Factor (VIF), assessing effect sizes through f^2 values categorized as small (0.02), medium (0.15), and large (0.35), determining explanatory power via R^2 values classified as small (≥ 0.25–< 0.50), moderate (≥ 0.50–< 0.75), and substantial (≥ 0.75), and examining predictive relevance using PLSpredict by comparing Q^2 values and RMSE or MAE against a linear model benchmark [46]. Hypotheses were tested using bootstrapping, with path relationships statistically significant at the 5% level when p-values were below 0.05.

4.0 RESULTS AND DISCUSSION

Following the preliminary testing phase, which encompassed assessments of convergent and discriminant validity as well as indicator reliability and internal consistency based on 40 respondents, the study proceeded to full scale data collection until the minimum required sample size of 160 respondents was achieved. After data tabulation and rigorous data cleaning procedures, out of 190 responses collected, 160 were deemed valid and suitable for analysis, while 30 responses were excluded due to noncompliance with eligibility criteria, including incomplete questionnaire submissions. Demographic analysis indicates that the majority of respondents held the position of Site Administration Manager or an equivalent role at 39.38 percent, was predominantly male at 93.13 percent, possessed a Diploma IV or Bachelor degree at 83.75 percent, and fell within the age range of thirty four to thirty six years at 60.00 percent. Furthermore, respondents were drawn from several major state owned construction enterprises with a relatively balanced distribution, primarily PT Adhi Karya at 23.75 percent, PT HutamaKarya at 21.88 percent, PT Wijaya Karya at 20.63 percent, PT Pembangunan Perumahan at 18.75 percent, and PT WaskitaKarya at 15.00 percent, with no representation from PT BrantasAbipraya in accordance with the study criteria.

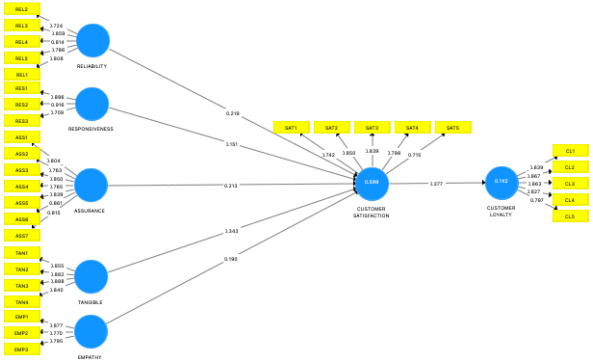

Figure 2: Result of Outer Model
Source: Data Processed by SmartPLS 4. (2025)

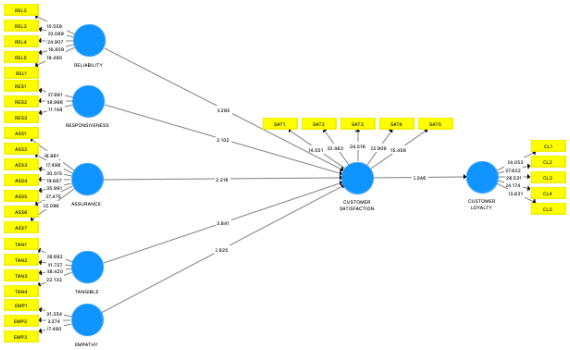

Figure 3: Result of Inner Model
Source: Data Processed by SmartPLS 4. (2025)

4.1 Measurement Model Evaluation

The outer model assessment aims to evaluate the extent to which the measurement instruments employed in this study demonstrate adequate validity and reliability. This evaluation is conducted by examining the relationships within the outer model through indicators of reliability, internal consistency reliability, convergent validity, and discriminant validity.

Table 1: Result of Indicator and Internal Consistency Reliability

Variable	Item Measurement	Indicator Reliability	Internal Consistency Reliability		
		Loading Factor	CA	Composite Reliability	
				Rho_A	Rho_C
Customer Loyalty [15]	I will say positive things about PT BrantasAbipraya – CL1	0.839	0.895	0.906	0.922
	I will continue to rent heavy equipment from PT BrantasAbipraya even if the price is higher than other companies – CL2	0.867			
	I will consider PT BrantasAbipraya again for heavy equipment rental in future projects – CL3	0.863			
	I recommend renting heavy equipment from PT BrantasAbipraya to my colleagues – CL4	0.827			
	I am a loyal customer of PT BrantasAbipraya – CL5	0.797			
Customer Satisfaction [8]	Overall, I am very satisfied with my relationship with PT BrantasAbipraya – SAT1	0.742	0.849	0.859	0.893
	Overall, PT BrantasAbipraya is a good company to collaborate with – SAT2	0.850			
	Overall, PT BrantasAbipraya treats me very fairly – SAT3	0.839			
	The relationship between PT BrantasAbipraya and me is very positive – SAT4	0.798			
	I enjoy maintaining a relationship with PT BrantasAbipraya – SAT5	0.715			
Responsiveness [6]	PT BrantasAbipraya provides services promptly – RES1	0.896	0.799	0.853	0.881
	PT BrantasAbipraya shares information regarding service schedules – RES2	0.916			
	PT BrantasAbipraya is ready to assist, including additional tasks – RES3	0.709			
Assurance [6]	The behavior of PT BrantasAbipraya employees inspires trust – ASS1	0.804	0.915	0.918	0.932
	PT BrantasAbipraya employees demonstrate courteous behavior – ASS2	0.763			

Variable	Item Measurement	Indicator Reliability	Internal Consistency Reliability		
		Loading Factor	CA	Composite Reliability	
				Rho_A	Rho_C
	PT BrantasAbipraya employees conduct proper supervision on site – ASS3	0.850			
	PT BrantasAbipraya employees are competent in resolving problems appropriately – ASS4	0.765			
	PT BrantasAbipraya employees possess sufficient knowledge to answer questions – ASS5	0.839			
	I feel safe during transactions with PT BrantasAbipraya employees – ASS6	0.861			
	PT BrantasAbipraya employees ensure work quality complies with standards – ASS7	0.815			
Tangible [6]	PT BrantasAbipraya has a sufficient number of equipment units – TAN1	0.855	0.889	0.894	0.923
	PT BrantasAbipraya has sufficient workforce to complete assigned tasks – TAN2	0.882			
	PT BrantasAbipraya employees are neat and professionally dressed – TAN3	0.888			
	PT BrantasAbipraya employees demonstrate attention to detail in administrative documents – TAN4	0.840			
Empathy [6]	PT BrantasAbipraya employees understand clients' specific needs – EMP1	0.877	0.750	0.781	0.855
	PT BrantasAbipraya employees have convenient operating hours – EMP2	0.770			
	PT BrantasAbipraya employees provide personal attention to me – EMP3	0.795			
Reliability [6]	PT BrantasAbipraya performs tasks in accordance with the contract – REL1	0.808	0.858	0.865	0.898
	PT BrantasAbipraya fulfills promises beyond contractual agreements – REL2	0.724			
	PT BrantasAbipraya shows genuine concern in resolving problems – REL3	0.859			
	PT BrantasAbipraya provides services at the promised time – REL4	0.814			
	PT BrantasAbipraya regularly and continuously reports equipment condition – REL5	0.786			

Source: Data Processed by SmartPLS 4. (2025)

As shown in Table 1, all measurement items meet the recommended indicator reliability criterion (LF > 0.6), confirming their validity. The highest loadings are observed for CL2 in Customer Loyalty (0.867), SAT2 in Customer Satisfaction (0.850), RES2 in Responsiveness (0.916), ASS6 in Assurance (0.861), TAN3 in Tangibles (0.888), EMP1 in Empathy (0.877), and REL3 in Reliability (0.859). Internal consistency results further indicate strong reliability, with Cronbach's Alpha values ranging from 0.750 to 0.915 and Composite Reliability exceeding 0.85 for all constructs, confirming that the measurement model is reliable for further analysis.

Table 2: Convergent and Discriminant Validity

Variable	Convergent Validity	Discriminant Validity						
	AVE	Heterotrait-Monotrait Ratio (HTMT)						
		ASS	CL	CS	EMP	REL	RES	TAN
Assurance	0.664							
Customer Loyalty	0.703	0.077						
Customer Satisfaction	0.625	0.682	0.429					
Empathy	0.664	0.512	0.317	0.593				
Reliability	0.639	0.350	0.170	0.476	0.310			
Responsiveness	0.715	0.385	0.119	0.541	0.278	0.234		
Tangible	0.751	0.632	0.161	0.719	0.403	0.181	0.519	

Source: Data Processed by SmartPLS 4. (2025)

Based on the measurement model assessment, all constructs comprising Responsiveness, Assurance, Tangibles, Empathy, Reliability, Customer Satisfaction, and Customer Loyalty satisfy convergent and discriminant validity criteria. The Average Variance Extracted values for all constructs exceed the recommended threshold of 0.50 as proposed by [48], indicating that each latent construct explains more than 50 percent of the variance in its indicators. Discriminant validity, assessed using the Heterotrait–Monotrait Ratio, further confirms that all interconstruct values remain below the 0.90 threshold, indicating the absence of conceptual overlap. These confirm the conceptual clarity and measurement of all constructs.

4.2 Structural Model Evaluation

This stage is conducted in accordance with the procedural recommended by [48], including the evaluation of collinearity within the structural model, the examination of the effect size, coefficient determination, PLSPredict, and the research hypotheses testing.

Table 3: Colinearity Statistics and Effect Size

Variable	VIF	f-square
Responsiveness -> Customer Satisfaction	1.282	0.045
Assurance -> Customer Satisfaction	1.744	0.065
Tangible -> Customer Satisfaction	1.707	0.172
Empathy -> Customer Satisfaction	1.284	0.070

Reliability -> Customer Satisfaction	1.141	0.105
Customer Satisfaction -> Customer Loyalty	1.000	0.165

Source: Data Processed by SmartPLS 4. (2025)

Based on the structural model evaluation, the collinearity assessment indicates that all Variance Inflation Factor values range from 1.000 to 1.744, well below the recommended threshold of 3.0 proposed by [48], confirming the absence of multicollinearity and allowing accurate interpretation of path coefficients. The analysis reveals varying levels of influence, with Tangibles emerging as the strongest predictor of Customer Satisfaction with an f^2 value of 0.172, followed by Reliability at 0.105, Empathy at 0.070, and Assurance at 0.065 which fall within the small to moderate range, while Responsiveness exhibits a small effect of 0.045. Customer Satisfaction also exerts a moderate effect on Customer Loyalty with an f^2 value of 0.165, highlighting satisfaction as an important loyalty determinant despite the influence of external factors such as price and tender policies in B2B construction. Furthermore, the adjusted R square for Customer Satisfaction is 0.586, means that Responsiveness, Assurance, Tangibles, Empathy, and Reliability jointly explain 58.6 percent of the variance, which corresponds to a moderate explanatory power [48]. In contrast, the adjusted R square for Loyalty is 0.137, reflecting a weak explanatory effect and confirming that customer loyalty at PT BrantasAbipraya is substantially shaped by additional factors beyond those included in the model.

Table 4: The Result of PLSPredict

ITEMS	LM RMSE	PLS RMSE	LM MAE	PLS MAE
CL1	0.809	0.786	0.637	0.630
CL4	0.816	0.796	0.636	0.627
CL3	0.873	0.830	0.692	0.678
CL2	0.819	0.798	0.691	0.671
CL5	0.890	0.822	0.691	0.675
SAT3	0.572	0.569	0.428	0.450
SAT4	0.637	0.743	0.493	0.572
SAT2	0.562	0.598	0.407	0.465
SAT1	0.536	0.623	0.380	0.496
SAT5	0.675	0.688	0.503	0.527

Source: Data Processed by SmartPLS 4. (2025)

Based on the PLS Predict results, the majority of Customer Satisfaction and Customer Loyalty indicators exhibit lower PLS MAE values compared to LM MAE, indicating strong predictive capability of the PLS SEM model in line with [48]. Although a small number of satisfaction indicators, such as SAT4, show slightly higher PLS MAE values than LM MAE, the model overall demonstrates adequate predictive stability and sufficiency in forecasting customer satisfaction and loyalty behavior within the context of project based construction services at PT BrantasAbipraya.

Table 5: Result of Hypothesis Testing

Hypothesis	Original sample (O)	Sample mean (M)	STDEV	T statistics	P values	Ket
Direct Path						
H1: RES -> SAT	0.151	0.155	0.072	2.102	0.036	Diterima
H2: ASS -> SAT	0.213	0.213	0.092	2.318	0.021	Diterima
H3: TAN -> SAT	0.343	0.335	0.089	3.841	0.000	Diterima
H4: EMP -> SAT	0.190	0.187	0.067	2.825	0.005	Diterima
H5: REL -> SAT	0.219	0.224	0.067	3.295	0.001	Diterima
H6: SAT –> CL	0.377	0.384	0.075	5.046	0.000	Diterima

Source: Data Processed by SmartPLS 4. (2025)

Based on the hypothesis testing results, all structural paths are statistically significant with p values below 0.05 and exhibit positive directions, leading to the acceptance of all proposed hypotheses. The findings demonstrate that all service quality dimensions comprising Responsiveness, Assurance, Tangibles, Empathy, and Reliability significantly influence Customer Satisfaction, with Tangibles emerging as the most dominant determinant, followed by Reliability, Assurance, Empathy, and Responsiveness. Furthermore, Customer Satisfaction exerts a positive and significant effect on Customer Loyalty, confirming its role as a key mediating mechanism in the formation of customer loyalty. These results substantiate that comprehensive service quality enhancement constitutes a strategic lever for strengthening customer satisfaction and loyalty within PT BrantasAbipraya's project based construction service context.

4.3 Responsiveness on Customer Satisfaction

The results of H1 confirm that responsiveness has a positive and significant effect on customer satisfaction, indicating that higher service responsiveness at PT BrantasAbipraya leads to greater customer satisfaction, consistent with the findings of [6], [30], [49]. In the context of state owned construction projects, which are highly dependent on timeliness, coordination, and operational flexibility, responsiveness is reflected not only in prompt reactions but also in the ability to adapt services to dynamic project conditions, including the provision of support beyond initial contractual arrangements. However, the effect size analysis reveals that responsiveness contributes the least to customer satisfaction relative to other service quality dimensions, suggesting that responsiveness is perceived as a basic service requirement rather than a key source of differentiation. This finding reinforces the SERVQUAL framework, wherein responsiveness functions as a foundational prerequisite for maintaining customer satisfaction, while more substantial satisfaction gains are driven by other service quality dimensions.

4.4 Assurance on Customer Satisfaction

The results for H2 indicate that assurance has a positive and significant effect on customer satisfaction, confirming that the credibility, technical competence, and professionalism of PT BrantasAbipraya's personnel enhance customer satisfaction, consistent with [21], [50]. In the context of complex and high-pressure state-owned construction projects, customers, predominantly technically trained project managers, assess service quality based on professional expertise and

problem-solving capability, positioning assurance as a key source of trust. However, effect size results reveal that assurance contributes less to satisfaction than tangibles, empathy, and reliability, suggesting that assurance is perceived as a basic requirement expected of large firms rather than a primary differentiator, although it remains essential for maintaining trust and smooth working relationships.

4.5 Tangible on Customer Satisfaction

The results of H3 indicate that tangibles have a positive and significant effect on customer satisfaction, confirming that the physical condition of heavy equipment, supporting facilities, and the professional appearance of PT BrantasAbipraya's workforce constitute the primary determinants of customer satisfaction, consistent with [21], [51] In asset-based construction services, customers, predominantly project officials, evaluate service quality rationally through directly observable physical evidence, particularly equipment readiness and performance as indicators of provider professionalism. Effect size analysis further shows that tangibles exert the strongest influence among all service quality dimensions, underscoring the dominance of physical and technical aspects in shaping satisfaction. This finding reinforces the SERVQUAL framework and the technical quality perspective, whereby service quality in the construction sector is primarily assessed through tangible outcomes and objectively measurable operational conditions.

4.6 Empathy on Customer Satisfaction

The results of H4 demonstrate that empathy has a positive and significant effect on customer satisfaction, indicating that personal attention, an in depth understanding of project specific needs, and the demonstrated concern of PT BrantasAbipraya play a meaningful role in enhancing customer satisfaction, consistent with the findings of [52], [53]. In the context of technically intensive and dynamic state owned construction projects, empathy is manifested through service flexibility, support beyond standard working hours, and adaptive communication aligned with on site conditions, thereby fostering a sense of appreciation and prioritization among customers. Nevertheless, the effect size results indicate that the contribution of empathy is moderate, weaker than tangibles and reliability but stronger than assurance and responsiveness, suggesting that empathy functions as a complementary factor that strengthens the quality of working relationships, particularly after fundamental technical and operational requirements have been fulfilled.

4.7 Reliability on Customer Satisfaction

The results of H5 indicate that reliability has a positive and significant effect on customer satisfaction, confirming that PT BrantasAbipraya's ability to fulfill contractual commitments, maintain service consistency, and deliver outcomes in accordance with agreed specifications constitutes a critical determinant of customer satisfaction, in line with Le et al. (2020); Parasuraman et al. (1985). In the context of state owned construction projects, where customers are predominantly project executives, satisfaction is primarily evaluated based on contractual compliance, timeliness, and onsite technical reliability as the foundation of trust in the service provider. Although some perceptual variation remains in administrative aspects such as equipment condition reporting, the effect size results show that reliability exerts a moderate influence, weaker than tangibles but stronger than empathy, assurance, and responsiveness, thereby reinforcing its role as a core foundation of service quality within the SERVQUAL framework.

4.8 Customer Satisfaction on Customer Loyalty

The results of H6 demonstrate that customer satisfaction has a positive and significant effect on customer loyalty, confirming that satisfaction constitutes a primary determinant in the formation of long term B2B relational loyalty, consistent with [9], [21], [23]. In the context of tender based state owned construction projects, customer satisfaction arises not only from functional performance but also from relational attributes such as comfort, communication quality, and the nature of interactions throughout the project lifecycle, which foster preference and positive recommendations toward PT BrantasAbipraya. Although actual loyalty behavior remains constrained by external factors such as pricing and procurement regulations, the effect size results indicate a moderate and among the strongest influences in the model, underscoring the strategic role of customer satisfaction as the central foundation for loyalty formation and the sustainability of collaborative relationships.

5.0 CONCLUSION

The evaluation of the measurement and structural models demonstrates that all SERVQUAL dimensions comprising responsiveness, assurance, tangibles, empathy, and reliability exert positive and significant effects on customer satisfaction, with tangibles emerging as the most dominant determinant, followed by reliability, empathy, assurance, and responsiveness, which is largely perceived as a minimum service standard. Furthermore, customer satisfaction is shown to have a positive and significant effect on customer loyalty, although within the context of state owned construction enterprises this relationship is partially shaped by external constraints such as tender policies and budget efficiency requirements. Overall, these findings confirm that superior service quality, particularly in terms of physical evidence and technical reliability represents a strategic lever for fostering customer satisfaction and cultivating loyal preferences in project based construction services.

This study reinforces the relevance of SERVQUAL theory in a business to business construction context by demonstrating that all service quality dimensions significantly influence customer satisfaction, albeit with context dependent weights. In project and contract based construction services, tangibles and reliability function as the most influential determinants, reflecting the centrality of technical quality and observable outcomes, whereas responsiveness and assurance operate primarily as baseline service prerequisites and empathy serves as a relational enhancer. Customer satisfaction further exerts a positive effect on customer loyalty, although its magnitude is moderate, as loyalty within state owned tender based systems is more accurately reflected in preference and recommendation rather than repeated contractual engagement. These results extend the application of SERVQUAL by emphasizing that the effectiveness of each dimension is contingent upon industry characteristics and the prevailing business model.

From a managerial perspective, the findings provide strategic implications for PT BrantasAbipraya by underscoring that enhancing customer satisfaction and customer loyalty cannot rely solely on descriptive satisfaction scores but must prioritize service quality dimensions with the strongest causal effects. Tangibles and reliability constitute the primary drivers of satisfaction in business to business construction services and therefore require reinforcement not only through well maintained heavy equipment but also through integrated, transparent administrative systems, documentation, and project reporting. Responsiveness and assurance have evolved into baseline

expectations, necessitating consistency and system level strengthening of communication and cross project competencies rather than reliance on individual speed or professionalism. Empathy plays a complementary relational role and should be institutionalized through flexible and sustainable operational support. Although customer satisfaction contributes to customer loyalty, loyalty in a tender based business to business environment remains predominantly preferential and recommendation oriented rather than contractual. Consequently, firms must strategically manage customer satisfaction through data driven approaches to convert relational capital into competitive advantage in future tender processes.

Despite successfully validating all hypothesized relationships using PLS SEM, this study is subject to limitations including a cross sectional design, the absence of group comparison across managerial roles, project types, and scales, and the lack of qualitative data to enrich the interpretation of quantitative findings. Moreover, the moderate explanatory power of the model suggests the presence of additional determinants beyond SERVQUAL such as pricing, reputation, tender mechanisms, and contractual characteristics, as well as a measurement of customer loyalty that primarily captures attitudinal rather than behavioral loyalty in a tender based business to business setting. Future research is therefore encouraged to adopt longitudinal designs, multigroup analysis, and mixed method approaches, while extending the model with contextual variables to more comprehensively capture decision making complexity and loyalty dynamics in the business to business construction industry.

REFERENCES

[1] B. P. Statistik, "Indikatorkonstruksi: Triwulan IV 2024," 2025. [Online]. Available: https://www.bps.go.id/id/publication/2025/03/27/9bae1d4a4dd0b3cd7fb31ffd/indikator-konstruksi--triwulan-iv-2024.html

[2] A. W. Fahreva, Y. Latief, R. Hidayawanti, R. A. Machfudiyanto, L. S. Riantini, and H. Setyowardhani, "Innovation of marketing strategy for spun pile products at precast construction company in Indonesia with a risk approach and ISO 56002 innovation process to increase competitiveness," 2025, p. 040102. doi: 10.1063/5.0254394.

[3] D. Kelly Sawlani, I. Gautama So, A. Furinto, and M. Hamsal, "The Effect of Competitive Advantage on Company Performance in the Construction Industry Sector in Indonesia," *Psychol Educ*, vol. 58, no. 5, 2021.

[4] B. W. Soemardi and K. S. Pribadi, "The Indonesian Construction Industry, 1995–2019," in *Construction Industry Advance and Change: Progress in Eight Asian Economies Since 1995*, Emerald Publishing Limited, 2021, pp. 63–87. doi: 10.1108/978-1-80043-504-920211004.

[5] R. Romo, F. Orozco, E. Forcael, and F. Moreno, "Towards a Model That Sees Human Resources as a Key Element for Competitiveness in Construction Management," *Buildings*, vol. 13, no. 3, 2023, doi: 10.3390/buildings13030774.

[6] C. C. M. T. Win, T. C. Dodanwala, and D. S. Santoso, "Synthesizing customer satisfaction and loyalty through contractors' service quality and brand image," *Engineering, Construction and Architectural Management*, Nov. 2024, doi: 10.1108/ECAM-06-2023-0633.

[7] P. Kittur and S. Chatterjee, "Goods and services related brand image and B2B customer loyalty: effects of construal level," *Journal of Business and Industrial Marketing*, vol. 36, no. 1, 2021, doi: 10.1108/JBIM-06-2019-0284.

[8] N. Sharma, "How core, technical and social components of business relationship value drive customer satisfaction and loyalty in high tech B2B market," *Journal of Business and Industrial Marketing*, vol. 37, no. 5, 2022, doi: 10.1108/JBIM-12-2020-0554.

[9] M. Á. Zea-de la Torre, J. A. Jimber-del Río, J. Nuñez-Tabales, F. J. Rey-Carmona, and A. Vergara-Romero, "Residential Customer Satisfaction in a Latin American Urban Context," *Journal of the Knowledge Economy*, 2024, doi: 10.1007/s13132-024-01818-y.

[10] Y. J. Cho, L. Xue, S. R. Huang, and Z. P. Yang, "Construction and application of customer satisfaction model with the service quality of last-mile delivery in rural areas," *WSEAS Transactions on Business and Economics*, vol. 18, 2021, doi: 10.37394/23207.2021.18.69.

[11] R. A. Abidin, Y. Yudistria, and A. H. Ramli, "The Effect Of Customer Experience, Customer Satisfaction And Word Of Mouth On Customer Loyalty," *JurnalIlmiahManajemenKesatuan*, vol. 13, no. 2, pp. 685–702, Mar. 2025, doi: 10.37641/jimkes.v13i2.2125.

[12] Cherlin, P. Gultom, and S. Faris, "The Influence Of Price And Products On Customer Loyalty With Customer Satisfaction As A Mediation Variabele On Customer Biscuit Brand Hatari See Hong Puff," *International Journal of Business, Economics and Law*, vol. 24, no. 6, 2021.

[13] P. K. Soe, A. Bhaumik, and M. Chakravarthy, "The Impact of Service Qualities on Customer Satisfaction in Myanmar Heavy Equipment Machinery Industry," *International Journal on Recent Trends in Business and Tourism*, vol. 07, no. 03, 2023, doi: 10.31674/ijrtbt.2021.v07i03.001.

[14] K. Yang, J. Kim, J. Min, and A. Hernandez-Calderon, "Effects of retailers' service quality and legitimacy on behavioral intention: the role of emotions during COVID-19," *Service Industries Journal*, vol. 41, no. 1–2, 2021, doi: 10.1080/02642069.2020.1863373.

[15] A. Setijanto, I. G. So, F. Alamsjah, and V. U. Tjhin, "The influence of service quality, Guanxi, value co-creation and corporate image in building developers apartments loyalty toward contractors in apartment construction industry," *Cogent Business & Management*, vol. 11, no. 1, Dec. 2024, doi: 10.1080/23311975.2024.2422565.

[16] S. D. Trivedi, A. Nigam, and A. Pareek, "Service quality dimensions in the manufacturer–distributor dyadic relationship: manufacturer-to-distributor context," *International Journal of Retail and Distribution Management*, vol. 51, no. 3, 2023, doi: 10.1108/IJRDM-08-2022-0283.

[17] D. Malki, M. Bellahcene, H. Latreche, M. Terbeche, and R. Chroqui, "How social CRM and customer satisfaction affect customer loyalty," *Spanish Journal of Marketing - ESIC*, vol. 28, no. 4, 2024, doi: 10.1108/SJME-09-2022-0202.

[18] R. Lesmana, A. Sutarman, and N. Sunardi, "Building a customer loyalty through service quality mediated by customer satisfaction," *American Journal of Humanities and Social Sciences Research*, vol. 5, no. 3, 2021.

[19] O. R. Aluko, G. I. Idoro, and M. C. Mewomo, "Relationship between perceived service quality and client satisfaction indicators of engineering consultancy services in building projects," *Journal of Engineering, Design and Technology*, vol. 19, no. 2, 2021, doi: 10.1108/JEDT-03-2020-0084.

[20] L. A. Masitenyane and M. Dhurup, "Predictors of business-to-business loyalty and repurchase intentions in South Africa's concrete product market," *South African Journal of Business Management*, vol. 54, no. 1, 2023, doi: 10.4102/sajbm.v54i1.3575.

[21] A. Parasuraman, V. A. Zeithaml, and L. L. Berry, "A Conceptual Model of Service Quality and Its Implications for Future Research," *J Mark*, vol. 49, no. 4, 1985, doi: 10.1177/002224298504900403.

[22] M. Lee, M. Kang, and J. Kang, "Cultural influences on B2B service quality-satisfaction-loyalty," *Service Industries Journal*, vol. 39, no. 3–4, 2019, doi: 10.1080/02642069.2018.1495710.

[23] W. Fadhila and K. C. P. Putra, "Experience Quality's Impact on Green Customer Satisfaction Mediated by Green Perceived Value in the Malang Ecotourism Landscape," *International Journal of Green Tourism Research and Applications*, vol. 6, no. 1, pp. 8–20, Jun. 2024, doi: 10.31940/ijogtra.v6i1.8-20.

[24] D. Sanderson, "Determinants of satisfaction amongst occupiers of commercial property," 2017. doi: 10.15396/eres2015_86.

[25] C. C. Yang, "The refined Kano's model and its application," *Total Quality Management and Business Excellence*, vol. 16, no. 10, 2005, doi: 10.1080/14783360500235850.

[26] S. Nelson and T. Nelson, "RESERV: An Instrument for Measuring Real Estate Brokerage Service Quality," *Journal of Real Estate Research*, vol. 10, no. 1, 1995, doi: 10.1080/10835547.1995.12090768.

[27] J. J. Cronin and S. A. Taylor, "Measuring Service Quality: A Reexamination and Extension," *J Mark*, vol. 56, no. 3, 1992, doi: 10.2307/1252296.

[28] Z. A. Baharum, A. H. Nawawi, and Z. M. Saat, "Assessment of Property Management Service Quality of Purpose Built Office Buildings," *International Business Research*, vol. 2, no. 1, 2009, doi: 10.5539/ibr.v2n1p162.

[29] A. Supriyanto, B. B. Wiyono, and B. Burhanuddin, "Effects of service quality and customer satisfaction on loyalty of bank customers," *Cogent Business and Management*, vol. 8, no. 1, 2021, doi: 10.1080/23311975.2021.1937847.

[30] R. Kant and D. Jaiswal, "The impact of perceived service quality dimensions on customer satisfaction," *International Journal of Bank Marketing*, vol. 35, no. 3, pp. 411–430, May 2017, doi: 10.1108/IJBM-04-2016-0051.

[31] D. N. Le, H. T. Nguyen, and P. Hoang Truong, "Port logistics service quality and customer satisfaction: Empirical evidence from Vietnam," *Asian Journal of Shipping and Logistics*, vol. 36, no. 2, 2020, doi: 10.1016/j.ajsl.2019.10.003.

[32] O. Oyeyipo, B. Adeyemi, I. Osuizugbo, and R. Ojelabi, "Service quality of building services consultants in building project delivery; clients' perspectives," *International Journal of Construction Management*, vol. 22, no. 15, 2022, doi: 10.1080/15623599.2020.1829784.

[33] Y. Wang, Z. Zhang, M. Zhu, and H. Wang, "The Impact of Service Quality and Customer Satisfaction on Reuse Intention in Urban Rail Transit in Tianjin, China," *Sage Open*, vol. 10, no. 1, 2020, doi: 10.1177/2158244019898803.

[34] Y. Huang and D. Kim, "How Does Service Quality Improve Consumer Loyalty in Sports Fitness Centers? The Moderating Role of Sport Involvement," *Sustainability (Switzerland)*, vol. 15, no. 17, 2023, doi: 10.3390/su151712840.

[35] A. Kumar, "Does facility-maintenance service quality drive tenants' willingness to pay higher rent? Evidence from Indian residential real estate infrastructure," *Facilities*, vol. 42, no. 9/10, pp. 789–810, Jul. 2024, doi: 10.1108/F-08-2023-0069.

[36] S. Zygiaris, Z. Hameed, M. AyidhAlsubaie, and S. Ur Rehman, "Service Quality and Customer Satisfaction in the Post Pandemic World: A Study of Saudi Auto Care Industry," *Front Psychol*, vol. 13, 2022, doi: 10.3389/fpsyg.2022.842141.

[37] A. A. E. Othman, "An international index for customer satisfaction in the construction industry," 2015. doi: 10.1080/15623599.2015.1012140.

[38] G. Jagodič and B. Milfelner, "The role of B2B marketing strategy, ICT B2B marketing support, and service quality in market orientation–Performance relationship: evidence from three European countries," *Cogent Business and Management*, vol. 9, no. 1, 2022, doi: 10.1080/23311975.2022.2128252.

[39] A. O. Raphael, O. S. Samuel, and A. A. Dipeolu, "Evaluation of Service Quality Gaps in Construction Professional Service Firms in Nigeria," *Journal of Construction in Developing Countries*, vol. 27, no. 1, 2022, doi: 10.21315/jcdc2022.27.1.2.

[40] K. L. Keller and P. Kotler, "Holistic marketing: A broad, integrated perspective to marketing management," in *Does Marketing Need Reform?: Fresh Perspectives on the Future*, 2015.

[41] G. I. Phang and Y. S. Sim, "Rational or Emotional? An Examination of Customer Loyalty in B2B Packaged Food Retail Setting," *Asian Journal of Business Research*, vol. 10, no. 1, May 2020, doi: 10.14707/ajbr.200073.

[42] C. B. Liat, S. Mansori, G. C. Chuan, and B. C. Imrie, "Hotel Service Recovery and Service Quality: Influences of Corporate Image and Generational Differences in the Relationship between Customer Satisfaction and Loyalty," *Journal of Global Marketing*, vol. 30, no. 1, 2017, doi: 10.1080/08911762.2016.1262932.

[43] H. B. K. Nobar and R. Rostamzadeh, "The impact of customer satisfaction, customer experience and customer loyalty on brand power: Empirical evidence from hotel industry," *Journal of Business Economics and Management*, vol. 19, no. 2, 2018, doi: 10.3846/jbem.2018.5678.

[44] U. Sekaran and R. Bougie, *Research Methods For Business; A Skill-Building Approach (Seventh Edition). Chichester, West Sussex, United Kingdom*. 2016.

[45] L. Cohen, M. Lawrence, and K. Morrison, "Research Methods in Education. Eighth Edition," 2017.

[46] J. F. Hair, G. T. M. Hult, C. M. Ringle, and M. Sarstedt, *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Sage Publishing, 2022.

[47] M. Sarstedt, J. F. Hair, and C. M. Ringle, "'PLS-SEM: indeed a silver bullet'–retrospective observations and recent advances," *Journal of Marketing Theory and Practice*, vol. 31, no. 3, 2023, doi: 10.1080/10696679.2022.2056488.

[48] J. F. Hair, G. T. M. Hult, C. M. Ringle, and M. Sarstedt, *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Sage Publishing, 2022.

[49] E. Le Fur and J. F. Outreville, "Financial literacy, education and risk aversion: a survey of French students," *Managerial Finance*, vol. 48, no. 9–10, 2022, doi: 10.1108/MF-10-2021-0509.

[50] T. Vo-Thanh, T. Van Vu, N. P. Nguyen, D. Van Nguyen, M. Zaman, and H. Chi, "How does hotel employees' satisfaction with the organization's COVID-19 responses affect job insecurity and job performance?," *Journal of Sustainable Tourism*, vol. 29, no. 6, 2020, doi: 10.1080/09669582.2020.1850750.

[51] D. N. Le, H. T. Nguyen, and P. Hoang Truong, "Port logistics service quality and customer satisfaction: Empirical evidence from Vietnam," *Asian Journal of Shipping and Logistics*, vol. 36, no. 2, 2020, doi: 10.1016/j.ajsl.2019.10.003.

[52] S. Zygiaris, Z. Hameed, M. AyidhAlsubaie, and S. Ur Rehman, "Service Quality and Customer Satisfaction in the Post Pandemic World: A Study of Saudi Auto Care Industry," *Front Psychol*, vol. 13, 2022, doi: 10.3389/fpsyg.2022.842141.

[53] K. Yang, J. Kim, J. Min, and A. Hernandez-Calderon, "Effects of retailers' service quality and legitimacy on behavioral intention: the role of emotions during COVID-19," *Service Industries Journal*, vol. 41, no. 1–2, 2021, doi: 10.1080/02642069.2020.1863373.

