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## PLS-SEM Modeling of the Relationship Between University Service Quality and Student Satisfaction: Evidence from a Peruvian Public University

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### Abstract

To determine the influence of university service quality on student satisfaction at a public university in Lima during the year 2023. The study designs and validates a formative model supported by an appropriate data collection instrument to assess the most relevant dimensions in the context of public universities. The research follows a quantitative approach, with a non-experimental, cross-sectional, and correlational-causal design. A data collection instrument (Likert-type survey) was developed, and content validity was assessed by expert judgment using Aiken's *V* coefficient and confidence interval methods. Reliability analysis was conducted through Cronbach's alpha internal consistency method. A multivariate analysis was carried out with 85 undergraduate students enrolled in the tenth academic term of the School of Industrial Engineering, Faculty of Industrial Engineering at the National University of San Marcos (UNMSM), each registered for a minimum of 12 academic credits. Partial Least Squares Structural Equation Modeling (PLS-SEM) was then performed. The instrument (questionnaire) was validated, and the model's validity and reliability were confirmed. The results indicate that service quality has a positive and significant relationship (0.919) with student satisfaction in the structural model.

**Keywords:** Service Quality, Student Satisfaction, Structural Equation Modeling, PLS-SEM, Public University.

### Introduction

Ensuring service quality in public universities is a complex challenge, hindered by multiple factors that complicate the continuous provision of high-quality education. The reliance on limited and unstable state budgets, often vulnerable to frequent cuts caused by economic crises, restricts critical investments in modern infrastructure, updated technological equipment, and the creation of new academic programs aligned with societal demands. Equally relevant is the pressure to expand access and equity, which entails admitting a greater number of students with varying levels of academic preparation and diverse socioeconomic backgrounds (Moeurn, 2025; Novaes, 2025). This situation requires significant efforts to provide robust academic support and efficient university services that foster student success. Nonetheless, the ongoing concern for student satisfaction (Nobario Moreno, 2018), through continuous assessment of service quality, serves as a guiding mechanism for identifying priority areas to ensure student well-being (Herrera Torres et al., 2024).

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Ali and Ahmad (2021) found that information quality, ease of use, perceived usefulness, system quality, and computer self-efficacy influenced student satisfaction with Moodle at Palestine Technical University. Kapustina et al. (2020) proposed a modified HEdPERF model to assess the quality and sustainability of post-pandemic higher education at the Ural State University of Economics, emphasizing the role of qualified staff and institutional location. Muhammad et al. (2019) reported high satisfaction (86.75%) with e-learning websites at Stikubank University but identified improvement areas in clarity, accuracy, and communication. Similarly, Subandi et al. (2019) highlighted website appearance as a key determinant of satisfaction among returning visitors at SMK Muhammadiyah schools.

There is a strong relationship between website quality (assessed using WebQual) and student satisfaction, emphasizing the importance of communication, information, and security (Zeqiri et al., 2023; Napitupulu, 2017). Comparable findings were observed in personal and institutional dimensions among students from different disciplines, although differences emerged in curricular (more favorable for biosanitary fields) and teaching dimensions (for humanities) (Bertolini et al., 2024; Ordóñez Sierra & Rodríguez Gallego, 2016). The relevance of service quality dimensions in universities, such as accessibility, human relations, attitudes, and social responsibility, has been demonstrated in user satisfaction (Gupta & Kaushik, 2018; Alvarado Peña & Izaguirre Díaz De León, 2015). Furthermore, it was concluded that the perception of quality at Universidad Adventista del Plata is influenced by cultural and contextual factors, and that its evaluation requires specific indicators defined by each institution (Amado Mateus et al., 2024; Tumino & Poitevin, 2013).

Álvarez (2021) examined the influence of the HEdPERF model on the satisfaction of 1,191 undergraduate and graduate students from three Peruvian public universities, finding that perceived quality significantly influenced satisfaction, with “Reputation” and “Programs” identified as dimensions of high perceived quality, and “Economic Accessibility,” “Institutional Licensing Mechanism,” and “High Employability” as determinants for university recommendation. Meanwhile, Chumpitaz (2021), through structural equation modeling, demonstrated that factors such as security, reliability, empathy, tangibility, and responsiveness were significant and positively influential in determining service quality. The present study aimed to determine the influence of university service quality on student satisfaction at a public university in Lima during 2023. The research is justified by the relevance of knowledge management processes within higher education institutions and other organizations, as it seeks to promote interest in the evaluation of service quality while serving as a reference for future researchers. By employing a multidimensional approach through PLS-SEM and a validated instrument, the study underscores the practical importance of assessing university service quality to foster an environment of excellence. Moreover, it aspires to strengthen the philosophy of quality within universities by disseminating knowledge, simplifying communication, and facilitating efficient information management and standardization of criteria. It is essential to highlight that student satisfaction represents a primary objective supported by prior research linking quality and satisfaction, making its measurement crucial for institutional sustainability and the promotion of continuous improvement and innovation.

The evaluation of student satisfaction with the quality of educational services, which encompasses academic, non-academic, and infrastructural aspects, has gained increasing

relevance amid the technological revolution in higher education. This transformation is reshaping teaching and learning methods by transcending the physical classroom through e-learning, which provides flexibility and unrestricted access in terms of space and time (Sahin et al., 2024; Sitar-Tăut & Moisescu, 2024). The COVID-19 pandemic, beginning in 2020, accelerated this transition toward digitalization (Muhammad et al., 2019), making face-to-face learning less central. Although prior research in Peruvian public universities has demonstrated the influence of perceived quality on student satisfaction within traditional in-person settings, it remains uncertain whether this perception persists in hybrid environments characterized by semi-presential learning and intensive use of information technologies (Attuquayefio et al., 2025).

## **University Service Quality**

Quality in the educational context, from the student's perspective, is defined as a factor that drives intellectual, moral, emotional, and social development, maximizing the institution's capacity to achieve these outcomes. It is also understood as the evaluation of expectations versus the perceived experience received by the student, representing a multidimensional assessment of the overall educational experience, encompassing not only teaching performance but also infrastructure, equipment, and support services. Given the diversity of methodologies and scales used to measure both service quality and student satisfaction, there is no universally accepted definition (Kayyali, 2025; Araiza et al., 2016).

Educational organizations have the responsibility to ensure total quality management in higher education. This requires adopting a collaborative and long-term management approach centered on quality and student satisfaction, guided by a philosophy of continuous improvement (Parveen et al., 2024; Rahman & Nasrin, 2024). Key conceptual models include that of Al-Omouh et al. (2015), which incorporates factors such as leadership, customer orientation, continuous improvement, and employee involvement to achieve academic excellence, and that of Mohammed et al. (2016), which proposes a model that includes a quality department and the application of the PDCA (Plan, Do, Check, Act) cycle to promote continuous improvement.

The HEdPERF model, developed by Firdaus (2006), is a scale adapted from SERVPERF and specialized in measuring service quality in higher education institutions. Its main feature lies in its multidimensional approach, which goes beyond academic aspects to integrate elements such as non-academic services, institutional reputation, access to resources, and in its modified version, online learning, thus adapting it to the current reality of hybrid education. The use of HEdPERF is preferred for three fundamental reasons. First, it has demonstrated proven reliability and validity across multiple studies, including applications in developing countries, ensuring accurate and consistent results. Second, its specificity to the educational sector makes it more relevant than generic models, allowing for a detailed assessment of students' perceptions. Finally, the model facilitates the identification of improvement areas by breaking down service quality into specific dimensions, enabling universities to strategically allocate resources to enhance student satisfaction, motivation, and performance (Bouranta et al., 2025; Gürbüz & Bayraktar, 2023; Tra & Ha, 2021; Winstone et al., 2021).

## Student Satisfaction

Student satisfaction refers to the subjective evaluation of the educational experience, in which the student determines whether the quality and services provided by the institution meet or exceed expectations. It is a complex and multifaceted construct encompassing aspects such as academic excellence, interaction with faculty, infrastructure, available resources, and administrative support. This perception is fundamental, as it reflects the value students attribute to their education and the institution as a whole, influencing their development, loyalty, and persistence (Sahin et al., 2024; Altinsoy et al., 2022).

The relevance of measuring student satisfaction lies in its direct influence on multiple aspects of institutional performance. This evaluation not only reflects the quality of educational services, verifying whether the university fulfills its commitments, but also plays an essential role in promoting student retention and loyalty. Understanding the level of satisfaction provides institutions with valuable information for continuous improvement, identifying areas of opportunity, supporting strategic decision-making, and enabling more efficient resource allocation. In an increasingly competitive and market-oriented educational environment, assessing student satisfaction has become essential for accountability, strengthening institutional positioning, and adapting academic offerings to the evolving needs of students (Wong, 2023; Kandiko Howson & Matos, 2021).

To conduct an effective analysis of student satisfaction, it is essential to approach it from three main perspectives rather than limiting it to a general evaluation. A comprehensive measurement should include overall satisfaction, which provides a general overview; expectation–perception comparison, which detects potential gaps in quality; and perception–ideal comparison, which allows institutions to go beyond expectations and strive for excellence (Altinsoy et al., 2022; Kandiko et al., 2021).

## Hypothesis Development

Based on the review of previous studies and the theoretical framework, the variables and the following hypotheses were established (Table 1).

**Table 1**

### *Research Hypothesis*

<b>General Hypothesis (H1)</b>		
Service quality is positively and significantly related to student satisfaction at a public university in Lima, 2023.		
<b>Specific Hypotheses</b>		
Hypothesis H2 (H2)	Faculty competence is positively and significantly related to the quality of service provided at a public university in Lima, 2023.	The faculty competence dimension is defined by disciplinary and pedagogical mastery, the integration of personal experience, student tutoring for autonomy, the teacher–student interaction style (accessibility and cordiality), and

		personalized attention supported by institutional systems (Dervenis et al., 2022; Paliwal & Singh, 2021; Ordóñez Sierra & Rodríguez Gallego, 2015; Tumino & Poitevin, 2013).
Hypothesis H3 (H3)	El Diseño curricular se relaciona positiva y significativamente con la calidad del servicio brindado en una Universidad pública de Lima, 2023.	Curriculum design is defined by updated and professionally relevant content, practical experiences, flexible curricular innovation, engaging presentation of content with feedback, certifying evaluation with formative feedback, scientific–educational integration, and a balance between mandatory and elective courses (Kayyali, 2023; Fernandes & Singh, 2022; Smith & Baik, 2019).
Hypothesis H4 (H4)	Institutional support is positively and significantly related to the quality of service provided at a public university in Lima, 2023.	Institutional support refers to the set of resources, services, and policies that the university offers to facilitate the academic, personal, and professional success of students, faculty, and researchers. This includes tutoring and advising programs, adequate infrastructure, and opportunities for professional development (Bouranta et al., 2025; Krsmanovic et al., 2024; Vugteveen et al., 2024; Gürbüz & Bayraktar, 2023; Tra & Ha, 2021).
Hypothesis H5 (H5)	University services are positively and significantly related to the quality of service provided at a public university in Lima, 2023.	The university services dimension includes adequate parking (including accessible spaces), affordable and balanced food services, pre-professional internships addressing real-world problems through collaboration, and non-academic activities such as conferences, cultural events, and recreational programs (Kruja et al., 2021; Arrieta & Avolio, 2020; Alvarado Lagunas et al., 2015).
Hypothesis H6 (H6)	Reputation and image are positively and significantly related to the quality of service provided at a	Institutional reputation refers to the enduring evaluation held by stakeholders, based on the

	public university in Lima, 2023.	university's history and values. Institutional image represents the current perception shaped by communication and experience. Both are crucial for building trust and enhancing the university's attractiveness (Juhaidi et al., 2025; Islam et al., 2020; Foroudi et al., 2020; Patlán Pérez & Martínez Torres, 2017; Turpo & Jaimes, 2016).
Hypothesis H7 (H7)	The quality of distance learning is positively and significantly related to the quality of service provided at a public university in Lima, 2023.	This dimension refers to the effectiveness of technology-mediated teaching and learning processes that ensure academic achievements equivalent to face-to-face modalities. It includes rigorous instructional design, meaningful interaction, accessible learning resources, valid assessment, and adequate institutional support to foster student success (Attuquayefio et al., 2025; Sahin et al., 2024; Sitar-Tăut & Moiescu, 2024; Muhammad et al., 2019; Patlán Pérez & Martínez Torres, 2017; Turpo & Jaimes, 2016).

## Methodology

This quantitative, applied, and correlational–causal study examined the relationship between university service quality and student satisfaction among tenth-cycle Industrial Engineering students at the National University of San Marcos (UNMSM). Data were collected from a sample of 85 students using a 37-item Likert-scale questionnaire, designed and validated through four phases, including expert judgment and a pilot test. Data analysis was performed using SPSS and SmartPLS, applying Cronbach's alpha to assess reliability and Structural Equation Modeling (SEM) to examine relationships, considering service quality as a second-order construct and satisfaction as a unidimensional construct through a two-phase analysis in SmartPLS.

## Results

### a. Questionnaire Validation

The 37-item, 5-point Likert-scale questionnaire underwent content validation, obtaining an Aiken's V of 1 ("Valid") and a Lawshe CVR of 1 ("Essential") for all items. After administering 30 questionnaires in a pilot test to students with similar characteristics, a Cronbach's alpha of 0.972 was obtained, indicating high reliability of the measured variables (Table 2).

**Table 2**

*Selected Dimensions and Variables*

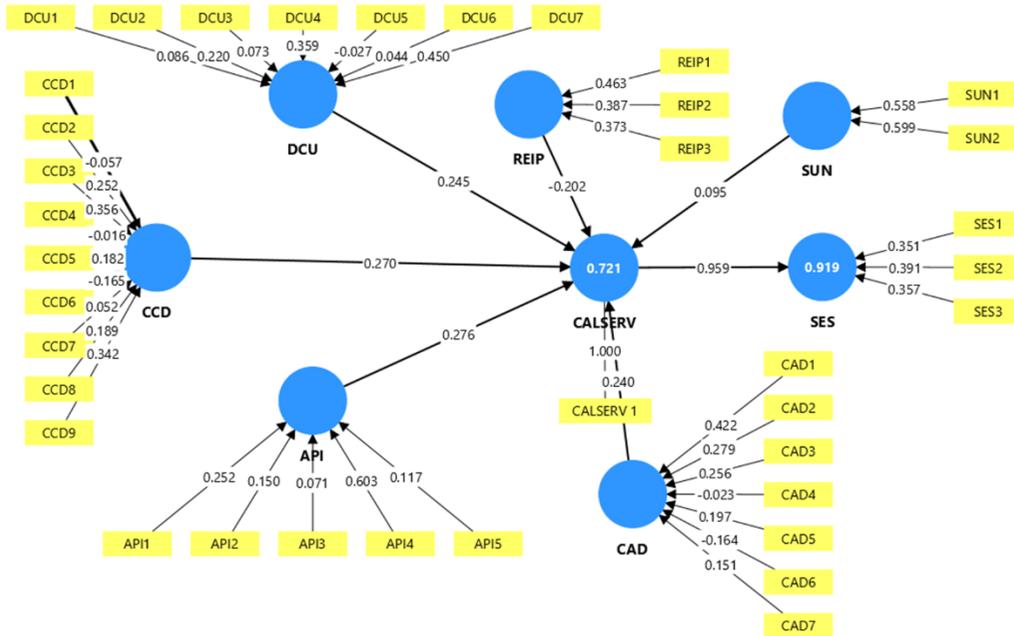
Variable	No.	Indicator	Code
Teaching Staff Competence	1	Theoretical knowledge of the instructor.	CCD1
	2	Practical knowledge of the instructor.	CCD2
	3	Up-to-date professional knowledge.	CCD3
	4	Ability to clearly and effectively transmit knowledge.	CCD4
	5	Guidance toward student autonomy.	CCD5
	6	Cordial relationship between instructor and students.	CCD6
	7	Subject matter expertise of the instructor.	CCD7
	8	Guidance and support provided to students.	CCD8
	9	Encouragement of student participation.	CCD9
Curriculum Design (Tumino & Poitevin, 2013)	10	Scientifically valuable and professionally useful content.	DCU1
	11	Activities that apply studied theories.	DCU2
	12	Innovative teaching methodology.	DCU3
	13	Use of resources and assessments aligned with learning outcomes.	DCU4
	14	Appropriateness of study materials for achieving competencies	DCU5
	15	Proper balance between theoretical and practical content.	DCU6
Institutional Support (Araya & Bernardo, 2019)	16	Adequate balance between mandatory and elective courses.	DCU7
	17	Trust in administrative staff.	API1
	18	Convenience of class schedules.	API2
	19	Agility of administrative processes (enrollment, documentation).	API3
	20	Practical and experiential non-labor activities related to national context.	API4
University Services (Alvarado et al., 2015)	21	Organization of extracurricular activities (conferences, company visits, museums).	API5
	22	Practical training experiences in the national context.	SUN1
	23	Encouragement of student participation.	SUN2
Reputation	24	The program has a positive image and reputation.	REIP1

and Image	25	Interaction of the academic program with other organizations and its impact on prestige.	REIP2
	26	Graduates are highly demanded in the labor market.	REIP3
Quality of Online Learning	27	Alignment between objectives and online technology.	CAD1
	28	Level of student interaction in online settings.	CAD2
	29	Compliance with assessment and competency tools through online technologies.	CAD3
	30	Clarity of student evaluation criteria.	CAD4
	31	Ability to track course progress using online tools.	CAD5
	32	Practical importance of mastering the subject through online technologies.	CAD6
	33	Quality of technical support.	CAD7
University Service Quality	34	Level of satisfaction with the overall service quality.	CALSERV
Student Satisfaction	35	Y1. General satisfaction with the educational service received.	SES1
	36	Y2. Expectations vs. perception of satisfaction.	SES2
	37	Y3. Perception vs. ideal service.	SES3

### Formative Model – PLS-SEM

Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to analyze how service quality influences student satisfaction, due to its ability to represent complex relationships among multiple latent variables simultaneously. This approach does not require normal data distribution or large sample sizes, making it both flexible and reliable. Moreover, it allows for assessing the validity and reliability of constructs, as well as analyzing direct and indirect effects among the different dimensions of service quality and satisfaction. Since service quality results from the combination of different dimensions or indicators that shape students' overall perceptions, a formative model was deemed most appropriate to capture this conceptual structure and accurately assess its influence on satisfaction (Parveen et al., 2024; Gürbüz et al., 2021; Wong, 2019).

This study proposes a formative model in which Service Quality comprising Academic Quality (Teaching Staff Competence and Curriculum Design), Non-Academic Quality (Institutional Support and University Services), Reputation and Image, and Quality of Online Learning influences Student Satisfaction (Figure 1). The formative model encompasses both the measurement model and the structural model. The measurement model specifies the relationships between constructs and indicators, represented graphically by rectangles, whereas the structural model illustrates the theoretical relationships between constructs, represented by ellipses.



**Figure 1.** Formative Model of Service Quality and Satisfaction

Note. Author’s elaboration (application of the PLS algorithm using SmartPLS 4.0 software).

**Evaluation of the Measurement Model Estimation**

The evaluation of the measurement model in PLS-SEM considered outer weights (relative importance of formative indicators), outer loadings (absolute importance, ideally >0.70), and collinearity. Despite low or negative weights in some indicators of Institutional Support, Quality of Online Learning, Teaching Staff Competence, Curriculum Design, Reputation and Image, University Services, and Student Satisfaction, no items were removed due to their statistical significance (p-value = 0) and moderate communality (see Table 3). Although the outer loadings for API2, CAD4, CAD6, CCD1, and CCD6 were below 0.70, their statistical significance justified their retention (Table 4), thereby preserving the integrity of the questionnaire.

**Table 3**

Values of Outer Weights

	Outer weights	Cramér-von Mises p value		Outer weights	Cramér-von Mises p value
API1 → API	0.252	0	CCD6 → CCD	-0.165	0.003
API2 --> API	0.15	0	CCD7 → CCD	0.052	0
API3 → API	0.071	0	CCD8 --> CCD	0.189	0
API4 → API	0.603	0.001	CCD9 → CCD	0.342	0
API5 → API	0.117	0	DCU1 → DCU	0.086	0
CAD1 → CAD	0.422	0	DCU2 → DCU	0.22	0

CAD2 → CAD	0.279	0	DCU3 → DCU	0.073	0
CAD3 → CAD	0.256	0	DCU4 → DCU	0.359	0
CAD4 → CAD	-0.023	0	DCU5 → DCU	-0.027	0
CAD5 → CAD	0.197	0	DCU6 → DCU	0.044	0
CAD6 → CAD	-0.164	0	DCU7 → DCU	0.45	0
CAD7 → CAD	0.151	0	REIP1 → REIP	0.463	0
CALSERV 1 → CALSERV 1		0	REIP2 → REIP	0.387	0
CCD1 → CCD	-0.057	0	REIP3 → REIP	0.373	0
CCD2 → CCD	0.252	0	SES1 → SES	0.351	0
CCD3 → CCD	0.356	0	SES2 → SES	0.391	0
CCD4 → CCD	-0.016	0	SES3 → SES	0.357	0
CCD5 → CCD	0.182	0	SUN1 → SUN	0.558	0
			SUN2 → SUN	0.599	0

**Table 4**  
*Evidence of Outer Loadings (Absolute Importance)*

	Outer loadings		Outer loadings
API1 → API	0.812	CCD6 → CCD	0.647
API2 → API	0.652	CCD7 → CCD	0.767
API3 → API	0.731	CCD8 → CCD	0.782
API4 → API	0.941	CCD9 → CCD	0.845
API5 → API	0.67	DCU1 → DCU	0.741
CAD1 → CAD	0.924	DCU2 → DCU	0.76
CAD2 → CAD	0.876	DCU3 → DCU	0.728
CAD3 → CAD	0.823	DCU4 → DCU	0.833
CAD4 → CAD	0.694	DCU5 → DCU	0.782
CAD5 → CAD	0.809	DCU6 → DCU	0.788
CAD6 → CAD	0.63	DCU7 → DCU	0.897
CAD7 → CAD	0.757	REIP1 → REIP	0.845
CALSERV 1 → CALSERV 1		REIP2 → REIP	0.848
CCD1 → CCD	0.659	REIP3 → REIP	0.753
CCD2 → CCD	0.884	SES1 → SES	0.895
CCD3 → CCD	0.889	SES2 → SES	0.931
CCD4 → CCD	0.747	SES3 → SES	0.901
CCD5 → CCD	0.771	SUN1 → SUN	0.854
		SUN2 → SUN	0.874

**Evaluation of the Structural Model**

The evaluation of the structural model in PLS-SEM involves five key analyses: collinearity, significance and relevance of structural relationships (path coefficients), predictive power and relevance ( $R^2$  and  $Q^2$ ), effect size ( $f^2$  and  $q^2$ ), and predictive power. In this study, the collinearity analysis revealed Variance Inflation Factor (VIF) values below 5 for all indicators (Table 3), indicating acceptable moderate correlations among the items.

**Table 5***Collinearity Values (VIF)*

Constructs	Indicators	VIF	Constructs	Indicators	VIF
	API1	2.346		CCD1	2.008
	API2	1.704		CCD2	3.659
	API3	2.094		CCD3	3.548
	API4	2.466		CCD4	4.375
	API5	2.196		CCD5	2.37
	CAD1	2.926		CCD6	2.563
	CAD2	2.662		CCD7	2.495
	CAD3	3.149		CCD8	3.174
	CAD4	2.821		CCD9	4.426
	CAD5	3.402		DCU1	2.361
	CAD6	2.137		DCU2	2.281
	CAD7	1.554		DCU3	3.612
	CALSERV1	1		DCU4	2.285
				DCU5	3.923
				DCU6	2.741
				DCU7	2.129
				REIP1	1.547
				REIP2	1.655
				REIP3	1.382
				SES1	2.373
				SES2	2.672
				SES3	2.416
				SUN1	1.474
				SUN2	1.474

The path coefficients (standardized beta values) measure the strength of the relationships between constructs, where a negative sign rejects the hypothesis of relationship and a positive sign indicates a relationship ranging from small (0.10–0.25) to excellent (0.91–1.00) (Table 4). The general hypothesis, which proposed a positive and significant relationship between service quality and student satisfaction, was accepted, with a path coefficient of 0.959 (excellent). The specific hypotheses were also accepted for Faculty Competence (0.270, small), Curriculum Design (0.245, small), University Services (0.095, small), Institutional Support (0.276, small), and Quality in Distance Learning (0.240, acceptable). However, the specific hypothesis for Reputation and Image was rejected, as it presented a negative path coefficient (–0.202), indicating a negative relationship with service quality.

**Table 6**  
*Evidence of Path Coefficients*

	Path coefficients
API → CALSERV	0.276
CAD → CALSERV	0.240
CALSERV → SES	0.959
CCD → CALSERV	0.270
DCU → CALSERV	0.245
REIP → CALSERV	-0.202
SUN → CALSERV	0.095

The model exhibited moderate predictive relevance for Student Satisfaction ( $R^2 = 0.919$ ) and substantial predictive relevance for Service Quality ( $R^2 = 0.721$ ) (Table 5). Similarly, out-of-sample predictive power ( $Q^2$ ) was high for Service Quality (0.596) and for Student Satisfaction ( $SES1 = 0.689$ ,  $SES2 = 0.454$ ,  $SES3 = 0.471$ ) (Table 5). Regarding the effect size ( $f^2$ ) (Table 6), Service Quality had a large impact (11.354) on satisfaction.

**Table 7**  
*Coefficient of Determination ( $R^2$ ) and Prediction of Service Quality and Student Satisfaction Variables*

	R-square		
CALSERV	0.721		
SES	0.919		
	$Q^2$ predict	PLS-SEM RMSE	PLS-SEM MAE
CALSERV 1	0.596	0.556	0.458
SES1	0.689	0.483	0.361
SES2	0.454	0.665	0.568
SES3	0.470	0.673	0.542

**Table 8**  
*Contributive Level of Service Quality and Student Satisfaction Factors*

	$f$ -square	Alpha 1%	Alpha 5%
API → CALSERV	0.070	0.585	0.815
CAD → CALSERV	0.041	0.453	0.714
CALSERV → SES	11.354	1.000	1.000
CCD → CALSERV	0.059	0.566	0.801
DCU → CALSERV	0.042	0.472	0.729
REIP → CALSERV	0.029	0.321	0.586
SUN → CALSERV	0.010	0.073	0.221

The  $q^2$  effect size indicated a medium predictive strength for Teaching Staff Competence (0.259), Quality of Online Learning (0.230), Curriculum Design (0.235), and Institutional Support (0.264) on Student Satisfaction, while University Services (0.091) showed a small predictive strength. Finally, Reputation and Image demonstrated a negative predictive strength (-0.194) (Table 7). The Standardized Root Mean Square Residual (SRMR), which assesses model fit, showed values of 0.073 for the saturated model and 0.075 for the estimated model (Table 8), both below the 0.08 threshold, indicating a good model fit.

**Table 9**

*Relative Evidence of the Predictive Strength of Service Quality Dimensions on Student Satisfaction*

	Specific Indirect Effects ( $q^2$ )
API → CALSERV → SES	0.264
CAD → CALSERV → SES	0.230
CCD → CALSERV → SES	0.259
DCU → CALSERV → SES	0.235
REIP → CALSERV → SES	-0.194
SUN → CALSERV → SES	0.091

**Table 10**

Structural Model Fit

	Saturated Model	Estimated Model
SRMR	0.073	0.075
d_ULS	3.792	4.001
d_G	3.317	3.73
Chi-square	1075.05	1092.53
NFI	0.712	0.707

## Discussion

This research demonstrated the influence of university service quality on student satisfaction through a formative structural measurement model. This methodological choice was justified by the multidimensional nature of service quality, in which the exogenous indicators exhibit limited interchangeability and low covariation. Thus, the formative model was the most appropriate to analyze the relationship between service quality and customer satisfaction.

Aspects assessed within the dimension of faculty competence include personality, teaching performance, interpersonal relationships with students, and professional and human development. Regarding personality, highly valued characteristics include sincerity, honesty, attentiveness to students, presence, kindness, empathy, and sense of humor. Attitudes toward teaching, such as interest, enthusiasm, and up-to-date knowledge, along with the consideration

of students' prior knowledge and the methodology employed, are also relevant. Además, la participación del docente en investigación, cargos de responsabilidad y actividades paralelas se incluye en su análisis. Furthermore, faculty participation in research, administrative responsibilities, and complementary activities are considered in this analysis. The personality of the instructor is emphasized as a highly valued factor influencing student satisfaction, a factor also considered in the present study (Dervenis et al., 2022; Paliwal & Singh, 2021; Ordóñez Sierra & Rodríguez Gallego, 2015; Tumino & Poitevin, 2013).

Hybrid and distance education have become an everyday reality, demanding new teaching strategies and continuous investment in infrastructure and digital training for institutions. Student satisfaction in digital environments is associated with learning, convenience, time, institutional support (equipment and infrastructure), connectivity, communication and teacher flexibility, personal support from the instructor, assessment methods, conceptual understanding, feedback, virtual interaction, instructional organization, learning resources, and online guidance. Therefore, the distance teaching–learning process requires an approach that considers both student needs and technological aspects, including individual context, technological support, personalized feedback, instructional planning and assessment, as well as access to equipment, platforms, connectivity, robust infrastructure, and digital training for both instructors and students (Kapustina et al., 2020; Muhammad et al., 2019; Subandi et al., 2019).

The institutional support dimension, from an experiential perspective, is based on communication, the goods and services offered, and how these elements are integrated into the student experience. Communication must be timely and include academic information, topics of interest, social development, events, and commemorations. Timeliness refers to the appropriate moment for offering and requesting services. Immediate accessibility and prompt administrative responses are part of university quality, as is employee conduct, whose efficiency impacts student satisfaction by meeting their needs and expectations. Although institutional support was not significant in the structural model, its analysis remains relevant given its relationship with perceived satisfaction (Bouranta et al., 2025; Krsmanovic et al., 2024; Vugteveen et al., 2024; Gürbüz & Bayraktar, 2023; Tra & Ha, 2021).

## **Conclusion**

This study examined how Service Quality—comprising academic factors (Faculty Competence, Curriculum Design), non-academic factors (Institutional Support, University Services), Reputation and Image, and Quality in Distance Learning—affects Student Satisfaction, using a formative model. The validity of the indicators was confirmed through the measurement model assessment. The analysis of the structural model, which included collinearity, path significance, predictive power ( $R^2$  and  $Q^2$ ), and effect size ( $f^2$ ), demonstrated a positive and significant relationship between service quality and student satisfaction, as well as between satisfaction and most quality dimensions, except for reputation and image. It is recommended that higher education institutions prioritize quality assurance through the participation of all stakeholders and maintain continuous monitoring of these variables to optimize student satisfaction. Future research should explore qualitative student perceptions, analyze temporal variations in satisfaction, and consider external factors not included in this model—such as biases and contextual variables that may influence results—since student satisfaction remains an ongoing

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