

Digital Service Innovation and University Image: The Mediating Role of Student Satisfaction in Higher Education

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Abstract

The adoption of digital advancements in the higher education sector in Indonesia is currently experiencing rapid growth, yet it frequently encounters technical and operational challenges that could impact user experience. This research aims to explore the impact of Digital Service Innovation (X) on University Image (Y), with Student Satisfaction (Z) serving as a mediating factor. The methodology used in this study is quantitative and follows a descriptive format. Information was gathered by sending out surveys to 233 active students at Telkom University. The analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) through SmartPLS software. The findings demonstrate that, directly, Digital Service Innovation positively and significantly influences Student Satisfaction (path coefficient = 0.960) and University Image (path coefficient = 0.472), while Student Satisfaction also positively and significantly impacts University Image (path coefficient = 0.498). Indirectly, Digital Service Innovation has a positive and significant influence on University Image through Student Satisfaction ($O=0.478$, $t=5.668$, $p=0.000$). The R Square value indicates that it accounts for 98.0% of the variance in Student Satisfaction and 98.7% in University Image. The outcome of this study confirms that the ongoing improvement and effective adoption of digital service innovations that align with student needs significantly enhances the university's reputation and positive image.

INTRODUCTION

In the post-pandemic landscape, the convergence of Industry 4.0 and Society 5.0 paradigms has radically restructured organizational operating models, placing higher education institutions under unprecedented pressure to undergo deep digital transformation. Contemporary universities are no longer perceived merely as traditional centers of academic instruction; instead, they have evolved into complex, technology-driven service ecosystems expected to deliver seamless, highly responsive, and adaptive educational experiences. Within an increasingly saturated global education market, an institution's competitive differentiation heavily hinges upon its capability to leverage advanced digital infrastructure to create superior stakeholder value. Consequently, modernizing academic operations, automating administrative workflows, and digitizing student engagement have shifted from being secondary administrative enhancements to core strategic priorities for sustainable institutional growth. Digital service innovation in higher education acts as a vital catalyst for enhancing operational efficiency, institutional agility, and service accessibility. Far beyond the simple acquisition of hardware or basic software applications, comprehensive

digital innovation encompasses an integrated digital ecosystem. This includes advanced Learning Management Systems (LMS), integrated academic portals, cloud-based administrative platforms, and mobile service applications designed to streamline student-university touchpoints. In developing economies like Indonesia, national initiatives have driven rapid adoption, with over 82% of higher education institutions digitizing their core administrative and instructional channels. However, rapid technological deployment often outpaces organizational readiness, introducing operational vulnerabilities that directly impact primary service beneficiaries namely, students. Telkom University, as a prominent private institution in Indonesia with an explicit strategic focus on Information and Communication Technology (ICT), sits at the forefront of digital service implementation. The university has deployed specialized digital platforms, such as the Center for e-Learning Open Education (CeLOE), the Integrated Academic Information System (iGracias), and the myTel-U mobile application. While these tools aim to optimize student convenience and service speed, empirical realities reveal an ongoing gap between technological deployment and user experience. Frequent technical bottlenecks including server overloads during course registration periods, system downtime on e-learning portals, rigid user interfaces (UI/UX), and delayed digital helpdesk responses continue to generate friction among users. Guided by the Technology Acceptance Model (TAM) and Expectation-Confirmation Theory (ECT), technology adoption and user evaluation depend fundamentally on perceived ease of use, perceived usefulness, and system reliability. When digital innovations encounter persistent operational failures, user satisfaction suffers, undermining the strategic return on digital investments. Student satisfaction functions as the primary qualitative benchmark for evaluating educational service delivery. Modern students operate as discerning consumers of educational services who expect higher education digital touchpoints to mirror the speed, responsiveness, and intuitiveness of commercial digital services. Superior digital service quality directly fosters cognitive and affective satisfaction by minimizing administrative friction, optimizing study schedules, and facilitating academic achievement. Conversely, service failures within digital academic channels induce cognitive fatigue, diminish learning engagement, and foster negative institutional perceptions. Beyond immediate operational satisfaction, student evaluations collectively aggregate into the broader construct of university image. University image represents the holistic synthesis of beliefs, impressions, and reputational associations held by stakeholders toward an institution. In an information-rich academic landscape, a strong, positive brand image constitutes an invaluable intangible asset that drives student recruitment, fosters alumni loyalty, and secures market positioning. Despite the growing body of literature on educational marketing and ed-tech adoption, a significant theoretical and empirical gap persists. Existing studies predominantly focus on the direct impact of traditional,

offline service quality dimensions on university reputation, or examine the isolated effects of technological tools on user satisfaction without assessing long-term brand equity. Empirical inquiries that comprehensively investigate the structural mechanism through which digital service innovation influences institutional image—specifically incorporating student satisfaction as a mediating mechanism within an ICT-specialized university context—remain sparse. Addressing this gap is critical for establishing whether technological innovation directly drives institutional branding or if its strategic value is entirely dependent on successfully satisfying student expectations. To bridge this literature gap, this study draws upon the Dynamic Capabilities View (DCV) and Signaling Theory. According to DCV, an organization maintains its competitive advantage through its capability to continuously innovate, reconfigure, and deploy internal technological competencies to match changing market expectations. Complementarily, Signaling Theory posits that an institution's investment in sophisticated digital innovations serves as a strong market signal of operational quality and modern leadership. When students experience high-performing, reliable digital touchpoints, this positive signal is confirmed through heightened satisfaction, which subsequently translates into long-term institutional prestige and positive word-of-mouth endorsement. Building upon these theoretical foundations, this research formulates four structural hypotheses to investigate the direct and indirect relationships between Digital Service Innovation (X), Student Satisfaction (Z), and University Image (Y) at Telkom University:

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H1 Digital Service Innovation exerts a direct, positive, and significant influence on Student Satisfaction.

H2: Student Satisfaction exerts a direct, positive, and significant influence on University Image.

H3: Digital Service Innovation exerts a direct, positive, and significant influence on University Image.

H4: Digital Service Innovation indirectly exerts a positive and significant influence on University Image through the mediating role of Student Satisfaction.

METHODS

Research Design and Context

This study adopts an explanatory quantitative research design using a structural equation modeling (SEM) approach to evaluate the causal-associative relationships between Digital Service Innovation (X), Student Satisfaction (Z), and University Image (Y). The research was conducted at Telkom University (Main Campus in Bandung, Indonesia), a prominent private higher education institution recognized for its ICT-focused ecosystem. This context was selected due to the institution's comprehensive deployment of digital platforms specifically CeLOE (Learning Management System), iGracias (Integrated Academic Information System), and myTel-U (mobile application)—which provides an ideal setting to assess user perception and service performance.

Population, Sampling Technique, and Sample Size

The group we focused on included every current undergraduate and diploma student at Telkom University who is part of different schools and often uses the university's online tools and websites. A purposeful sampling method was used to choose people who met certain set rules for being included. (1) active student status in Diploma (D3) or Undergraduate (S1) programs, and (2) completion of at least two academic semesters to ensure adequate operational experience with the university's digital ecosystem.

To satisfy the statistical power requirements For Partial Least Squares Structural Equation Modeling (PLS-SEM), the sample size was calculated following the rule of 10 times rule and standard guidelines recommending 100 to 200 observations for complex structural models. Data collection yielded 233 valid and fully completed questionnaires from eligible respondents, exceeding the minimum threshold and providing high precision while mitigating potential outlier distortions.

Variable Measurement and Operationalization

The research model incorporates three primary constructs operationalized through multi-item indicators derived from established literature:

1. Digital Service Innovation (X): Operationalized as an independent construct measuring system accessibility, reliability and performance, functionality and usefulness, user interface/experience (UI/UX) ease, and system integration across academic channels.

2. Student Satisfaction (*Y*): Operationalized as a mediating construct reflecting expectation confirmation, digital service satisfaction, technical helpdesk/interaction responsiveness, and overall affective user satisfaction.
3. University Image (*Z*): Operationalized as a dependent construct capturing academic and institutional reputation, technological modernization perception, overall brand impression, and student pride/word-of-mouth endorsement.

Measurement items were evaluated using a 7-point Semantic Differential Scale ranging from bipolar endpoints (e.g., 1 = Sangat Tidak Setuju / Very Negative to 7 = Sangat Setuju / Very Positive). The 7-point scale was selected over conventional 5-point Likert scales due to its higher measurement sensitivity, granular response variance, and superior distribution properties for variance-based SEM analysis.

Data Collection Procedure

The main information was collected through an online questionnaire that people filled out themselves, which was shared on Google Forms, distributed across student communication channels between November 2025 and January 2026. Secondary data, including institutional profiles and platform usage metrics, were collected to contextualize the empirical findings.

Data Analysis Technique

Empirical information was examined utilizing Partial Least Squares Structural Equation Modeling (PLS-SEM) implemented through SmartPLS software. PLS-SEM was selected for its effectiveness in evaluating intricate mediation models and its ability to make predictions without the need for stringent multivariate normality prerequisites. The analysis was structured in a two-step process:

The evaluation of the measurement model, also called the outer model, checked how well the variables measured what they were supposed to. This included looking at convergent validity by checking the outer loadings, which should be higher than 0.70, and the average variance extracted, which should be above 0.50. Discriminant validity was assessed using the Fornell-Larcker criteria, the heterotrait-monotrait ratio (HTMT), which should be less than 0.70, and composite reliability, which should be over 0.70.

Structural Model Evaluation (Inner Model): This aspect was assessed by looking at explanatory power through the Coefficient of Determination (R^2), predictive relevance determined by Stone-Geisser Q^2 values utilizing the blindfolding method, and hypothesis testing

performed through 5,000-resample bootstrapping to derive path coefficients (β), t-statistics (greater than 1.96), and p-values.

RESULTS AND DISCUSSION

Demographic Profile of Respondents

Primary data were gathered from a verified sample of 233 active student respondents at Telkom University. The demographic distribution shows that the sample was dominated by male students (61.37%, $n = 143$), while female students accounted for 38.63% ($n = 90$). In terms of academic cohort, the majority of respondents belonged to the 2023 class (41.20%, $n = 96$), followed by 2024 (27.47%, $n = 64$), 2022 (17.60%, $n = 41$), and 2025 (13.73%, $n = 32$). Respondents represented seven faculties, with the School of Applied Sciences / FIT comprising the largest group (31.33%, $n = 73$), followed by FTE (13.73%), FEB (13.30%), FKS (12.45%), FIF (12.02%), FIK (9.44%), and FRI (7.73%). This diverse distribution ensures that empirical evaluations reflect a comprehensive, campus-wide perspective on digital service experiences.

Descriptive Statistical Analysis

Descriptive analysis was conducted to evaluate baseline user perceptions across all research constructs using a 7-point scale. The overall mean score for Digital Service Innovation (X) reached 4.80 (High category), with the highest indicator score observed in digital adaptation ($X_{14} = 4.81$). Student Satisfaction (Z) recorded an overall mean score of 4.85 (High category), anchored by high satisfaction in graduate competency prospects ($Z_{14} = 4.85$). Similarly, University Image (Y) registered an overall mean score of 4.84 (High category), driven by accurate service performance ($Y_2 = 4.88$). These scores confirm that students hold favorable perceptions regarding the university's digital transformation and institutional prestige.

Measurement Model Evaluation (Outer Model)

The outer model was evaluated to establish convergent validity, discriminant validity, and internal consistency reliability.

Convergent Validity and Reliability

As shown in Table 1, every indicator's outer loadings went beyond the cautious limit of 0.70, lying within the range of 0.955 to 0.970. Additionally, The average variance extracted (AVE) values for each construct were above 0.50, which shows that there is strong convergent validity. The reliability of the constructs was confirmed, since both Cronbach's Alpha and Composite Reliability for all constructs were above 0.95, showing very strong internal consistency.

Table 1. Measurement Model Assessment

Measurement Model Assessment						
Construct	Indicator	Item Statement	Outer Loading	Croanbach's Alpha	Composite Reliability	AVE
Digital Service Innovation (X)	X1	Digital tech supports learning processes	0.970	0.964	0.976	0.933
	X8	Digital content is relevant to student needs	0.962			
	X14	Institution adopts new digital technology	0.965			
University Image (Z)	Z3	Professional academic staff service	0.958	0.955	0.971	0.971
	Z5	Campus facilities are well maintained	0.955			
	Z14	Graduates possess relevant skills	0.961			
Student Satisfaction (Y)	Y2	University services are accurate	0.961	0.956	0.972	0.920
	Y5	Competent staff service delivery	0.960			
	Y8	Responsive administrative staff helpdesk	0.956			

Source: SEM-PLS Data Management Results (2025)

Discriminant Validity

Discriminant validity was confirmed by applying the Fornell-Larcker criterion. In Table 2, it is evident that the square root of the AVE for every construct (shown in the diagonal) exceeds the correlations between constructs, which validates the distinct empirical uniqueness of all latent variables.

Table 2. Discriminant Validity (Fornell-Larcker Criterion)

Discriminant Validity	
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Construct	Digital Innovation (X)	University Image (Z)	Student Satisfaction (Y)
Digital Innovation (X)	0.966		
University Image (Z)	0.951	0.959	
Student Satisfaction (Y)	0.960	0.952	0.958

Source: SEM-PLS Data Management Results (2025)

Structural Model Evaluation (Inner Model)

Coefficient of Determination (R^2) and Predictive Relevance (Q^2)

The structural model demonstrates remarkable explanatory power. As shown in Table 3, Digital Service Innovation accounts for 98.0% of the variance in Student Satisfaction ($R^2 = 0.980$). Together, Digital Service Innovation and Student Satisfaction explain 98.7% of the variance in University Image ($R^2 = 0.987$). Furthermore, Stone-Geisser Q^2 values calculated via blindfolding yielded 0.929 for Student Satisfaction and 0.921 for University Image, far exceeding 0.35 and confirming substantial predictive relevance ($Q^2 > 0.35$).

Table 3. Explanatory Power (R^2) and Predictive Relevance (Q^2)

Explanatory Power (R^2) and Predictive Relevance (Q^2)				
Endogenous Construct	R^2 Score	R^2 Adjusted	Q^2 Score	Predictive Power Category
Student Satisfaction (Y)	0.980	0.979	0.929	Large Predictive Relevance
University Image (Z)	0.987	0.986	0.921	Large Predictive Relevance

Source: SEM-PLS Data Management Results (2025)

Hypothesis Testing and Mediation Analysis

Hypothesis testing was performed using a 5,000-resample bootstrapping method in SmartPLS. In Table 4, the direct and indirect path coefficients (Beta), t-statistics, and p-values applied to assess H1 to H4 are outlined.

Table 4. Structural Path Coefficients and Hypothesis Testing

Structural Path Coefficients and Hypothesis Testing							
Hypothesis	Path Direction	Original Sample (Beta)	Sample Mean (M)	Std Dev (STDEV)	T-Statistics	P-Values	Decision
H1	Digital Innovation (X) -> Satisfaction (Z)	0.960	0.960	0.008	118.520	0.000	Accepted

H2	Satisfaction (Z) -> University Image (Y)	0.498	0.496	0.085	5.843	0.000	Accepted
	Digital Innovation (X) -> University Image (Y)	0.472	0.474	0.091	5.210	0.000	Accepted
H4	Digital Innovation (X) -> Satisfaction (Z) -> Image (Y)	0.478	0.476	0.084	5.668	0.000	Accepted

Source: SEM-PLS Data Management Results (2025)

The effect of digital service innovation on student satisfaction is positive and very strong (Beta = 0.960, $t = 118.520$, $p = 0.000$), which supports the first hypothesis. Constant improvements in system accessibility, CeLOE e-learning stability, and myTel-U responsiveness directly help increase student satisfaction.

Student satisfaction has a strong positive influence on how the university is perceived (Beta = 0.498, $t = 5.843$, $p = 0.000$), which supports the second hypothesis. When students are happier, it creates better feelings about the institution, which makes the school or university more respected and admired.

Digital service innovation has a direct effect on the university's image, with a strong positive relationship (Beta = 0.472, $t = 5.210$, $p = 0.000$), which supports the third hypothesis. Technological leadership clearly shows that an institution is modern and has high academic standards.

Student satisfaction plays a mediating role in the connection between Digital Service Innovation and University Image. The test of indirect paths shows that Student Satisfaction strongly influences this relationship, acting as a key link. The results show a Beta value of 0.478, a t -value of 5.668, and a p -value of 0.000, which supports the hypothesis H4. Because both direct and indirect paths are still statistically significant, Student Satisfaction partially mediates the relationship.

Discussion

The empirical findings strongly reinforce the theoretical frameworks of the Technology Acceptance Model (TAM), Expectation-Confirmation Theory (ECT), and Signaling Theory.

First, the near-perfect direct influence of Digital Service Innovation on Student Satisfaction (Beta = 0.960) highlights that for digital-native students, platform reliability (iGracias, CeLOE, myTel-U) is not merely an auxiliary administrative asset, but a primary determinant of the educational experience. Eliminating technical friction—such as server overload during registration and portal downtime—directly aligns actual system performance with user expectations, confirming ECT principles.

Second, the confirmation of the partial mediation mechanism (H4) demonstrates that while digital infrastructure directly enhances institutional brand perception ($\beta = 0.472$), its strategic value is amplified when it successfully generates user satisfaction (Indirect Effect = 0.478). In accordance with Signaling Theory, technology deployment serves as a market signal of institutional quality. However, this signal translates into long-term brand equity and positive word-of-mouth endorsement only when students experience seamless, functional, and user-centric digital interactions.

CONCLUSION

This study concludes that digital service innovation is a strategic imperative for strengthening institutional image in the higher education sector, operating primarily through the mechanism of student satisfaction. Empirically, Digital Service Innovation has a clear, positive, and strong effect on both Student Satisfaction and University Image. The impact is proven by the numbers: Student Satisfaction increases by 0.960 and University Image by 0.472. These findings highlight that continuous technological improvements such as expanding system accessibility, optimizing user interfaces, and ensuring operational stability during high-traffic periods across platforms like CeLOE, iGracias, and myTel-U directly fulfill student expectations and signal institutional modernity.

Furthermore, Student Satisfaction significantly influences University Image ($\beta = 0.498$) and acts as a potent partial mediating variable linking Digital Service Innovation to University Image ($\beta = 0.478$, $t = 5.668$, $p = 0.000$). This confirms that while investing in advanced digital tools directly enhances brand perception, the strategic return on digital transformation is maximized when technology successfully delivers a frictionless, high-quality service experience that satisfies students.

Practical and Managerial Implications

1. For university administrators and management at Telkom University, the empirical insights suggest the following strategic actions:
2. System Optimization and Infrastructure Reliability: Prioritize server capacity and infrastructure scalability to eliminate technical downtime and bottlenecks during peak usage periods, such as course registration (KRS) and examination periods.
3. User-Centric Service Design: Continuously refine user interfaces (UI/UX) and mobile responsiveness across academic platforms to ensure intuitive navigation and rapid digital helpdesk resolution.
4. Continuous Feedback Integration: Establish systematic, periodic evaluation channels to collect student feedback regarding digital platform performance, using user satisfaction as a key performance indicator (KPI) for technological upgrades.

Limitations and Future Research Directions

This study is subject to certain limitations. The study used data only from Telkom University, which might make the results less applicable to other universities that aren't focused on ICT or are in different regions. Future research should extend the structural model across multiple public and private universities to cross-validate the results. Second, future inquiries could incorporate additional exogenous constructs such as perceived digital security, brand trust, student loyalty, or user experience (UX) to expand the explanatory scope of university brand equity in the digital era.

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