



Determination of UT student loyalty at SALUT: the role of service quality, technology skills, and student satisfaction

Rudi Syahrifudin ^{1*}, Ginta Ginting ², Amir Tengku Ramly ³

¹ Master of Management Study Program, Universitas Terbuka, Tangerang Selatan, Indonesia

² Universitas Terbuka, Tangerang Selatan, Indonesia

³ Ibn Khaldun University Bogor, Indonesia

Article info

Article history:

Submitted [24-02-2026]

Revised [23-04-2026]

Accepted [02-05-2026]

Keywords:

Service quality
Employee technology skills
Customer satisfaction
Customer loyalty
SALUT

A b s t r a c t

Distance education requires a support service system capable of addressing limitations in interaction, student heterogeneity, and dependence on technology. Although service quality and staff technological competence have been extensively studied in higher education, research specifically integrating these two aspects into a model of student satisfaction and loyalty in distance education service centers remains limited. This study aims to analyze the influence of service quality and employees' technological skills on student satisfaction and loyalty at the Open University Service Center (SALUT) of PT Dwi Guna Cipta Nusantara, positioning satisfaction as an intervening variable. This study applies a quantitative approach using a survey method involving 270 respondents who utilize SALUT services. Data were collected using a close-ended questionnaire with a five-point Likert scale and analyzed using Structural Equation Modeling Partial Least Squares (SEM-PLS). The results indicate that both service quality and employees' technological skills have a positive, significant effect on customer satisfaction. Customer satisfaction significantly affects student loyalty and fully mediates the influence of service quality and employees' technological skills on loyalty. However, employees' technological skills show no direct effect on loyalty. This study concludes that customer satisfaction is a key mechanism in building student loyalty; therefore, strengthening service quality and technological competence is an important strategy in managing distance education. For future research, it is recommended to employ a longitudinal design or mixed method approaches, expand the scope across institutions, and incorporate variables like trust, perceived value, student engagement, and institutional image to build a more comprehensive model.

Introduction

Digital transformation in higher education has driven the adoption of distance learning systems as an inclusive and flexible strategy to expand access to education. The Open University (UT), as an open higher education institution in Indonesia, represents an educational model that places students at the center as well as the primary managers of their learning process (Rozi et al., 2021). In this ecosystem, academic success no longer depends on the intensity of face-to-face interaction, but on the capacity of students to manage their learning process independently through Self-Regulated Learning (SRL). Students are required to set goals (goal setting), monitor progress (self-monitoring), as well as regulate motivation and learning behavior without direct supervision (Shin et al., 2023; Xing et al., 2023). Thus, SRL is a central determinant in the effectiveness of distance learning (Arrafii et al., 2025).

The transformation of higher education towards online learning requires a high level of adaptation and learning independence from students. However, the implementation of distance education at the Open University (UT) still faces various challenges, both from psychosocial and technological aspects. Obstacles that often arise include low motivation to learn, limited self-regulated learning abilities, low digital literacy of students, and lack of optimal use of Learning Management System (LMS). To overcome these problems, the Open University collaborates with PT Dwi Guna Cipta Nusantara (DGCN) through the establishment of the Open University Service Center (SALUT) which functions to provide academic assistance and information technology-based service support for students.

*Corresponding author

Email address: Rudi Syahrifudin (rudisyahrifudin@gmail.com)

However, operational data shows indications of declining student loyalty, which is reflected in the high number of old students who do not re-register every semester. The results of preliminary research also show that around 64% of students have a less positive perception of the quality of SALUT services. This condition is mainly triggered by the slow response of staff and the limited ability of employees to utilize digital platforms to handle administrative and academic problems of students.

Previous research has shown that service quality is an important factor that affects student satisfaction and loyalty. Several studies have found that service quality has a positive and significant effect on satisfaction which then encourages student loyalty. However, other studies have shown different results, where the quality of service has no significant influence on student satisfaction or loyalty (Noe et al., 2022). In terms of digital competence, a number of studies have also shown that staff technology skills can increase student satisfaction (Anna Noviana & Linda Daniati Melinda, 2024; Setyaningsih et al., 2023). However, other studies have found that information technology skills have no significant effect on student satisfaction or academic achievement (Wibowo & Wilujeng, 2021).

The difference in findings shows that there is a research gap in the study of distance education services. In addition, most previous studies still examined the quality of service and technology skills of employees separately. Studies that integrate these two factors simultaneously in influencing student satisfaction and loyalty, especially in hybrid educational service centers such as the Open University Service Center (SALUT), are still limited. Therefore, this study aims to analyze the influence of service quality and employee technology skills on student satisfaction and loyalty at SALUT comprehensively.

Based on this background, this study examines the influence of service quality and employee technology skills on student satisfaction, as well as the effect of satisfaction on student loyalty to SALUT. This study also analyzes the direct influence of service quality and employee technology skills on student loyalty, as well as the role of student satisfaction as a mediating variable in the relationship between service quality and student loyalty as well as between employee technology skills and student loyalty.

However, these demands for high autonomy are often not offset by the actual readiness of students. Identified that online learning readiness covers seven main dimensions: technological ability, digital literacy, learning habits, remote work readiness, interests and motivation, self-regulation, and time management (Reyes-Millán et al., 2023). Deficits in these dimensions are directly correlated with decreased academic performance and low learning engagement. In the Indonesian context, these challenges are exacerbated by digital infrastructure gaps and significant disparities in access to technology (Handayani et al., 2025).

In addition to technical factors and self-regulation, psychological barriers such as the phenomenon of loneliness are also an important determinant in distance learning. The absence of physical and social interaction can trigger academic isolation, which negatively impacts students' motivation and sense of connection with the institution (Almendingen et al., 2021; Xing et al., 2023; Xu et al., 2023). In the long term, this condition has the potential to increase the risk of withdrawal or dropping out (Bozkurt & Dash, 2024). Low help-seeking behavior found in the context of Indonesian students further exacerbates this dynamic (Arrafii et al., 2025).

At the same time, digital literacy is being redefined in the era of artificial intelligence (AI). Literacy is no longer just the technical ability to operate a device, but includes critical competencies based on know-why and know-how to evaluate the validity of information and participate ethically in the digital space (Georgopoulou et al., 2024). Students with higher digital literacy have been shown to have a positive correlation with learning independence and better time management skills (Aswan, 2023). Conversely, low digital literacy hinders active participation and academic performance (Handayani et al., 2025).

Although various studies have examined SRL (Caixia et al., 2025), online learning readiness (Reyes-Millán et al., 2023), digital literacy (Georgopoulou et al., 2025), as well as psychological factors such as loneliness (Almendingen et al., 2021), most of those studies were conducted separately and partially. The higher education management literature has also emphasized the importance of service quality and technological support to student satisfaction and loyalty (Al-Fraihat et al., 2020; Atmaja & Sagala, 2023; Teeroovengadum et al., 2019). However, the integration between the psychological dimension, online learning readiness, digital literacy, and institutional service support in one comprehensive conceptual framework remains limited, especially in the context of Open Universities in Indonesia.

Quality of Service: Key Foundations Service quality is defined as the gap between expectations and perceptions of performance perceived by students. The dimensions tangibles, reliability, responsiveness, assurance, and empathy as key pillars of service quality (Pramesti & Rizal, 2023; Wijayanti, 2023). In the context of higher education, which covers both academic and non-academic aspects (Nguyen et al., 2024). Argue that service quality dimensions have a significant influence on satisfaction, but their impact on loyalty is often indirect, but mediated by satisfaction (Mulyono et al.,

2020). Add that responsive and empathetic administrative staff significantly shape students' positive perception (Hidayat & Rohana, 2022).

The Role of Information Technology in PJJ For UT, technology is not just a supporting element, but the core of operations. In their study on e-learning success emphasizes that system quality and information quality are strong predictors of user satisfaction (Al-Fraihat et al., 2020). Found that perceived ease of use and performance expectancy technology has a positive effect on customer satisfaction (Divalona & Sfenrianto, 2023; Saragih & Napitupulu, 2023). In the context of SALUT, technology synergy means that the system used by employees must be well integrated to speed up administrative services (speed and accuracy).

Student Satisfaction as a Mediator Satisfaction is a post-consumption emotional response. Define satisfaction as a feeling of pleasure or disappointment that arises after comparing product performance with expectations (Noe et al., 2023). Researchers consistently found that student satisfaction mediates the relationship between service quality and loyalty (Borishade et al., 2021; Wijayanti, 2023). Without satisfaction, good service quality does not necessarily guarantee loyalty (insignificant relationships were found directly in studies).

Student Loyalty, Trust, and Institutional Image Loyalty is defined as a deep commitment to re-subscribe or make a repurchase (Wijayanti, 2023). The reputation or image of an institution is a primary determinant of loyalty (Bakrie et al., 2019; Kusnara, 2022). In addition, found that trust is another important mediating variable; students must believe in the integrity of the institution before they become loyal (Atmaja & Sagala, 2023).

Thus, there is a significant research gap. First, there has been limited research that integrates online learning readiness, SRL, and digital literacy as structural contexts in the analysis of distance education service quality. Second, the relationship between institutional service support, especially service quality and staff technological skills and student loyalty, has not been comprehensively analyzed through the mediation mechanism of student satisfaction in open and distance education settings. Third, empirical evidence concerning geographically heterogeneous non-traditional students in Indonesia remains limited.

Based on these gaps, this research offers conceptual novelty through the development of an integrative model that links the quality of SALUT services and staff technology skills with student satisfaction and loyalty in the context of distance learning. This research positions student satisfaction as a strategic mediator that transforms service experiences into long-term institutional loyalty. By integrating the psychological, technological, and service dimensions in a single structural model, this study not only enriches the distance education literature but also provides practical implications for the strengthening of technology-based academic services at the Open University.

In particular, this study aims to analyze: (1) the effect of service quality on student satisfaction; (2) the influence of staff technology skills on student satisfaction; (3) the direct influence of service quality and technological skills on student loyalty; and (4) the mediating role of student satisfaction in the relationship between service quality, technological skills, and student loyalty. The conceptual model developed is expected to make a theoretical and practical contribution in strengthening the sustainability of studies and student loyalty to the distance education system in Indonesia.

The quality of academic services in the distance higher education ecosystem reflects the institutional capacity to provide services that are reliable, responsive, and student-oriented. In an online learning environment, the dimension of service quality goes beyond mere availability; it includes clarity of information, accessibility, and the speed and accuracy of academic staff responses. An empirical study confirms that the main determinants of student satisfaction in e-learning are service quality, technical system quality, and information quality, which collectively explain the 71.4% variance in perceived satisfaction (Al-Fraihat et al., 2020). Specifically, service quality, which includes the availability of technical staff, clear guidance, and personal responsiveness, is a significant predictor of user satisfaction. In the context of the Open University Service Center (SALUT), this implies the urgency of providing accurate academic information, ease of access to services, and consistency of staff in providing sustainable solutions to academic problems.

In addition to the quality of service, the technological competence of SALUT staff serves as a fundamental enabler in the effectiveness of distance learning. These skills are not limited to technical mastery of hardware and software, but also include a pedagogical-technical capacity to guide students in navigating obstacles in e-learning, especially those related to the use of Learning Management System (LMS). The literature confirms that adequate technical support and the availability of competent IT staff are positively correlated with student satisfaction. Furthermore, find that the quality of technical services (such as staff assistance and training) has a positive relationship with satisfaction, which in turn affects net benefits perceived by the students (Al-Fraihat et al., 2020). Therefore, the technological skills of

SALUT staff are a critical element in ensuring the smooth instructional process and improving the student learning experience.

Within the framework of causality relationships, student satisfaction is positioned as a strategic mediator that connects the quality of service and technology support with student loyalty. Validation a structural model in which student satisfaction acts as a strong predictor of loyalty, which is manifested through positive word-of-mouth behavior and the desire to continue studies at the same institution (Teeroovengadam et al., 2019). These findings are reinforced by the study of which shows that service quality has a positive effect on student loyalty either directly or through mediation of student satisfaction and student trust (Atmaja & Sagala, 2023). Students who perceive high-quality academic services and reliable technology support tend to have higher levels of satisfaction, which significantly strengthens their commitment and loyalty to the institution. Thus, student satisfaction is not just an outcome, but rather a crucial intervening mechanism that transforms the service experience into long-term institutional loyalty (Atmaja & Sagala, 2023).

Based on the challenges faced by Open University students that have been described, this study was prepared with a conceptual framework that describes the relationship between the quality of SALUT services, the technological skills of SALUT staff, student satisfaction, and student loyalty. The conceptual framework is presented in Figure 1 and shows the relationship between research variables in a systematic manner.

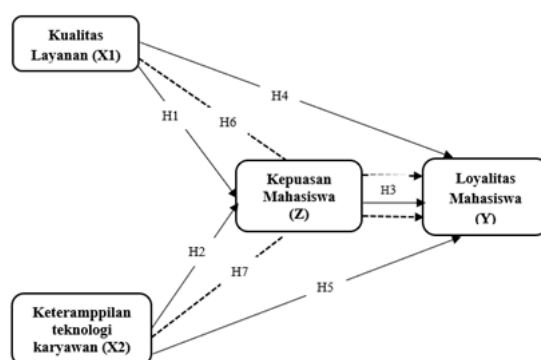


Figure 1. Frame of Mind

In this conceptual model, the quality of service (X1) and the technological skills of SALUT staff (X2) are positioned as independent variables. These two variables represent the role of SALUT in providing academic and technological support to Open University students. The quality of service reflects SALUT's ability to provide reliable and responsive services, while the staff's technological skills demonstrate the technical and digital capabilities of the staff in supporting distance learning.

Student satisfaction (Z) is positioned as an intervening variable that mediated the influence of service quality and staff technology skills on student loyalty (Y). Student satisfaction is formed as an evaluative response to students' experiences in receiving services and technology support from SALUT.

The conceptual model shows that service quality (X1) and technological skills (X2) have a direct effect on student satisfaction (Z). In addition, these two independent variables also have a direct influence on student loyalty (Y). On the other hand, student satisfaction (Z) also directly affects student loyalty (Y).

Thus, the conceptual framework of this study confirms that student satisfaction plays a role as a partial mediator in the relationship between service quality and technological skills of SALUT staff on student loyalty. This model provides an overview of the role of technology-based support services in improving the student learning experience, which ultimately contributes to the study continuity and the loyalty of Open University students.

Research Methods

This research was carried out at the Open University Service Center (SALUT) of PT Dwi Guna Cipta Nusantara with a data collection period that lasted from November 2024 to January 2025. The research population is all students who use the SALUT service of PT Dwi Guna Cipta Nusantara with an estimated population of 200 students. The determination of the minimum sample count uses the Slovin formula with a 5% error rate, which is a commonly used standard in social science research to maintain a balance between the level of accuracy and efficiency of the research. Based on this calculation, a minimum sample number of 132 respondents was obtained. In its implementation, this study succeeded

in collecting data from 270 respondents, so that it met the sample adequacy criteria for Structural Equation Modeling analysis based on Partial Least Squares (PLS-SEM) (Hair et al., 2021).

The sampling technique used non-probability sampling with the purposive sampling method. Respondents were selected based on certain criteria, namely students who have direct experience using SALUT services. This approach allows researchers to obtain data that is relevant to the research objective, although it has limitations in terms of generalization because the sample is not randomly selected.

This study uses a quantitative approach with an explanatory design. A quantitative approach is used to test hypotheses empirically through statistical analysis of samples representing the research population (Sugiyono, 2019). Explanatory design aims to explain the causal relationship between independent variables and dependent variables in a research model.

Primary data collection was carried out through a survey using a closed questionnaire distributed online through Google Form. The distribution of questionnaires was carried out through student WhatsApp groups and official SALUT communication channels. The research instrument uses a five-point Likert scale that is commonly used to measure respondents' attitudes and perceptions in social research (Shrestha, 2021).

The operationalization of variables in this study consisted of service quality as an independent variable (X1), employee technology skills as an independent variable (X2), student satisfaction as a mediating variable (Z), and student loyalty as a dependent variable (Y). Service quality variables were measured using the SERVQUAL model which included the dimensions of tangibles, reliability, responsiveness, assurance, and empathy (Parasuraman et al., 1985). Technology skill variables are measured through the dimensions of functional skills, creativity, collaboration and communication, and the ability to find and evaluate digital information. Student satisfaction is measured through indicators of overall satisfaction, confirmation of expectations, and comparison with ideal conditions, while student loyalty is measured through indicators of trust, emotional commitment, switching costs, word-of-mouth, and cooperation.

The research model was designed to test the influence of service quality and employee technology skills on student satisfaction and loyalty to SALUT services. In addition to direct influence, this study also examines the role of student satisfaction as a mediating variable in the relationship between service quality and student loyalty as well as between employee technology skills and student loyalty. This model allows the analysis of causal relationships between variables in one integrated structural framework, thus providing a more comprehensive understanding of the factors that influence student loyalty in the context of distance education services.

Data analysis was carried out using Structural Equation Modeling based on Partial Least Squares (SEM-PLS). This method was chosen because it is suitable for analyzing research models that involve several latent variables as well as mediating relationships and does not require strict multivariate normality assumptions (Ghozali, 2012; Hair et al., 2021). The evaluation of the measurement model (outer model) was carried out through convergent validity testing with the criteria of outer loading > 0.70 and Average Variance Extracted (AVE) > 0.50 , discriminant validity using the Fornell–Larcker and Heterotrait–Monotrait Ratio (HTMT) criteria, and reliability using Cronbach's alpha and composite reliability with $>$ values of 0.70. Multicollinearity was evaluated using the Variance Inflation Factor (VIF) value < 5 .

Furthermore, the evaluation of the structural model (inner model) was carried out through testing the R-Square (R^2) value to assess the ability of exogenous variables to explain endogenous variables, effect size (f^2) with small (0.02), medium (0.15), and large (0.35) (Cohen, 1988) categories, as well as predictive relevance using Q-Square (Q^2) values. Model suitability was also evaluated through Standardized Root Mean Square Residual (SRMR) and Normed Fit Index (NFI) values. Hypothesis testing was carried out using the bootstrapping method, with hypothesis criteria accepted if the t-statistical value > 1.96 and p-value < 0.05 (Ghozali, 2021).

Results and Discussion

This study involved 270 students who used the services of the Open University Service Center (SALUT) of PT Dwi Guna Cipta Nusantara from various regions. These respondent characteristics provide a demographic and academic picture that affects their perception of services, with the following details: The majority of respondents in this study were women, namely 155 people (57%), while male respondents amounted to 115 people (43%). The age distribution was dominated by the group of young students in the age range of 22–30 years old as many as 143 people (53%), followed by the age group of 31–40 years old as many as 53 people (20%). The dominance of this productive age indicates the high

level of adaptation of respondents to technology-based distance learning systems. The most respondents came from the operational areas of SALUT Cibinong (59 people or 22%) and SALUT Tangerang (48 people or 18%), while the least number came from SALUT Bekasi with 25 people (9%). Most of the respondents are in the early to mid-stage of their studies. Semester 4 students dominated with 52 people (19%), followed by semester 2 with 48 people (18%) and semester 3 with 47 people (17%).

The results of the structural model testing in this study show that independent variables have a strong ability to explain the variation in student satisfaction and loyalty, with R-square values of 0.744 and 0.766, respectively. These findings are based on an analysis of 270 respondents in various branches of SALUT DGCN. This section will elaborate in detail on the validity of measurement instruments as well as hypothesis testing results, including the interesting finding that employees' technology skills do not have a direct effect on loyalty, but are mediated by customer satisfaction.

Measurement Model Testing (Outer Model)

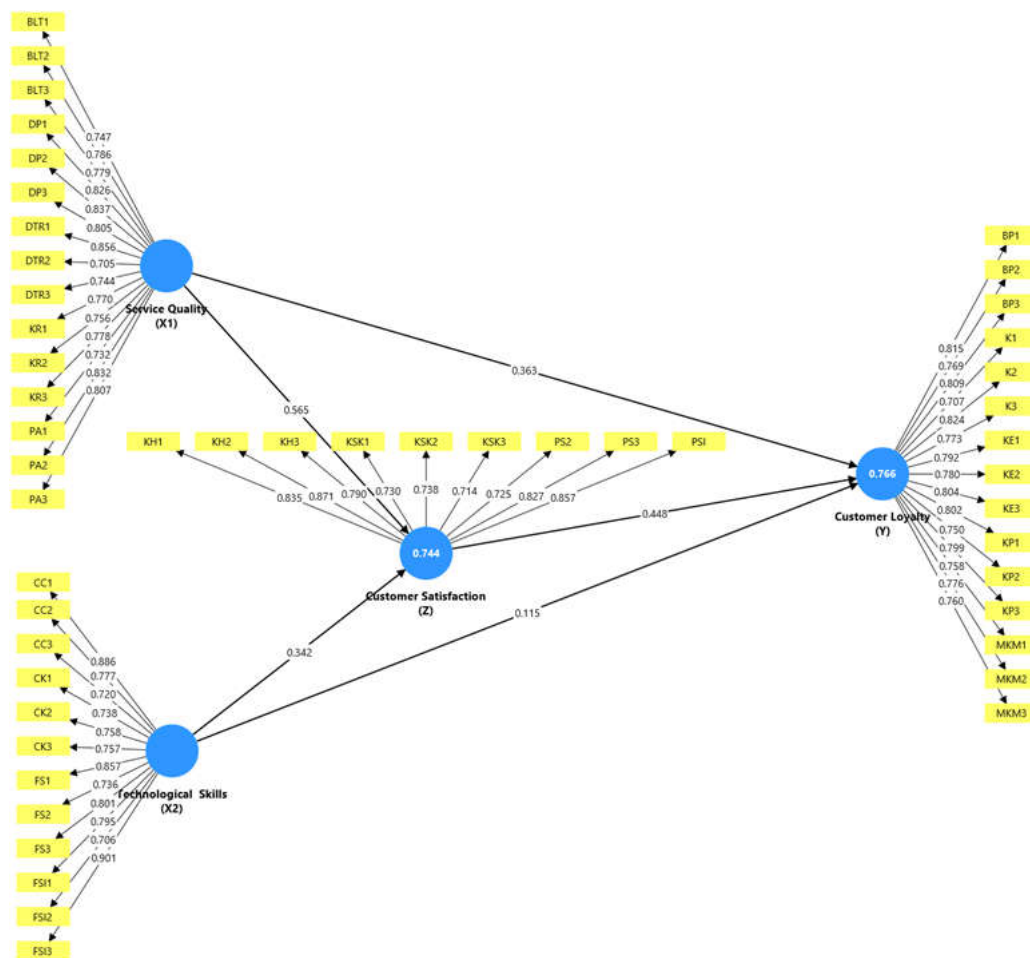


Figure 2. Outer Model

Convergence Validity

Table 1. Summary of Convergent Validity

Variabel	Outer Loading	AVE	Criteria	Remarks
Service Quality (X1)	0,705 – 0,856	0,616	>0,70 & >0,50	Valid
Technological Skills (X2)	0,706 – 0,901	0,622	>0,70 & >0,50	Valid
Customer Satisfaction (Z)	0,714 – 0,871	0,623	>0,70 & >0,50	Valid
Customer Loyalty (Y)	0,707 – 0,824	0,611	>0,70 & >0,50	Valid

All indicators have an outer loadings > 0.70, and all constructs have AVE values > 0.50. Therefore, the model meets the criteria for convergent validity

Discriminant Validity

Table 2. Fornell-Larcker Summary

Construct	$\sqrt{\text{AVE}}$	Highest Correlation with Other Constructs	Remarks
X1	0,785	0,837	Meets Criteria
X2	0,789	0,791	Meets Criteria
Z	0,789	0,843	Meets Criteria
Y	0,782	0,859	Meets Criteria

The test results show that all indicators have an outer loadings above 0.70 and the AVE value of each construct exceeds 0.50. Methodologically, these findings indicate that the indicators in the study have a strong representative ability to reflect latent constructs. From the perspective of PLS-SEM, this condition confirms that the variables of service quality, technological skills, customer satisfaction, and customer loyalty have met the principle of convergent validity, which is the level of internal similarity between indicators in one construct (Hair et al., 2021). This means that the constructs built in the model have sufficient conceptual and empirical consistency to explain the phenomenon of distance learning services in SALUT.

Table 2. HTMT Summary

Relationships Between Constructs	HTMT Value	Criteria (<0.90)	Remarks
X1 – Z	0,883	<0.90	Valid
X2 – Z	0,837	<0.90	Valid
X1 – Y	0,859	<0.90	Valid
Z – Y	0,879	<0.90	Valid
X2 – Y	0,785	<0.90	Valid

All HTMT values are below 0.90; therefore, no construct overlap is detected, and discriminant validity is established. Tests using the Fornell-Larcker criterion and HTMT approach show that the $\sqrt{\text{AVE}}$ value for each construct is higher than its correlation with other constructs and that all HTMT values remain below the 0.90 threshold. Theoretically, these findings strengthen the argument that each construct has a distinct conceptual domain and does not exhibit construct redundancy. This is particularly important in the context of technology-based educational services, where constructs such as service quality and technological skills often share conceptual overlap. However, the empirical results show that the two remain statistically distinguishable, indicating that the model has adequate structural clarity.

Table 3. Reliability Test

Variable	Cronbach's Alpha	Composite Reliability	Criteria (>0.70)	Remarks
X1	0,955	0,960	>0,70	Highly Reliable
X2	0,944	0,951	>0,70	Highly Reliable
Z	0,924	0,937	>0,70	Highly Reliable
Y	0,954	0,959	>0,70	Highly Reliable

All variables demonstrate excellent internal consistency. The Cronbach's alpha and composite reliability values for all variables are well above the 0.70 threshold. This shows a very strong level of internal consistency. Methodologically, high reliability indicates that the measurement instrument is stable and capable of producing consistent estimates when the study is replicated in a similar context. Therefore, the measurement model can be declared robust and feasible for testing causal relationships in the structural (inner) model.

Structural Model Test (Inner Model)**R-Square (R²)**

Table 4. R-Square Value

Variable Dependency	R ²	Category
Customer Satisfaction (Z)	0,744	Strong
Customer Loyalty (Y)	0,766	Strong

The model demonstrates a strong explanatory power (>0.70). The R² value of 0.744 for satisfaction and 0.766 for loyalty indicates that the model's explainability falls within the strong category.

Substantively, this means that the variation in student satisfaction is largely explained by service quality and technological skills, while student loyalty is predominantly influenced by satisfaction and service quality. From the perspective of educational service management, these findings show that service-related dimensions have a significant explainability in shaping student loyalty behavior within a distance learning system.

Path Coefficients & Significance

Table 5. Hypothesis Test Results

Relationship	Coefficin	T-Stat	P-Value	Verdict
X1 → Z	0,565	6,989	0,000	Signifikan
X2 → Z	0,342	3,947	0,000	Signifikan
From → Y	0,448	6,226	0,000	Signifikan
X1 → Y	0,363	5,443	0,000	Signifikan
X2 → Y	0,115	1,825	0,069	Insignifikan

Results of 4 significant direct relationships, 1 relationship is insignificant (X2 → Y), The hypothesis testing results show that: Service Quality → Satisfaction (significant), Technological Skills → Satisfaction (significant), Satisfaction → Loyalty (significant), Service Quality → Loyalty (significant), Technological Skills → Loyalty (insignificant). Theoretically, these findings reinforce the service-profit chain model in the context of education, where service quality functions as a key determinant of satisfaction, which in turn drives loyalty. Interestingly, technological skills do not have a direct effect on loyalty. This suggests that technological competence alone is insufficient to build a student's long-term commitment without going through a satisfaction experience. In other words, technology functions as a hygiene factor that increases satisfaction but does not directly drive loyalty. This finding provides a conceptual contribution that, in the context of distance learning, human-centered service quality remains a dominant factor compared to technical capability alone in fostering long-term institutional loyalty.

Effect Size (f^2)

Table 6. Effect Size

Relationship	f^2	Category
X1 → Z	0,460	Large
X2 → Z	0,168	Medium
From → Y	0,220	Medium
X1 → Y	0,142	Medium
X2 → Y	0,018	Small

The effect size results indicate that the strongest influence is found in the relationship between Service Quality and Satisfaction ($f^2 = 0.460$), which falls into the large category. This confirms that service quality is a key strategic variable in the model.

Conversely, the direct influence of Technological Skills → Loyalty is very small ($f^2 = 0.018$). Substantively, this suggests that student loyalty is more strongly influenced by perceived service experience than mere technical sophistication.

Predictive Relevance (Q^2)

Table 7. Q^2 Redundancy

Variable	Q^2	Remarks
Customer Satisfaction (Z)	0,453	Has predictive power
Customer Loyalty (Y)	0,457	Has predictive power

Table 8. Q^2 Predict

All indicators have Q^2 predict > 0
Value range: 0.288 – 0.626

The model demonstrates good predictive relevance. The Q^2 values for Satisfaction and Loyalty are above zero, and all Q^2 _predict values are positive. This indicates that the model not only has explanatory capability but also predictive capability. Thus, the model is able to adequately reconstruct observational data and shows strong empirical relevance.

Table 9. Final Model Summary

Evaluation Aspects	Results
Convergent Validity	✓ Meets Criteria
Discriminant Validity	✓ Meets Criteria
Reliability	✓ Highly Reliable
R ²	✓ Strong
Path Significance	6 Accepted, 1 Rejected
Effect Size	Dominant: X1 → Z
Q ²	✓ Predictive Model

Conclusion

This study confirms that student loyalty in the open higher education system and technology-based distance learning system is formed through an evaluative mechanism that integrates service quality, technological competence, and customer satisfaction. The empirical results show that service quality has a direct and significant effect on student satisfaction and loyalty. These findings strengthen the service quality theory, which positions reliability, responsiveness, assurance, empathy, and tangibles as the main determinants in shaping positive institutional evaluations.

Employees technological skills are shown to have a significant effect on student satisfaction, but do not have a direct effect on loyalty. These findings suggest that, in the context of distance learning, technological competence serves as a service enabler that supports the service experience but does not automatically generate long-term commitment. Loyalty is formed only when these competencies translate into a satisfying service experience.

Furthermore, customer satisfaction significantly mediates the relationship between service quality and loyalty, as well as between technological skills and loyalty. This confirms that student loyalty in digital-based higher education is more strongly determined by affectively internalized service experiences than by technical excellence alone.

Theoretical Contributions

This study provides three main theoretical contributions. First, it reinforces the validity of service quality theory in the context of digital-based open higher education, which has traditionally been tested more extensively in the commercial services sector. Second, it extends the satisfaction–loyalty linkage model by showing that technological competence does not act as a direct determinant of loyalty but rather as an indirect antecedent through satisfaction. These findings add nuance to the literature on technology-based customer loyalty. Third, this study proposes an integrative framework that positions service quality as a strategic foundation, technological competence as operational support, and satisfaction as a transformational mechanism leading to student loyalty. This model enriches the development of service management theory within the context of digital higher education.

Practical Contributions

Practically, this study implies that strategies aimed at strengthening student loyalty in distance learning system cannot rely solely on technological enhancement. Institutions need to integrate service quality, employee competencies, and satisfaction management into a consistent service experience orchestration. Improving service operational standards, implementing technology training oriented toward student experience, and establishing data-driven satisfaction monitoring systems are strategic instruments for strengthening student retention. Student loyalty is more effectively cultivated through comprehensive service experience management than through technology investment alone.

Research Limitations

This study has several limitations. First, the cross-sectional design limits the ability to capture longitudinal changes in student loyalty. Future research is recommended to employ longitudinal design to examine the stability of the model from the initial semester to the end of the study period. Second, this study is limited to a single SALUT entity; therefore, generalization of the findings requires further testing across other institutions or regions. Comparative studies involving multiple SALUT units or online-based higher education institutions would strengthen the external validity of the model. Third, although the model demonstrates strong explainability, it does not incorporate other theoretically relevant variables such as trust, perceived value, student engagement, and institutional image, which may influence loyalty.

Future research may develop more comprehensive models using mixed method approaches to enrich analytical depth. Thus, the development of student loyalty studies in digital higher education remains open for further exploration, particularly in understanding the integration of service quality, technological competence, and learning experiences in shaping students' long-term institutional commitment.

Recommendations

Theoretically, this study contributes to the development of higher education service management research, particularly in the context of distance education and open university systems. The findings reinforce the service quality theory, which asserts that service quality is a primary determinant of customer satisfaction, which subsequently influences loyalty. This study also strengthens the literature regarding the role of customer satisfaction as an intervening variable in the relationship between service quality, employees' technological skills, and customer loyalty. The results indicate that technological skills do not always have a direct effect on loyalty but operate indirectly through customer satisfaction. These findings provide empirical evidence that in technology-based services, technical competencies must first be translated into perceived service experience. Furthermore, this study extends the application of the satisfaction-loyalty model within the context of the Open University Service Center (SALUT), which has unique characteristics, i.e. serving students from diverse geographical, social, and technological backgrounds. Thus, this study may serve as an academic reference for future studies examining student loyalty, academic services quality, and distance learning support systems in open and online higher education institutions.

Practically, the findings confirm that service quality is the most dominant factor in shaping customer satisfaction and loyalty. Therefore, SALUT should prioritize service quality improvement as a strategic agenda. Applicable best practices include standardizing service procedures, enhancing clarity of academic information, and increasing responsiveness in addressing student inquiries and complaints. Although an employee's technological skills do not directly affect loyalty, they play an important role in improving customer satisfaction. Accordingly, technological capacity development for SALUT staff should focus not only on technical expertise but also on communication, mentoring, and problem-solving competencies. Continuous and context-relevant technology training will enable staff to provide more effective and empathetic services. Customer satisfaction has proven to be the primary driver of student loyalty. SALUT should systematically monitor satisfaction levels through periodic surveys and feedback mechanisms. This information can serve as a foundation for continuous service improvement, ensuring that students feel cared for, supported, and valued throughout their academic journey. As a central service unit, SALUT should integrate administrative, academic, and technological support into a unified service system. Such integration will minimize miscommunication, delays in academic information, and technical challenges frequently encountered in distance education. Integrated services will foster a more positive learning experience and strengthen student loyalty to the Open University.

References

- Al-Fraihat, D., Joy, M., Masa'deh, R., & Sinclair, J. (2020). Evaluating E-learning systems success: An empirical study. *Computers in Human Behavior*, 102(June 2019), 67–86. <https://doi.org/10.1016/j.chb.2019.08.004>
- Almendingen, K., Morseth, M. S., Gjølstad, E., Brevik, A., & Tørris, C. (2021). Student's experiences with online teaching following COVID-19 lockdown: A mixed methods explorative study. *PLOS ONE*, 16(8), e0250378. <https://doi.org/10.1371/journal.pone.0250378>
- Anna Noviana, & Linda Daniati Melinda. (2024). Pengaruh Kompetensi Teknologi Informasi Komunikasi Guru Terhadap Kepuasan Siswa di SMK Negeri 3 Bandung. *ATRABIS Jurnal Administrasi Bisnis (e-Journal)*, 10(1), 196–208. <https://doi.org/10.38204/atrabis.v10i1.1962>
- Arrafii, M., Sumarsono, D., & Suadiyatno, T. (2025). Self-regulated learning strategies in distance education: Insights from Indonesia. *Journal of Pedagogical Sociology and Psychology*, 7(4), 160–173. <https://doi.org/10.33902/JPSP.202534897>
- Aswan, D. (2023). Analisis Pengaruh Literasi Digital terhadap Kemandirian Belajar Mahasiswa dalam Era Internet Dedy Aswan Universitas Negeri Makassar. *Jurnal Ilmiah Wahana Pendidikan*, 9(20), 949–955. <https://doi.org/https://doi.org/10.5281/zenodo.10362490>
- Atmaja, D. R., & Sagala, H. M. br. (2023). Analysis of the Relationship Between E-Learning Service Quality and Student Trust, Student Satisfaction, and Student Loyalty. *Majalah Ilmiah Bijak*, 20(1), 173–182. <https://doi.org/10.31334/bijak.v20i1.3306>
- Bakrie, M., Sujanto, B., & Rugaiyah, R. (2019). The Influence of Service Quality, Institutional

- Reputation, Students' Satisfaction on Students' Loyalty in Higher Education Institution. *International Journal for Educational and Vocational Studies*, 1(5), 511–518. <https://doi.org/10.29103/ijevs.v1i5.1615>
- Borishade, T. T., Ogunnaike, O. O., Salau, O., Motilewa, B. D., & Dirisu, J. I. (2021). Assessing the relationship among service quality, student satisfaction and loyalty: the NIGERIAN higher education experience. *Heliyon*, 7(7), e07590. <https://doi.org/10.1016/j.heliyon.2021.e07590>
- Bozkurt, A., & Dash, M. (2024). *Supporting Retention and Student Services in Online and Distance Education* (European Association of Distance Teaching Universities (EADTU) | George Ubachs (ed.)). <https://doi.org/10.5281/zenodo.11120440>
- Caixia, L., Bakar, Z. A., & Qianqian, X. (2025). Self-Regulated Learning and Academic Achievement in Higher Education: A Decade Systematic Review. *International Journal of Research and Innovation in Social Science*, IX(III), 4488–4504. <https://doi.org/10.47772/IJRISS.2025.90300358>
- Divalona, S., & Sfenrianto. (2023). An Empirical Study on the Factors Affecting Customer Satisfaction and Customer Loyalty in Online Transportation Apps. *Journal of System and Management Sciences*, 13(4), 93–106. <https://doi.org/10.33168/JSMS.2023.0406>
- Georgopoulou, M. S., Krouska, A., Troussas, C., & Sgouropoulou, C. (2024). Redefining the Concept of Literacy: a DigCompEdu extension for Critical Engagement with AI tools. *2024 9th South-East Europe Design Automation, Computer Engineering, Computer Networks and Social Media Conference (SEEDA-CECNSM)*, 98–102. <https://doi.org/10.1109/SEEDA-CECNSM63478.2024.00026>
- Georgopoulou, M. S., Troussas, C., Krouska, A., & Sgouropoulou, C. (2025). Digital Literacy in Higher Education: Examining University Students' Competence in Online Information Practices. *Computers*, 14, 528. <https://doi.org/https://doi.org/10.3390/computers14120528>
- Ghozali, I. (2021). Partial Least Squares: Konsep, Teknik, dan Aplikasi SmartPLS 3.2.9 Untuk Penelitian Empiris. In *Penelitian Empiris* (Ed. 3). Badan Penerbit Universitas Diponegoro.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R*. Springer International Publishing. <https://doi.org/10.1007/978-3-030-80519-7>
- Handayani, T., Mokay, M. M., Sukmayadi, D., A. Fitriani, & Belangi, S. P. (2025). Digital Literacy and Learning Outcomes: Analyzing the Impact of Blended Learning in Higher Education during the Post-Pandemic Era. *International Journal of Educational Research Excellence (IJERE)*, 4(2), 678–684. <https://doi.org/10.55299/ijere.v4i2.1552>
- Hidayat, R., & Rohana, T. (2022). Pengukuran Loyalitas Mahasiswa dengan Pelayanan Pegawai Administrasi dan Kepuasan Mahasiswa. *Ekonomi, Keuangan, Investasi Dan Syariah (EKUITAS)*, 3(4), 849–855. <https://doi.org/10.47065/ekuitas.v3i4.1616>
- Kusnara, H. P. (2022). Pengaruh Kualitas Jasa Pendidikan Tinggi, Manajemen Kerelasiaan Mahasiswa Terhadap Citra Universitas Widyatama. *Jurnal Ekonomi Dan Bisnis*, 9(2).
- Mulyono, H., Hadian, A., Purba, N., & Pramono, R. (2020). Effect of Service Quality Toward Student Satisfaction and Loyalty in Higher Education. *The Journal of Asian Finance, Economics and Business*, 7(10), 929–938. <https://doi.org/10.13106/jafeb.2020.vol7.no10.929>
- Nguyen, H. V., Vu, T. D., Saleem, M., & Yaseen, A. (2024). The influence of service quality on student satisfaction and student loyalty in Vietnam: the moderating role of the university image. *Journal of Trade Science*, 12(1), 37–59. <https://doi.org/10.1108/jts-12-2023-0032>
- Noe, J., Hidayati, F., & Lastiti, N. (2022). Pengaruh Kualitas Layanan Citra Institusi Terhadap Kepuasan Yang Dimediasi Loyalitas Mahasiswa (Studi pada Magister Administrasi Publik Universitas Brawijaya). *Jurnal Administrasi Publik*, 6(1), 1–6.
- Noe, J., Hidayati, F., & Lastiti, N. (2023). Pengaruh Kualitas Layanan Citra Institusi Terhadap Kepuasan Yang Dimediasi Loyalitas Mahasiswa. *Jurnal Administrasi Publik (JAP)*, 6(1), 1–6.
- Pramesti, M. D., & Rizal, A. (2023). Pengaruh Kualitas Layanan dan Citra Perguruan Tinggi Terhadap Kepuasan dan Dampaknya Pada Niat Untuk Merekomendasikan. *Syntax Literate; Jurnal Ilmiah Indonesia*, 7(9), 16004–16020. <https://doi.org/10.36418/syntax-literate.v7i9.13775>
- Reyes-Millán, M., Villareal-Rodríguez, M., Murrieta-Flores, M. E., Bedolla-Cornejo, L., Vázquez-Villegas, P., & Membrillo-Hernández, J. (2023). Evaluation of online learning readiness in the new distance learning normality. *Heliyon*, 9(11), e22070. <https://doi.org/10.1016/j.heliyon.2023.e22070>
- Rozi, F., Ramdlani, M., Najah, F., Azizah, N., Niswa, H., Abdillah, M., & Rozi, F. (2021). Distance Learning and Independent Learning of Students in Higher Education. *Journal of Physics: Conference Series*, 1899, 12177. <https://doi.org/10.1088/1742-6596/1899/1/012177>
- Saragih, T. K., & Napitupulu, T. A. (2023). An Empirical Study on the Joox Usage Trend. *Journal of*

- System and Management Sciences*, 13(5), 561–573. <https://doi.org/10.33168/JSMS.2023.0536>
- Setyaningsih, Y., Khusaini, K., & Widiarti, A. (2023). Analisis Kepuasan Mahasiswa Dan Faktor-Faktor Yang Mempengaruhinya (Studi Pada Mahasiswa Fakultas Keguruan Dan Ilmu Pendidikan Universitas Islam Syekh-Yusuf Tangerang. *Journal of Business Education and Social*, 3(1), 33–42. <https://doi.org/10.33592/jbes.v3i1.3384>
- Shin, J., Balyan, R., Banawan, M. P., Arner, T., Leite, W. L., & McNamara, D. S. (2023). Pedagogical discourse markers in online algebra learning: Unraveling instructor’s communication using natural language processing. *Computers & Education*, 205(December 2022), 104897. <https://doi.org/10.1016/j.compedu.2023.104897>
- Shrestha, P. M. (2021). Impact of Service Quality on Customer Satisfaction and Loyalty. *Management Dynamics*, 24(2), 71–80. <https://doi.org/10.3126/md.v24i2.50041>
- Teeroovengadum, V., Nunkoo, R., Gronroos, C., Kamalanabhan, T. J., & Seebaluck, A. K. (2019). Higher education service quality, student satisfaction and loyalty. *Quality Assurance in Education*, 27(4), 427–445. <https://doi.org/10.1108/QAE-01-2019-0003>
- Wibowo, H. A. C., & Wilujeng, I. (2021). Pengaruh Keterampilan dan Kesadaran Teknologi Informasi terhadap Prestasi Belajar Mahasiswa Selama Pandemi Covid-19. *Edu Cendikia: Jurnal Ilmiah Kependidikan*, 1(2), 55–64. <https://doi.org/10.47709/educendikia.v1i2.1024>
- Wijayanti, D. R. (2023). Pengaruh Kualitas Pelayanan Terhadap Loyalitas Mahasiswa Dengan Variabel Mediasi Kepuasan Mahasiswa. *Al-Muttaqin : Jurnal Studi, Sosial, Dan Ekonomi*, 4(2), 215–228. <https://doi.org/10.63230/almuttaqin.v4i2.119>
- Xing, W., Huang, X., Li, C., & Xie, C. (2023). Teaching thermodynamics with augmented interaction and learning analytics. *Computers and Education*, 196(April 2022), 104726. <https://doi.org/10.1016/j.compedu.2023.104726>
- Xu, Z., Zhao, Y., Liew, J., Zhou, X., & Kogut, A. (2023). Synthesizing research evidence on self-regulated learning and academic achievement in online and blended learning environments: A scoping review. *Educational Research Review*, 39(January), 100510. <https://doi.org/10.1016/j.edurev.2023.100510>