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Academic Infrastructure and Student Satisfaction in Islamic Higher Education: Evidence from a Regression Study at UIN Sunan Kalijaga

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Abstract

Purpose – This study addresses the critical role of academic infrastructure in student satisfaction within Indonesian higher education, a context underexplored in existing literature. It examines whether facility availability at FITK UIN Sunan Kalijaga Yogyakarta significantly impacts student satisfaction, offering empirical insights to guide institutional policies. Key findings reveal infrastructure as a primary determinant of satisfaction, reinforcing its strategic importance in academic environments.

Design/methods – A quantitative approach was employed, with data collected via a 5-point Likert-scale questionnaire administered to 83 students (2020 cohort) selected through probability sampling (Slovin formula, 10% margin of error). Validity and reliability were confirmed using Pearson correlation (r-count > 0.1818) and Cronbach's alpha (α > 0.90). Normality testing (Kolmogorov–Smirnov, p = 0.20) and SPSS v29-supported simple linear regression analyzed the relationship between infrastructure (independent variable) and satisfaction (dependent variable).

Findings – Regression analysis demonstrated a significant positive effect (Y = 5.826 + 1.528X, p < 0.001), with infrastructure explaining 70.9% of satisfaction variance. Hypothesis testing confirmed the effect (F-test: p = 0.001; t-test: t-calculated = 14.035 > t-table = 1.664). All instrument items were valid (r-count > 0.1818) and reliable (α = 0.903–0.970).

Research implications/limitations – The single-faculty focus and cross-sectional design limit generalizability. Unexplained variance (29.1%) suggests unmeasured factors (e.g., teaching quality) may influence satisfaction, warranting broader variable inclusion in future studies.

Practical implications – Institutions should prioritize infrastructure investment, aligning development with student feedback and enrollment growth. Policymakers can leverage these findings to enhance institutional competitiveness and retention, integrating facility upgrades into budget planning.

Originality/value – This study contributes novel empirical evidence from Indonesia's Islamic higher education context, employing robust methodological rigor. It underscores infrastructure's strategic value, proposing longitudinal, multi-institutional research to validate findings and explore non-material satisfaction drivers.

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Introduction

The availability of adequate educational infrastructure plays a pivotal role in shaping the learning experience and overall satisfaction of students in higher education institutions globally. As education systems face the dual pressure of increasing enrollment and maintaining quality, infrastructural adequacy emerges as a key determinant of educational equity and institutional effectiveness (Cui, 2023; Karbila & Usman, 2021; Thapa et al., 2017). Student satisfaction, a critical indicator of institutional performance, is profoundly influenced by students' perceptions of the availability and functionality of campus facilities (Ma et al., 2024; Ramírez-Díaz & Hidalgo-Solano, 2018). In the context of higher education, where students are increasingly viewed as active consumers of educational services, ensuring the availability of relevant infrastructure is not merely a matter of compliance but a strategic priority (Mejía et al., 2022). Accordingly, the intersection between infrastructural quality and student satisfaction represents an important and pressing problem for educational administrators and policymakers.

A growing body of literature underscores the multifaceted influence of infrastructure on student satisfaction and academic performance. Studies reveal that well-maintained facilities, such as libraries, classrooms, and laboratories, contribute significantly to enhancing students' academic motivation and engagement (Abdulla et al., 2022; Bawa'aneh, 2021; Haley et al., 2020). Specifically, access to clean restrooms, functional learning spaces, and sufficient internet connectivity has been shown to affect not only student morale but also their overall academic outcomes (Hasan et al., 2013; Mohebi, 2023; Momen et al., 2023). In addition, infrastructural readiness has proven vital during transitions to digital and blended learning, where physical and digital resources must operate in tandem to support learning continuity (Muñoz-Repiso & Tejedor, 2010; Sunitha et al., 2022). These findings establish the foundational link between infrastructure and educational satisfaction in diverse learning contexts.

Building on this foundation, infrastructural adequacy has been particularly emphasized in relation to student-centered learning environments. Research on modern educational practices indicates that infrastructure not only supports pedagogical delivery but also enhances students' psychological readiness to engage in learning (Diaz-Lazo et al., 2023; Jones et al., 2018; Ma et al., 2024). The availability of specialized facilities, such as clinical laboratories and digital learning platforms, has been associated with improved learning experiences and outcomes in fields ranging from medicine to teacher education (Li, 2024; Milstead & Nelson, 1998; Tarimo et al., 2018). Moreover, integrated management frameworks that encompass infrastructure as a core component have been shown to improve institutional quality and student satisfaction (Abbasi et al., 2025; Bakar et al., 2024; Dandan et al., 2025). These contributions reinforce the necessity of infrastructure as a structural prerequisite for delivering quality education.

At the same time, literature highlights that disparities in infrastructure affect students unevenly across disciplines, academic levels, and institutions. Students in STEM and final-year cohorts often report lower satisfaction due to unmet infrastructural needs during intensive academic phases (Gumasing et al., 2022; Hashmi et al., 2020; Horstschräer, 2012). Similarly, students at public institutions or those in under-resourced regions tend to experience more pronounced dissatisfaction linked to infrastructural deficits (Gómez et al., 2011; Hasan et al., 2013; Younus & Sajjad, 2021). The role of infrastructure in shaping institutional reputation and student decision-making is also well-documented, particularly in competitive academic markets (Kim & Denk, 2012; Martínez-Flisser et al., 2020; Mejía et al., 2022). These findings suggest that infrastructure is a non-trivial factor in shaping both individual and institutional trajectories in higher education.

Despite these insights, empirical investigations that focus specifically on the relationship between infrastructure availability and student satisfaction within the context of Indonesian Islamic higher education remain scarce. Existing studies predominantly

generalize infrastructural impacts without accounting for contextual variables such as religious affiliation, faculty specialization, or regional policy compliance (Al-Karaki et al., 2021; Al-Smadi et al., 2022; Hauer et al., 2009). Moreover, while national standards, such as those outlined in Indonesia's SNPT 2020, mandate infrastructural provisions, there is limited evidence evaluating their actual implementation or effectiveness from the student perspective. Additionally, few studies offer a granular analysis at the faculty level, where differences in resource allocation and student density may significantly shape perceptions of satisfaction (Hashmi et al., 2020; Hassan et al., 2013; Ranasinghe et al., 2012). This gap calls for targeted research that integrates local institutional contexts with broader theoretical frameworks on educational satisfaction.

Responding to this gap, the current inquiry examines the influence of infrastructure availability on student satisfaction within the Faculty of Tarbiyah and Teacher Training (FITK) at UIN Sunan Kalijaga Yogyakarta. By situating the investigation within one of the university's most populated faculties, the discussion offers nuanced insights into how infrastructural adequacy affects educational quality at the micro-institutional level. The findings are expected to contribute to the refinement of infrastructure-related policy implementation in Indonesian higher education and offer empirical grounding for future national standard evaluations. Furthermore, this perspective enriches the academic discourse on educational infrastructure by incorporating insights from Islamic higher education institutions, a context underrepresented in current global literature. Ultimately, such an approach aims to guide institutional strategies toward enhancing student satisfaction through informed infrastructure development.

Methods

This study employed a descriptive quantitative research method to examine the relationship between infrastructure availability and student satisfaction. The population consisted of approximately 500 active students from the 2020 cohort of the Faculty of Tarbiyah and Teacher Training at UIN Sunan Kalijaga Yogyakarta. A sample of 83 respondents was selected using a probability sampling technique with the Slovin formula, applying a 10% margin of error to achieve a 90% confidence level. Data collection utilized a structured questionnaire as the primary instrument, designed to gather information on student satisfaction regarding the availability of faculty infrastructure. The questionnaire employed a Likert scale with five response categories: (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, and (5) Strongly Agree. Quantitative data obtained from the survey were analyzed using descriptive statistics and simple linear regression to test the hypothesis concerning the influence of infrastructure availability on student satisfaction. Prior to analysis, classical assumption tests, including normality testing, were conducted to ensure data suitability. The reliability and validity of the research instrument were verified through validity testing, which assessed the correlation between item scores and total scores, and reliability testing using internal consistency measures to ensure the instrument's trustworthiness.

Results

1. Validity and Reliability Testing

The validity test was conducted to assess the accuracy and appropriateness of the research instrument. Specifically, it evaluated whether each questionnaire item was suitable for measuring the intended constructs. For data processing, the researcher used SPSS version 29 for Windows. The validity of each item was determined by comparing the calculated Pearson correlation coefficient (r-count) of each statement for every variable with the critical r-value (r-table) at a 90% confidence level (margin of error = 10%), resulting in a threshold r-value of 0.1818. The test was based on a sample of 83 respondents.

Table 1. Validity Test Results

Variable	Item	r-count	r-table	Description
Availability of Adequate Lecture Rooms (X1)	X.1	0.655	0.1818	Valid
	X.2	0.636	0.1818	Valid
	X.3	0.767	0.1818	Valid
Availability of Academic Support Facilities (X2)	X.4	0.557	0.1818	Valid
	X.5	0.721	0.1818	Valid
	X.6	0.638	0.1818	Valid
Availability of Student Activity Unit (UKM) Facilities (X3)	X.7	0.674	0.1818	Valid
	X.8	0.717	0.1818	Valid
	X.9	0.593	0.1818	Valid
Availability of Security Facilities (X4)	X.10	0.808	0.1818	Valid
	X.11	0.717	0.1818	Valid
Availability of Communication and Information Facilities (X5)	X.12	0.614	0.1818	Valid
	X.13	0.637	0.1818	Valid
	X.14	0.655	0.1818	Valid
	Y.1	0.829	0.1818	Valid
	Y.2	0.799	0.1818	Valid
	Y.3	0.760	0.1818	Valid
Basic Needs (Y1)	Y.4	0.764	0.1818	Valid
	Y.5	0.867	0.1818	Valid
	Y.6	0.834	0.1818	Valid
	Y.7	0.795	0.1818	Valid
	Y.8	0.719	0.1818	Valid
	Y.9	0.814	0.1818	Valid
	Y.10	0.834	0.1818	Valid
	Y.11	0.766	0.1818	Valid
Performance Needs (Y2)	Y.12	0.785	0.1818	Valid
	Y.13	0.844	0.1818	Valid
	Y.14	0.719	0.1818	Valid
	Y.15	0.777	0.1818	Valid

Variable	Item	r-count	r-table	Description
	Y.16	0.777	0.1818	Valid
	Y.17	0.810	0.1818	Valid
	Y.18	0.816	0.1818	Valid
	Y.19	0.824	0.1818	Valid
Innovation Needs (Y3)	Y.20	0.776	0.1818	Valid
	Y.21	0.657	0.1818	Valid
	Y.22	0.737	0.1818	Valid
	Y.23	0.752	0.1818	Valid

Based on the table above, it can be concluded that the calculated correlation coefficients (r-count) for all items—both for the independent variables (X), which include various types of facility availability, and the dependent variable (Y), which refers to student satisfaction—exceed the critical value (r-table = 0.1818). Thus, all questionnaire items are considered valid.

The reliability test is used to determine the consistency of a measuring instrument, specifically whether the instrument produces stable and dependable results when the measurement is repeated. In this study, reliability was tested using Cronbach's Alpha. An instrument is considered reliable if the Cronbach's Alpha value exceeds 0.6; conversely, it is deemed unreliable if the value is below 0.6.

Table 2. Reliability Test Results

Variable	Cronbach's Alpha (r-count)	Cronbach's Alpha (r-table)	Description
Availability of Facilities (X)	0.903	0.6	Reliable
Student Satisfaction (Y)	0.970	0.6	Reliable

Based on the table above, the results indicate that the Cronbach's Alpha values for both variables exceed the threshold of 0.6. Specifically, the availability of facilities (X) scored 0.903, and student satisfaction (Y) scored 0.970. These findings confirm that the instrument items for each variable are reliable, as they meet the minimum reliability standard of Cronbach's Alpha > 0.6.

2. Classical Assumption Testing: Normality Test

The normality test aims to assess whether the data distribution of each variable conforms to a normal distribution. If the significance value (p-value) is greater than 0.1, the residuals are considered to be normally distributed. Conversely, if the significance value is less than 0.1, the residuals are not normally distributed. In this analysis, the normality of the data was assessed using the One-Sample Kolmogorov–Smirnov Test.

One-Sample Kolmogorov-Smirnov Test

			Unstandardized Residual
N			83
Normal Parameters[a,b]	Mean		.0000000
	Std. Deviation		8.38150972
Most Extreme Differences	Absolute		.065
	Positive		.057
	Negative		-.065
Test Statistic			.065
Asymp. Sig. (2-tailed)[c]			.200[d]
Monte Carlo Sig. (2-tailed)[e]	Sig.		.528
	99% Confidence Interval	Lower Bound	.515
		Upper Bound	.541

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

e. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.

Figure 1. Normality Test Results

Based on the normality test using the Kolmogorov–Smirnov method, the significance value was found to be 0.20, which is greater than the threshold of 0.1. Therefore, it can be concluded that the residual values are normally distributed.

3. *Simple Linear Regression Analysis*

Simple linear regression analysis is employed to assess the relationship between two variables and to determine the direction of the influence of the independent variable—namely, the availability of facilities—on the dependent variable, which is student satisfaction. This analysis was conducted after confirming that the data met the assumption of normality, as evidenced by the classical assumption test. Therefore, the simple linear regression model can be used as a valid analytical tool for hypothesis testing.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	5.826	5.102		1.142	.257
	X : Ketersediaan sarana prasarana	1.528	.109	.842	14.035	<,001

a. Dependent Variable: Y : Kepuasan mahasiswa

Figure 2. Simple Linear Regression Analysis

Based on the results presented in the table, the constant (a) is 5.826, and the regression coefficient (b) is 1.528. Thus, the regression equation can be expressed as:

$Y = a + bX \rightarrow Y = 5.826 + 1.528X$

This means that for every 1% increase in the availability of facilities, the level of student satisfaction is expected to increase by 1.528 units. Hence, it can be concluded that the availability of academic facilities has a positive influence on student satisfaction.

4. Hypothesis Testing

The F-test is used to determine whether the independent variable, the availability of facilities, has a statistically significant effect on the dependent variable, student satisfaction.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14008.705	1	14008.705	196.981	<,001[b]
	Residual	5760.476	81	71.117		
	Total	19769.181	82			

a. Dependent Variable: Y : Kepuasan mahasiswa

b. Predictors: (Constant), X : Ketersediaan sarana prasarana

Figure 3. F-Test

Based on the F-test results, the significance value of the hypothesis is 0.001, which is less than 0.1, indicating statistical significance. Therefore, the hypothesis is accepted, and it can be concluded that the availability of facilities has a positive and significant effect on student satisfaction.

5. T-Test (Partial Test)

The t-test is used to determine whether the independent variable (X), which is the availability of facilities, significantly affects the dependent variable (Y), student satisfaction. A significant result implies that the effect is generalizable to the population.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.826	5.102		1.142	.257
	X : Ketersediaan sarana prasarana	1.528	.109	.842	14.035	<,001

a. Dependent Variable: Y : Kepuasan mahasiswa

Figure 4. T-Test (Partial Test)

From the t-test results presented in the table, the significance value is 0.001, which is less than 0.1. This result indicates that the availability of academic facilities significantly and positively affects student satisfaction.

Hypotheses:

H_0 (Null Hypothesis): There is no effect of the availability of facilities on student satisfaction.

H_1 (Alternative Hypothesis): There is a significant effect of the availability of facilities on student satisfaction.

Based on the table and the significance value obtained, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted. The t-test was conducted with a 10% significance level, a two-tailed test, and a specified degree of freedom.

$(df) = n - k - 1$
$= 83 - 1 - 1$
$= 81$

T-Test Analysis and Interpretation

In this test, the number of observations is denoted by *n*, and the number of independent variables is denoted by *k*. The critical t-value (t-table) was determined to be 1.663884, which can be calculated in Microsoft Excel using the formula =TINV(0.1,81), where 0.1 represents the 10% significance level and 81 denotes the degrees of freedom (n - k - 1).

The decision criteria are as follows:

H_0 is accepted if *t-calculated* < *t-table*
H_0 is rejected if *t-calculated* > *t-table*

In this study, the value of *t-calculated* was 14.035, which is greater than the critical *t-table* value of 1.664. Therefore, H_0 is rejected and H_1 is accepted, indicating a statistically significant influence of the availability of facilities on student satisfaction. Thus, it can be concluded that the availability of academic facilities significantly influences student satisfaction.

6. Coefficient of Determination (R^2)

The coefficient of determination (R^2) indicates the proportion of variance in the dependent variable that is explained by the independent variable. It reflects the explanatory power of the regression model, adjusted for the degrees of freedom used in the calculation.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Selection Criteria: Akaike Information Criterion	Selection Criteria: Amemiya Prediction Criterion	Selection Criteria: Mallows' Prediction Criterion	Selection Criteria: Schwarz Bayesian Criterion
1	.842[a]	.709	.705	8.433	355.915	.306	2.000	360.752

a. Predictors: (Constant), X
b. Dependent Variable: Y

Figure 5. Coefficient of Determination (R^2)

Based on the table, the R Square value is 0.709, meaning that approximately 70.9% of the variation in student satisfaction can be explained by the availability of academic facilities. The remaining 29.1% is attributed to other factors not included in this study. The results of the tests conducted—normality test, simple linear regression analysis, F-test, and t-test—collectively confirm that the availability of academic facilities has a positive and significant effect on the satisfaction of students in the Faculty of Tarbiyah and Teacher Training at UIN Sunan Kalijaga Yogyakarta. Specifically, students of the 2020 cohort expressed satisfaction with the availability of campus facilities, as substantiated by the rejection of the null hypothesis (H_0) and acceptance of the alternative hypothesis (H_1). This affirms that facility availability is a significant determinant of student satisfaction within this context.

Discussion

Building upon the foundational understanding that student satisfaction is a vital performance indicator in higher education, this study further explores how such satisfaction is intricately tied to the availability and quality of academic infrastructure. Student satisfaction remains a critical performance indicator in higher education, closely linked to the provision of academic infrastructure that supports effective teaching and learning environments. Previous studies have emphasized that student expectations regarding

facilities directly affect their academic motivation and overall satisfaction (Febrianti et al., 2019). Specifically, at the Faculty of Tarbiyah and Teacher Training (FITK) of UIN Sunan Kalijaga Yogyakarta, the increasing student population has heightened the urgency for adequate educational infrastructure to maintain service quality and student experience. In this context, educational facilities—ranging from classrooms to extracurricular amenities—serve not only functional roles but also influence students' perceived institutional support and comfort (Karbila & Usman, 2021). As per national standards, such provisions are mandated by government regulation, thus making institutional compliance and performance in this domain measurable and essential.

In alignment with these concerns, the findings confirm that the availability of facilities significantly and positively influences student satisfaction, with a regression coefficient of 1.528 indicating substantial responsiveness. This relationship was statistically supported through hypothesis testing using both F-test and t-test methodologies, all indicating significance at the 10% level. The coefficient of determination ($R^2 = 0.709$) further underlines that over 70% of the variance in student satisfaction is explained by the availability of facilities. Additionally, reliability and validity tests demonstrated high consistency and appropriateness of the instrument, with Cronbach's Alpha values exceeding 0.9 and all items surpassing the critical r-value. Such robust measurement supports the internal validity of the study and underscores the strong association between institutional infrastructure and student perceptions.

These results are congruent with earlier studies that affirm infrastructure as a cornerstone of educational satisfaction, both in physical and digital learning contexts (Bawa'aneh, 2021; Gómez et al., 2011; Masic, 2013). Facilities have been shown to directly enhance skill development and reduce dropout risks, aligning with our findings on student engagement and satisfaction (Diaz-Lazo et al., 2023; Ramírez-Díaz & Hidalgo-Solano, 2018). In diverse educational systems such as the Bologna framework, student satisfaction correlates positively with improved infrastructure and resource availability (Masic, 2013; Mejía et al., 2022). These consistencies across varied contexts underscore the generalizability of our findings and the critical role infrastructure plays in educational quality and learner contentment (Bawa'aneh, 2021; Gómez et al., 2011; Mejía et al., 2022).

Nevertheless, it is important to acknowledge that the significance of infrastructure is not universally consistent, especially under constrained or emergency conditions (Al-Smadi et al., 2022; Sunitha et al., 2022). Student satisfaction in online settings was reported to decline due to inadequate infrastructure and technical readiness (Al-Smadi et al., 2022; Sunitha et al., 2022). Although students recognized the utility of ICT facilities, it did not translate into higher satisfaction due to unmet expectations (Younus & Sajjad, 2021). These findings caution against assuming a direct causal effect in all contexts and stress the necessity of comprehensive infrastructure that aligns with pedagogical strategies and student needs (Sunitha et al., 2022; Younus & Sajjad, 2021). Thus, while our study supports a positive infrastructure-satisfaction link, it also highlights the conditional nature of this relationship (Al-Smadi et al., 2022; Younus & Sajjad, 2021).

Delving deeper into the institutional context of FITK, the observed strong association between facility availability and student satisfaction can be attributed to the faculty's ongoing infrastructure improvements and the alignment of such enhancements with student expectations. The provision of well-equipped lecture rooms, security systems, and student activity spaces likely foster a conducive learning environment, thereby elevating satisfaction levels (Abbasi et al., 2025; Martínez-Flisser et al., 2020). This also reflects institutional responsiveness to increased student enrollment, which demands scalable and accessible infrastructure. Nevertheless, it is crucial to interpret these findings within the scope of the current sample and institutional context, as satisfaction levels may differ in other faculties or universities with differing facility standards and student demographics. Additionally, the psychological and pedagogical dimensions of satisfaction, while influenced by

infrastructure, also depend on faculty performance, curriculum design, and peer interactions (Hasan et al., 2013; Hassan et al., 2013).

Moreover, the high explanatory power of infrastructure on satisfaction suggests that facilities act as foundational enablers for other educational outcomes, including engagement and academic performance (Martínez-Flisser et al., 2020; Tarimo et al., 2018). Improvements in clinical and laboratory settings have been shown to directly enhance professional skill acquisition and learner contentment (Martínez-Flisser et al., 2020; Tarimo et al., 2018). However, external variables such as administrative policies, socio-economic factors, and faculty-student relationships may mediate these outcomes (Tarimo et al., 2018). Therefore, while facility availability is evidently influential, institutions should adopt a holistic approach to student services that integrates infrastructure with supportive academic and psychological interventions (Martínez-Flisser et al., 2020). Future research could explore these interactions in a more granular manner, especially across faculties with differing resource allocations (Martínez-Flisser et al., 2020; Tarimo et al., 2018).

Ultimately, these findings underscore the necessity for higher education institutions, particularly in Indonesia, to prioritize continuous investment in educational infrastructure as a strategic avenue to improve student satisfaction. A well-maintained and adequately resourced campus environment not only boosts academic morale but also serves as a competitive advantage in student recruitment and retention (Bakar et al., 2024; Cui, 2023). Policy-makers and university administrators should consider these insights in planning budgets and development programs, especially within faculties experiencing enrollment growth. Moreover, aligning infrastructure development with educational goals and student feedback mechanisms could enhance its effectiveness and sustainability. Thus, this research contributes valuable empirical evidence for stakeholders aiming to enhance the quality and attractiveness of academic institutions through infrastructural excellence.

Conclusion

This study aimed to analyze the influence of infrastructure availability on student satisfaction at FITK UIN Sunan Kalijaga Yogyakarta, confirming through validity, reliability, and normality tests that the research instrument was robust. Regression analysis revealed a significant positive relationship (Y = 5.826 + 1.528X), with facility availability explaining 70.9% of satisfaction variance, supported by hypothesis testing (F-test: p = 0.001; t-test: t-calculated = 14.035 > t-table = 1.664). The findings underscore infrastructure's critical role in enhancing student satisfaction, urging institutional policymakers to prioritize resource allocation, though the study's single-faculty focus and cross-sectional design limit broader generalizability. Future research should expand to diverse contexts, employ longitudinal designs, and integrate non-material factors to deepen understanding of satisfaction dynamics, offering a foundation for strategic infrastructure development in higher education.

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