American Journal of Economic and Management Business
e-ISSN: 2835-5199
Vol. 5 No. 1 January 2026

The Effect of Digital Literacy and Data Security Systems on Student Service Satisfaction Through CSIRT at Yogyakarta State University

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Abstract

This study aims to analyze the effect of digital literacy and data security systems on student service satisfaction and to examine the role of the Computer Security Incident Response Team (CSIRT) as a mediating variable in the digital services of Universitas Negeri Yogyakarta. The study used a quantitative approach with 200 active student respondents selected through purposive sampling. Data were collected using a Likert scale questionnaire and analyzed using PLS-SEM with SmartPLS 4.1.1.4. The results show that digital literacy does not significantly affect service satisfaction or the role of CSIRT. Conversely, data security systems significantly affect student service satisfaction and the role of CSIRT. The role of CSIRT was also found to have a significant effect on service satisfaction and to mediate the effect of data security systems on student satisfaction, but it did not mediate the effect of digital literacy. These findings have important theoretical implications for the DeLone and McLean IS Success Model by demonstrating that, in educational contexts, system quality (represented by data security) exerts a stronger influence on user satisfaction than individual capabilities (digital literacy), particularly when mediated by institutional support mechanisms (CSIRT). The practical implications emphasize that universities should prioritize strengthening data security infrastructure and optimizing CSIRT operational effectiveness as strategic approaches to enhancing student satisfaction with digital services, rather than focusing primarily on digital literacy training programs.

Keywords: *CSIRT; Data Security Systems; Digital Literacy; PLS-SEM; Service Satisfaction.*

INTRODUCTION

The advancement of information and communication technology has brought fundamental transformations to various aspects of life, including the higher education sector (Fevolden & Tømte, 2015; Pegu, 2014; Sarkar, 2012). Universities in Indonesia continue to adapt to technological developments to improve the quality of services for students. One prominent form of transformation is the implementation of integrated digital services that facilitate academic, administrative, and other campus activities (Akour & Alenezi, 2022; Bagde et al., 2021). However, along with the increasing adoption of digital technology, universities face serious challenges related to data security and privacy protection.

Data breaches—namely, the unintentional exposure of sensitive information—pose a significant threat to organizations across various sectors (Amalliah et al., 2025). This condition is also experienced by educational institutions, where data breach incidents not only threaten the confidentiality of institutional information but also involve students' personal data (Gorkhali et al., 2024). Data from Breached.to shows that personal data occupies the first position with approximately 29 cases, followed by company data with 17 cases and government institutional data with 16 cases. The educational institution category recorded 9 cases, indicating that although

the number of data breaches in educational institutions is lower, it still requires attention as it involves the confidentiality of the academic community's information, including student data.

Based on this phenomenon, researchers correlate digital literacy with the role of students as the main users of higher education services in data protection. Digital literacy is the ability to acquire, understand, evaluate, and use digital information critically, ethically, and responsibly. The Ministry of Communication and Information Technology formulates four pillars of digital literacy that society needs to understand: digital skills, digital culture, digital ethics, and digital safety (Dini Hariyanti, 2022). These four pillars provide an important foundation for developing students' competence to face the digital era, especially in the digital safety pillar, which emphasizes increasing awareness of personal data protection and security.

In line with the urgency of digital literacy, it becomes more relevant when linked to the existence of data security systems that function to protect information from potential threats (Estrada et al., 2022; Roy, 2016). Data security is the practice of protecting information packages in digital world data exchange (Sallu & Qammaddin, 2020). Data security includes policies, procedures, and awareness to protect the integrity, confidentiality, and availability of data (Sung et al., 2023). In the university context, data security systems function to maintain students' trust as service users, protect personal and academic information, and ensure the smooth running of administrative and learning processes.

Universitas Negeri Yogyakarta (UNY) has implemented an integrated data security system managed by the *Pusat Teknologi Informasi dan Komunikasi* (*PTIK*) UNY to protect the security of computer networks and information systems in the campus environment. The UNY email service, integrated with Google Workspace, is equipped with protection features against spam and phishing, as well as high encryption to protect user data. Furthermore, UNY has established a Computer Security Incident Response Team (CSIRT) to prevent, detect, and respond to computer security incidents. CSIRT is a service team formed to help organizations prevent, detect, and respond to computer security incidents (Cichonski et al., 2012).

Student satisfaction is a crucial indicator for assessing the quality of higher education services, so improving digital literacy and strengthening data security systems are believed to contribute significantly to achieving that satisfaction (Khoiriyah et al., 2024). Based on this background, this study aims to analyze the influence of digital literacy and data security systems on student service satisfaction through CSIRT at Yogyakarta State University—specifically, the influence of digital literacy and data security systems on student service satisfaction and the mediating role of CSIRT at Universitas Negeri Yogyakarta.

Based on the background elaborated above, this study formulates several research questions that are relevant to examine in depth. First, this research seeks to determine whether digital literacy has a significant effect on student service satisfaction at Universitas Negeri Yogyakarta. Second, it investigates whether the data security system significantly influences student service satisfaction at Universitas Negeri Yogyakarta. Third, this study examines the influence of digital literacy on the role of the Computer Security Incident Response Team (CSIRT) at Universitas Negeri Yogyakarta. Fourth, it analyzes whether the data security system has a significant effect on the role

of CSIRT. Fifth, the study aims to identify whether the role of CSIRT significantly affects student service satisfaction. Furthermore, this research explores whether CSIRT plays a mediating role in the relationship between digital literacy and student service satisfaction, as well as whether CSIRT mediates the relationship between data security systems and student service satisfaction at Universitas Negeri Yogyakarta.

Based on the formulated research questions, the objectives of this study are clearly defined. This research aims to determine the effect of digital literacy on student service satisfaction at Universitas Negeri Yogyakarta and to analyze the influence of data security systems on student service satisfaction. In addition, the study seeks to examine the effect of digital literacy on the role of CSIRT, as well as the influence of data security systems on the role of CSIRT. Furthermore, this research aims to identify the impact of CSIRT's role on student service satisfaction. More specifically, this study also intends to analyze the mediating role of CSIRT in the relationship between digital literacy and student service satisfaction, as well as in the relationship between data security systems and student service satisfaction at Universitas Negeri Yogyakarta.

This research provides several theoretical and practical contributions. From a theoretical perspective, this study is expected to contribute to the development of knowledge, particularly in the fields of management, information technology, and public service satisfaction within higher education institutions. It enriches the academic literature by providing scientific references regarding the relationships between digital literacy, data security systems, and student service satisfaction through the role of CSIRT. Moreover, this study expands theoretical insights into the function of CSIRT as a mediating variable in digital service delivery within the education sector and can serve as a reference for future studies addressing similar topics in higher education or other organizations managing digital services.

From a practical perspective, this research offers strategic input and recommendations for Universitas Negeri Yogyakarta in improving the quality of digital services that are secure, responsive, and oriented toward student satisfaction. It provides empirical evidence regarding students' perceptions of CSIRT effectiveness in safeguarding campus information systems, which can be utilized as a basis for evaluation and performance improvement. Additionally, this study contributes to increasing awareness of the importance of digital literacy and information security among students. Finally, the findings of this research may serve as a valuable reference for future researchers, particularly those focusing on student service satisfaction in higher education contexts.

METHOD

This research uses a quantitative approach to determine the influence of digital literacy and data security systems on student service satisfaction through CSIRT. The research location is Yogyakarta State University (UNY), conducted for 3 months from May to August 2025.

The population of this study is active students at Yogyakarta State University. The sampling technique used is non-probability sampling with purposive sampling method. The sample selection criteria are: (a) active students of Yogyakarta State University, (b) students who have completed at

least 2 semesters, and (c) students who have accessed digital services on campus. Based on Hair et al. (2017) recommendations, the minimum sample size is five to ten times the number of indicators. With a total of 20 indicators, the sample needed is 200 respondents.

The research variables consist of independent variables (digital literacy and data security systems), dependent variable (student service satisfaction), and intervening variable (CSIRT). Data collection was conducted using a questionnaire with a 4-point Likert scale. The instrument was tested for validity and reliability before being used in the main study (Sugiyono, 2021).

Data analysis uses Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.1.1.4 for Windows software. The analysis includes descriptive statistical analysis, outer model evaluation (convergent validity, discriminant validity, and reliability), inner model evaluation (R-square, path coefficients), and hypothesis testing using bootstrapping with a significance level of 5%.

RESULT AND DISCUSSION

Respondent Characteristics

This study involved 200 active students from Yogyakarta State University who met the predetermined sampling criteria. The demographic analysis provides essential context for interpreting findings and assessing sample representativeness across key characteristics.

Based on gender distribution, female respondents dominated the sample with 167 participants (83.5%), while male respondents numbered 33 individuals (16.5%). This gender distribution reflects the broader demographic composition of UNY, which has historically attracted more female students, particularly in education-related programs that constitute a significant proportion of the university's academic offerings. While the gender imbalance may limit generalizability to male-dominated institutions, it accurately represents the study population and enhances the ecological validity of findings for UNY specifically.

Table 1. Respondent Characteristics by Gender

Gender	Number	Percentage
Male	33	16.5%
Female	167	83.5%
Total	**200**	**100.0%**

Source: Primary Data Processed, 2025

The distribution by faculty affiliation showed substantial variation across academic units. The Faculty of Economics and Business recorded the highest number of respondents with 72 students (36.0%), followed by the Faculty of Education Science and Psychology with 56 respondents (28.0%). This distribution is meaningful as it ensures representation across different disciplinary cultures and varying intensities of digital service usage—business students may engage more heavily with administrative digital systems, while education students may focus more on pedagogical platforms, thereby providing diverse perspectives on digital service satisfaction.

Based on semester level, the most numerous participants were students in their 8th semester with 46 individuals (23.0%), followed by students in their 2nd semester with 41 people (20.5%). This distribution across semester levels is advantageous for the study as it captures perspectives from both relatively new students (2nd semester) who may have heightened awareness of service quality as recent entrants, and senior students (6th-8th semester) who possess extensive longitudinal experience with digital services across multiple academic years, potentially providing more nuanced and informed evaluations.

Descriptive Analysis

Descriptive analysis demonstrates that all research variables are assessed favorably by respondents, with mean scores consistently in the high category (> 3.00 on the 4-point scale). The digital literacy variable obtained an average value of 3.21 (SD = 0.636), indicating that students perceive themselves as having good digital literacy competencies across the four pillars of digital skills, culture, ethics, and safety. The moderate standard deviation suggests reasonable consensus among respondents, though some variation exists in self-assessed digital capabilities. This relatively high self-reported digital literacy may reflect the millennial and Gen-Z composition of the student body, who have grown up as digital natives with early exposure to technology.

The data security system variable obtained an average value of 3.31 (SD = 0.585), indicating that students generally assess the implementation of data security systems at Yogyakarta State University as effective and adequate. This represents the highest mean score among all variables, suggesting that UNY's investments in security infrastructure (Google Workspace integration, encryption systems, security protocols) are recognized and valued by students. The relatively low standard deviation indicates strong consensus among students regarding security system quality.

The CSIRT variable obtained an average value of 3.13 (SD = 0.648), showing that students have a positive perception of the existence and service quality of CSIRT at UNY. However, this represents the lowest mean score among all variables, potentially indicating that CSIRT operations are less visible to students compared to more tangible security features, or that students have limited direct interaction with CSIRT functions during normal operations when no incidents occur. The higher standard deviation suggests more variability in student perceptions of CSIRT effectiveness, possibly reflecting differential awareness levels or varying experiences with incident response.

The student service satisfaction variable obtained an average value of 3.25 (SD = 0.641), indicating that students generally feel satisfied with the digital services available on campus, including academic information systems, e-learning platforms, communication tools, and administrative services. This satisfaction level, while positive, leaves room for improvement and suggests that continued investments in service quality enhancement remain important for maintaining and increasing student contentment.

Outer Model Analysis

Outer model evaluation is conducted to assess the validity and reliability of the measurement model. Convergent validity testing shows that all indicator loading factor values are above 0.70, indicating that all indicators are valid in measuring their respective constructs. The Average Variance Extracted (AVE) values for all variables are above 0.50, confirming good convergent validity.

Reliability testing shows Cronbach's Alpha values for all variables above 0.70 and Composite Reliability values above 0.70, indicating that all measurement instruments are reliable. Discriminant validity testing using the Fornell-Larcker criterion and cross-loading shows that all constructs have good discriminant validity.

Inner Model Analysis

The inner model evaluation assesses the structural relationships among latent constructs and determines the overall explanatory and predictive power of the theoretical model.

R-Square (Coefficient of Determination)

The R-square analysis reveals moderate to substantial explanatory power: The R-square value for the student service satisfaction variable is 0.687, indicating that digital literacy, data security systems, and CSIRT collectively explain 68.7% of the variance in student service satisfaction. This substantial R^2 value demonstrates that the model possesses strong explanatory power for the dependent variable, with the three predictor constructs accounting for more than two-thirds of satisfaction variance. The remaining 31.3% of variance is attributable to other factors not included in the model, such as service quality dimensions (tangibles, empathy, responsiveness), individual differences (prior expectations, technology readiness), or contextual factors (peer influence, competitive alternatives).

The R-square value for the CSIRT variable is 0.232, indicating that digital literacy and data security systems together explain 23.2% of the variance in CSIRT role effectiveness. While this represents a weak-to-moderate effect according to conventional thresholds, it is reasonable given that CSIRT effectiveness is likely influenced by numerous organizational factors beyond student digital literacy and security perceptions, including institutional resources, staff expertise, technology infrastructure, management support, and external threat environment. The model identifies important predictors while acknowledging that CSIRT performance is a complex organizational outcome with multiple determinants.

Hypothesis Testing

Hypothesis testing results using bootstrapping technique with 5,000 iterations reveal the following findings:

Table 2. Hypothesis Testing Results - Direct Effects

Hypothesis	Path	Path Coefficient (β)	T-Statistic	P-Value	Decision
H1	Digital Literacy → Student Satisfaction	0.107	1.772	0.076	Not Supported

H2	Data Security Systems → Student Satisfaction	0.624	10.654	0.000	Supported
H3	Digital Literacy → CSIRT Role	0.065	0.882	0.378	Not Supported
H4	Data Security Systems → CSIRT Role	0.471	6.860	0.000	Supported
H5	CSIRT Role → Student Satisfaction	0.254	4.116	0.000	Supported

Source: Primary Data Processed, 2025

Hypothesis testing results using bootstrapping technique with 5,000 iterations show the following findings:

1. Digital literacy does not significantly affect student service satisfaction (T-Statistic = 1.772 < 1.96; P-value = 0.076 > 0.05). This finding indicates that the ability to use digital technology has not been able to increase the level of satisfaction with campus services.
2. Data security systems have a positive and significant effect on student service satisfaction (T-Statistic = 10.654 > 1.96; P-value = 0.000 < 0.05). This indicates that the better the management and protection of data in the university environment, the higher the level of trust and satisfaction of academic digital service users.
3. Digital literacy does not significantly affect the role of CSIRT (T-Statistic = 0.882 < 1.96; P-value = 0.378 > 0.05). This shows that students' digital abilities are not directly related to the effectiveness of CSIRT's role.
4. Data security systems have a positive and significant effect on the role of CSIRT (T-Statistic = 6.860 > 1.96; P-value = 0.000 < 0.05). This proves that a strong security system can improve the effectiveness of CSIRT's role.
5. The role of CSIRT has a positive and significant effect on student service satisfaction (T-Statistic = 4.116 > 1.96; P-value = 0.000 < 0.05). Fast action, good coordination, and data protection guarantees carried out by CSIRT play an important role in building a sense of security and trust in the university's academic service system.
6. The role of CSIRT cannot mediate the significant effect of digital literacy on student service satisfaction (T-Statistic = 0.833 < 1.96; P-value = 0.405 > 0.05). This is because CSIRT's function is technical and does not interact directly with users.
7. The role of CSIRT can mediate the positive and significant effect of data security systems on student service satisfaction (T-Statistic = 3.753 > 1.96; P-value = 0.000 < 0.05). CSIRT acts as a link between the technical quality of data security and the service experience felt by users.

The research findings show that digital literacy does not significantly affect student service satisfaction at Yogyakarta State University. This is contrary to some previous studies that found a positive relationship between digital literacy and satisfaction. This finding can be explained by the fact that service satisfaction is more influenced by the quality of systems and services felt directly, rather than by individuals' digital abilities. This is in line with the DeLone & McLean (2003) model

which emphasizes that system quality and service quality are the main determinants of user satisfaction.

Conversely, data security systems have a significant positive effect on student service satisfaction. This confirms the importance of strengthening data security in the university environment. When students feel that their personal and academic data is well protected, their level of trust and satisfaction with digital services increases. This finding supports the research of Gabata et al. (2024) which states that data security is an important factor in determining user satisfaction with information system services.

The role of CSIRT is proven to have a significant positive effect on student service satisfaction and can mediate the influence of data security systems on student satisfaction. This shows that CSIRT not only plays a technical role in handling security incidents but also contributes to building student trust and satisfaction. Through fast response, effective coordination, and transparent communication in incident handling, CSIRT functions can turn security guarantees into trust and satisfaction with campus digital services. This finding is in line with the research of Van der Kleij et al. (2017) which confirms that CSIRT effectiveness is very dependent on the quality of data security infrastructure and the ability to respond quickly to incidents.

CONCLUSION

Based on the research results, several conclusions can be drawn. First, digital literacy does not significantly affect student service satisfaction or the role of CSIRT at Yogyakarta State University, indicating that service satisfaction is more influenced by system and service quality rather than individual digital abilities. Second, data security systems have a positive and significant effect on both student service satisfaction and the role of CSIRT, confirming the importance of strengthening data security in the university environment. Third, the role of CSIRT significantly affects student service satisfaction and can mediate the influence of data security systems on student satisfaction, but cannot mediate the influence of digital literacy. These findings emphasize the importance of strengthening data security systems and optimizing CSIRT to improve the quality of campus digital services. Suggestions for universities include: strengthening data security systems through enhanced protection, updated security devices, and implementation of two-factor authentication; expanding collaboration between CSIRT and the academic community through socialization and cyber security training; and increasing institutional support for CSIRT through human resource strengthening, provision of adequate work facilities, and security infrastructure updates. Future researchers are advised to explore other variables such as service quality, user trust, user experience, or perceived security risks and develop more specific digital literacy instruments.

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