

The Effect of Quality of Information System Service on User Satisfaction Through Service Efficiency in A Web-Based Digital Diploma System

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ABSTRACT

This study was conducted in response to the need to improve the quality of digital academic services in higher education, particularly the issuance and verification of web-based digital diplomas. Accordingly, the study examines how Quality of Information System Service affects user satisfaction through service efficiency in the context of a web-based digital diploma system. The study employed a quantitative explanatory model using a cross-sectional approach. The research population consisted of Universitas Ciputra students and alumni, and purposive sampling was used to obtain 95 respondents who had experience using the digital diploma system. The data were analyzed through path analysis using IBM SPSS Statistics, supported by validity testing, reliability testing, classical assumption testing, the Sobel test, and bootstrap confidence intervals. The results show that Quality of Information System Service has a positive and significant effect on user satisfaction and service efficiency. Service efficiency also has a positive and significant effect on user satisfaction and significantly mediates the relationship between Quality of Information System Service and user satisfaction. The mediation is partial because the direct effect remains significant while the indirect effect through service efficiency is also significant. These findings indicate that a high Quality of Information System Service can increase user satisfaction both directly and through more efficient service delivery. Higher education institutions should therefore strengthen the technical quality of digital academic systems and ensure that these systems create effective services in actual practice. Improvements should focus on system usability, reliability, security, accuracy, process simplification, error reduction, and responsive helpdesk support. A web-based digital diploma system should consequently be viewed not merely as a tool for document digitization, but also as a strategic instrument for institutional digital transformation and the improvement of academic service quality.

INTRODUCTION

To meet the demand for greater efficiency, transparency, and higher-quality academic services, higher education institutions must accelerate digitalization. Recent research shows that the use of web-based educational information systems can improve educational service quality and user satisfaction in universities. The implementation of these systems can enhance process efficiency, data transparency, and user satisfaction on campus (Hakim et al., 2025). The principal factors used to assess the effectiveness of an information system, including digital academic documents such as digital diplomas, are system quality, information quality, and service quality.

The development of a web-based digital diploma system represents the implementation of an organizational principle of internal innovation in response to environmental changes and user needs. In line with this view, Kurniawan and Fitriani (2022) found that accessibility and data security are crucial factors determining users' acceptance of digital services on campus. Web-based technology not only shortens bureaucratic distance but also minimizes the risk of human error in entering graduation data. Furthermore, Pratama et al. (2023) emphasized that customer satisfaction in an academic context is strongly influenced by system responsiveness; the faster the system responds to data-verification needs, the higher the alumni's loyalty and positive perception of the institution.

In conventional practice, diploma issuance is carried out manually through a lengthy series of stages, beginning with academic-data verification, data checking and correction, physical-document printing, signatures by authorized officials, and distribution to graduates. Each stage involves coordination among organizational units, the use of physical documents, and overlapping bureaucratic procedures. Based on process-time estimates, manual diploma completion may require between 20 and 45 working days, or approximately eight to nine weeks, depending on the smoothness of the verification process and the availability of authorized signatories. When all supporting stages are counted individually, the accumulated work allocation can reach approximately 85 working days.

Table 1. Estimated Diploma Completion Time

Main Process	Estimated Time (Working Days)	Percentage of Time	Primary Resources
Graduation-data verification	15	17.65%	Academic staff, related departments, and study programs
Document printing	15	17.65%	One printer and academic staff
Document signing	20	23.53%	Rector and dean
Photograph and hologram installation	10	11.76%	Administrative staff
Document duplication, archiving, and packaging	15	17.65%	Administrative staff and one photocopier
Other processes (recapitulation, correspondence, and reporting)	10	11.76%	Academic staff and academic operators
Total	85	100%	—

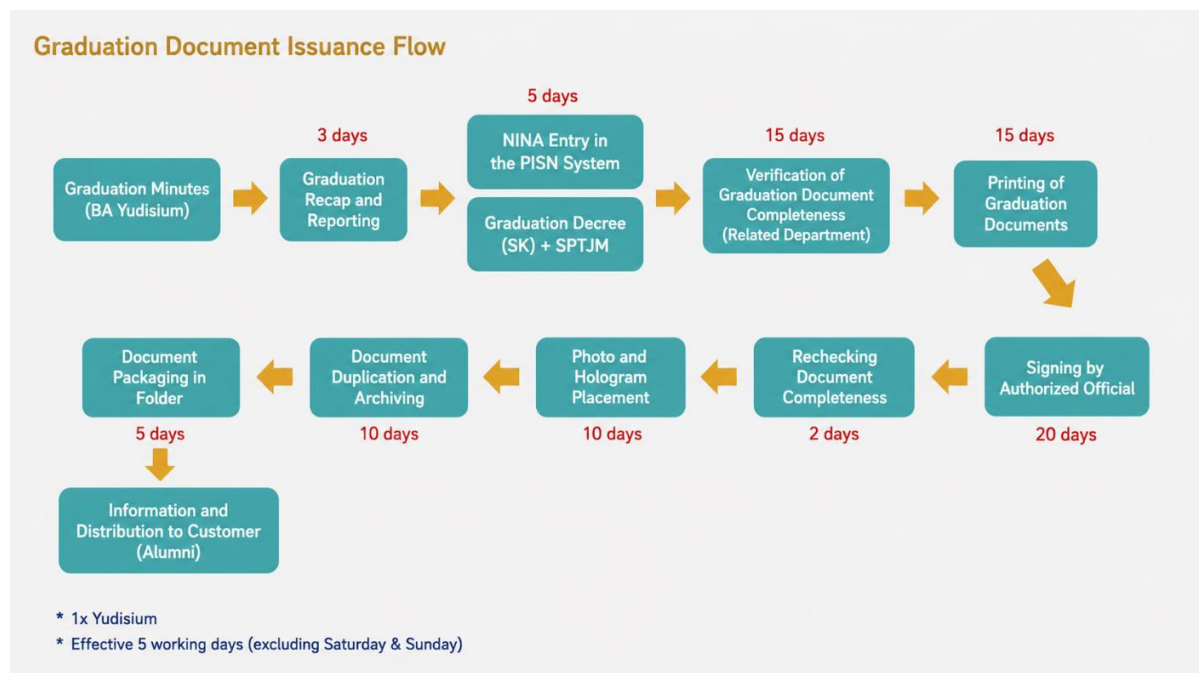


Figure 1. Diploma Issuance Flow

This issue is increasingly important because the growing demand for diploma verification by external parties, such as companies, institutions providing further education, and certification bodies, requires a system that is faster, safer, and easier to access. Ministerial Regulation No. 50 of 2025 concerning Diplomas, Competency Certificates, and Professional Certificates in Higher Education states in Article 7 paragraphs (2) and (5) that signatures on transcripts, diplomas, and diploma supplements must be validated by authorized university officials or leaders through either wet signatures or certified electronic signatures. The regulation therefore supports the development of digital diploma services that are more effective, secure, and integrated.

Universitas Ciputra, as a higher education institution that promotes entrepreneurial values, is committed to continuously innovating in the management of academic services in accordance with government regulations. One form of this innovation is a web-based digital diploma, namely a digital graduation document that is issued, stored, and verified online through internet access as an alternative to a physical diploma and is protected using a highly secure certified electronic signature. The implementation of this system is expected to accelerate service time, improve data accuracy, and provide easier access for users.

Research on information-system success frequently refers to the DeLone and McLean Information Systems Success Model (2003), which has been widely used in previous information-systems studies. Most earlier studies tested information-system-quality dimensions separately (Pratama et al., 2025; Wahyudi, Riza, et al., 2015; Susanto, 2020; Tarigan, 2024). Consequently, relatively few studies have integrated system quality, information quality, and service quality into a single comprehensive construct. Many studies have also retained the original model structure by including use as a major indicator of system

success. In mandatory systems, however, use becomes less relevant because it no longer represents the actual success of a system when users have no practical alternative.

Previous studies have also generally measured net benefits in broad forms, such as organizational performance or individual benefits (Suradi et al., 2020; Sanjaya & Febian, 2011; Annisa & Nor, 2025), without specifically examining service efficiency as a form of benefit in the context of digital services. In a web-based system such as a digital diploma platform, service efficiency is an important indicator of system success because it reflects whether the technology produces faster processing, fewer administrative errors, simpler procedures, and more accessible services.

Earlier research therefore commonly positioned system quality, information quality, and service quality as separate independent variables. This study seeks to address that gap by integrating the dimensions of information-system quality into one construct and examining the role of service efficiency as a mediating variable in improving satisfaction with Universitas Ciputra's web-based digital diploma system.

The novelty of this study lies in the development of an information-systems-success model that positions service efficiency as a mediator between Quality of Information System Service and customer satisfaction in the context of a web-based digital diploma system. Previous studies of information-system success have generally examined the direct effects of system quality, information quality, and service quality on user satisfaction or system benefits. Few studies have specifically explained that user satisfaction is formed not only through perceptions of system quality but also through tangible benefits in the form of service efficiency, including faster processes, reduced errors, simplified procedures, and easier access to digital academic services.

Improving user satisfaction strongly depends on information-system quality. A system that is easy to use, stable, secure, and capable of providing accurate and relevant information creates a positive user experience. DeLone and McLean (2003) explain that user satisfaction is influenced by system, information, and service quality. This position is reinforced by Petter et al. (2008), Wang and Liao (2008), and Urbach and Müller (2012), who show that user satisfaction is highly dependent on system quality. Susanto (2020) and Hakim et al. (2025) likewise show that academic information-system quality increases satisfaction with digital services in higher education.

H1: The quality of the web-based digital diploma system has a positive effect on user satisfaction.

High information-system quality can improve service efficiency by accelerating processes, reducing errors, and simplifying procedures. DeLone and McLean (2003) state that information-system quality produces net benefits, one of which is operational efficiency. Rai et al. (2002) and Sedera and Gable (2004) show that information-system quality affects the efficiency of organizational processes. Almutairi and Subramanian (2005) also demonstrate that information-system quality improves digital-service efficiency. In higher education,

Arbain et al. (2024) find that academic information systems can improve the efficiency of administrative services.

H2: The quality of the web-based digital diploma system has a positive effect on the efficiency of academic administrative services.

The services provided affect user satisfaction because services that are fast, easy, and simple can improve the user experience. The effectiveness of a digital diploma system is reflected in faster diploma issuance and easier administrative procedures. Collier and Bienstock (2006) and Blut (2016) support this relationship by showing that service efficiency significantly affects customer satisfaction in online services. In higher education, Arbain et al. (2024) show that more effective digital academic services are associated with stronger user satisfaction.

H3: Service efficiency has a positive effect on user satisfaction.

Quality of Information System Service affects user satisfaction not only directly but also through service efficiency as a form of net benefit. A high-quality system can increase satisfaction by accelerating administrative processes, improving service accuracy, and making services easier to access. Wixom and Todd (2005) explain that system quality affects system benefits, which subsequently influence user satisfaction. Gorla et al. (2010) find that system quality improves process efficiency and user satisfaction. Al-Debei et al. (2013) further show that system benefits can mediate the relationship between information-system quality and user satisfaction.

H4: Service efficiency mediates the effect of digital diploma system quality on user satisfaction.

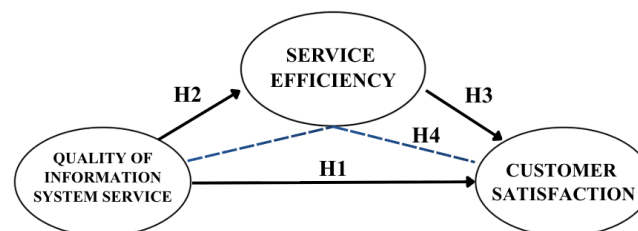


Figure 2. Conceptual Model

RESEARCH METHOD

This study aims to examine the causal relationships among the variables arranged in the conceptual model. It therefore uses a quantitative approach with an explanatory design. The explanatory design was selected because the study seeks to explain the phenomenon and determine how information-system quality affects user satisfaction, both directly and indirectly through service efficiency as a mediating variable.

Data were collected within a specific period using a cross-sectional approach. This method is consistent with information-systems research that applies the DeLone and McLean (2003) Information Systems Success Model to evaluate empirically the relationships among constructs.

The research model develops information-system quality as a multidimensional construct consisting of system quality, information quality, and service quality. The three dimensions are integrated into one latent variable, namely Quality of Information System Service. QISS is positioned as an independent variable that affects service efficiency and user satisfaction.

The research instrument was developed using indicators adapted from empirical literature on quality of information system service and user satisfaction in the context of digital higher education services. Data were collected through a survey using a structured questionnaire distributed online through a digital platform. A five-point Likert scale was used, ranging from 1, indicating strongly disagree, to 5, indicating strongly agree.

Table 2. Variables and Indicators

Variable	Dimension	Indicators	Item
Quality Of Information System Service (X) DeLone dan McLean (2003); Salim (2021); Setiadi et al (2023); Parasuraman, A., Zeithaml, V. A., & Berry, L. (1988)	System Quality (X1)	X1.1	Ease of Use
		X1.2	Response Time
		X1.3	Reliability
		X1.4	Security
		X1.5	Availability
	Information Quality (X2)	X2.1	Accuracy
		X2.2	Completeness
		X2.3	Relevance
		X2.4	Timeliness
		X2.5	Understandability
	Service Quality (X3)	X3.1	Responsiveness
		X3.2	Clarity Of Process
		X3.3	Assurance
		X3.4	Empathy
		X3.5	Competence
Service Efficiency (M) Parasuraman, A., Zeithaml, V. A., & Malhotra, A. (2005)		M.1	Time Efficiency
		M.2	Process Speed
		M.3	Error Reduction
		M.4	Process Simplification
		M.5	Overall Efficiency
Customer Satisfaction (Y) Oliver (1980) dan Bhattacharjee (2001)		Y.1	Satisfaction
			Expectation
		Y.2	Confirmation
		Y.3	User Experience
		Y.4	Decision Satisfaction
		Y.5	Continuance Intention

The population consisted of 1,981 Universitas Ciputra alumni who used the web-based digital diploma system during the 2023/2024 and 2024/2025 academic years. Purposive sampling was used, with respondents required to be alumni who had used the digital diploma

system. The sample size was calculated using the Slovin formula (Sevilla et al., 1992) with a 10% margin of error because the population was relatively homogeneous: all participants used the same digital diploma system at the same institution, followed the same procedures, and had relatively similar service experiences.

Using $n = N/[1 + N(e^2)]$, the calculation was $n = 1,981/[1 + 1,981(0.10)^2] = 1,981/20.81 = 95.1$. Based on this result, the minimum required sample was approximately 95 respondents, which satisfied the minimum adequacy requirement.

Descriptive analysis and path analysis were used to test direct and indirect relationships among variables in the model. QISS was the independent variable, service efficiency was the mediating variable, and customer satisfaction was the dependent variable.

Before hypothesis testing, descriptive statistical analysis was conducted to describe data characteristics and respondents' tendencies regarding the research variables. To test mediation, the study performed validity testing, reliability testing, classical assumption testing, path-regression analysis, and the Sobel test. The analysis was conducted using IBM SPSS Statistics because the model is quantitative and explanatory and is analyzed through regression and path analysis. SPSS supports all analytical stages required in this study, including validity, reliability, classical assumptions, path regression, and mediation testing through the Sobel procedure. Bootstrap confidence intervals were also used to strengthen the mediation evidence.

RESULTS AND DISCUSSION

This section presents the results of the data analysis conducted systematically. The findings are then discussed in depth by linking the empirical evidence with relevant theories and previous research to obtain a comprehensive understanding of the phenomenon under investigation.

Table 3. Respondent Characteristics

Characteristic	Frequency	Percentage
2024 Alumni	41	43.2%
2025 Alumni	54	56.8%
Total	95	100.0%

The study involved 95 Universitas Ciputra alumni who graduated in 2024 and 2025. The composition shows that the respondents were dominated by 2025 alumni, who had completed their studies relatively recently and therefore still had relevant experience of the digital diploma issuance process. This condition enabled respondents to provide current assessments of system quality, service efficiency, and user satisfaction, thereby increasing the relevance of the research data.

Table 4. Descriptive Statistical Analysis

Variable	Mean	Standard Deviation	N
CUST_SAT	21.9368	3.16500	95
QISS	64.1158	8.85445	95
SERV_EF	21.2000	3.59846	95

The descriptive results show that QISS had the highest mean compared with the other variables. This indicates that respondents generally evaluated the quality of the system, information, and services in the digital diploma system as good. Customer Satisfaction had a mean of 21.9368, indicating a relatively high level of user satisfaction and reflecting the conformity between service performance and user expectations. Service Efficiency had a mean of 21.2000, indicating that the system was also considered reasonably efficient in accelerating service processes and simplifying administrative procedures.

The standard deviations of the three variables were relatively low to moderate, indicating that respondents' answers tended to be homogeneous. In other words, their perceptions of the digital diploma system were relatively consistent, and there were no excessively extreme differences in opinion.

Table 5. Validity and Reliability Test Results

Variable	Dimenssion	Indicators	Item	Validity pearson correlation	Reliability Cronbach's Alpha
Quality Of Information System Service (X)	System Quality (X1)	X1.1	Ease Of Use	0.785	0.945
		X1.2	Response Time	0.806	
		X1.3	Reliability	0.748	
		X1.4	Security	0.705	
		X1.5	Availability	0.775	
	Information Quality (X2)	X2.1	Accuracy	0.631	
		X2.2	Completeness	0.758	
		X2.3	Relevance	0.818	
		X2.4	Timeliness	0.689	
		X2.5	Understandability	0.802	
	Service Quality (X3)	X3.1	Responsiveness	0.742	
		X3.2	Clarity Of Process	0.774	
		X3.3	Assurance	0.638	
		X3.4	Empathy	0.543	
		X3.5	Competence	0.663	
Service Efficiency (M)		M.1	Time Efficiency	0.786	0.884
		M.2	Process Speed	0.814	
		M.3	Error Reduction	0.754	
		M.4	Process Simplification	0.864	
		M.5	Overall Efficiency	0.892	
Customer Satisfaction (Y)		Y.1	Satisfaction	0.824	0.905
			Expectation	0.877	
		Y.2	Confirmation		
		Y.3	User Experience	0.877	
			Decision	0.869	
		Y.4	Satisfaction		
			Continuance	0.842	
		Y.5	Intention		

All indicators of QISS, Service Efficiency, and Customer Satisfaction had Pearson correlation values above the commonly used minimum threshold of 0.30. This demonstrates that every questionnaire item was valid and capable of measuring its intended construct. The indicators were therefore retained for subsequent analysis. The Cronbach's alpha values were 0.945 for QISS, 0.884 for Service Efficiency, and 0.905 for Customer Satisfaction. Each value exceeded 0.70, confirming that all variables were reliable. These high coefficients indicate very strong internal consistency among the items in each variable, and the instrument was therefore appropriate for testing the research model.

Table 6. Classical Assumption Test Results

Classical Assumption Test	Indicator	Value / Result	Conclusion
Normality	Kolmogorov–Smirnov test	0.463	Residuals are normally distributed
Multicollinearity	VIF QISS	2.023	No multicollinearity
Multicollinearity	VIF SERV_EF	2.023	No multicollinearity
Heteroscedasticity	Scatterplot	Randomly dispersed points	No heteroscedasticity

The classical assumption tests consisted of normality, multicollinearity, and heteroscedasticity tests and were performed to ensure that the regression model used in path analysis satisfied statistical requirements. When the assumptions are met, the regression findings can be regarded as more valid and suitable as a basis for drawing conclusions.

The Kolmogorov–Smirnov normality test produced a significance value of 0.463, which is greater than 0.05; therefore, the residual data were normally distributed. The multicollinearity test showed a Variance Inflation Factor of 2.023 for QISS and 2.023 for Service Efficiency. These values were below the threshold of 10, indicating the absence of problematic multicollinearity.

The heteroscedasticity test using a scatterplot showed that the points were dispersed randomly. This random pattern indicates that the model did not experience heteroscedasticity and fulfilled the assumption of homoscedasticity. Overall, the model satisfied the requirements for regression analysis, enabling direct and indirect relationships among the variables to be examined with greater confidence.

Table 7. Research Findings

Relationship / Model Component	t or z	p-value	R-square / F Significance
Constant	3.528	0.001	R ² = 0.679;
QISS → CUST_SAT	2.3563	0.0206	F p = 0.0000
SERV_EF → CUST_SAT	8.1477	0.0000	
QISS → SERV_EF	9.7536	0.0000	
QISS → SERV_EF → CUST_SAT	6.2530	0.0000	

The R-square value of 0.679 indicates that QISS and Service Efficiency explained 67.9% of the variation in Customer Satisfaction. The remaining 32.1% was explained by other factors not included in the model. The model-feasibility test also showed a significance value of 0.0000, which is below 0.05. The regression model was therefore feasible and suitable for explaining the relationships among the variables. QISS and Service Efficiency jointly had a significant effect on Customer Satisfaction.

The first hypothesis test showed that QISS had a significant effect on Customer Satisfaction, with $t = 2.3563$ and $p = 0.0206 < 0.05$. This finding reinforces the view that Quality of Information System Service is an important factor in shaping satisfaction with digital services. In a web-based digital diploma system, system quality—covering ease of use, response speed, reliability, security, availability, information quality, and service quality—improves users' positive perceptions of digital academic services. The finding is consistent with other digital-service contexts: satisfaction is determined not merely by the existence of technology but also by its technical quality, the quality of the information it produces, and the quality of user support.

The second test showed that Service Efficiency significantly affected Customer Satisfaction, with $t = 8.1477$ and $p = 0.0000 < 0.05$. This large t-value indicates that efficiency is a particularly strong factor in increasing satisfaction. Users of a digital diploma system are more satisfied when the system accelerates services, reduces errors, simplifies procedures, and provides easy access. In digital services, users tend to evaluate satisfaction based on speed, reliability, security, and convenience; service efficiency is therefore an important indicator of information-system success.

The third test showed that QISS significantly affected Service Efficiency, with $t = 9.7536$ and $p = 0.0000 < 0.05$. This finding confirms that a high- Quality of Information System Service can increase service efficiency. Good system quality enables administrative processes to become faster, more concise, and more accurate. In the digital diploma context, a web-based system reduces manual work, accelerates document verification, decreases potential human error, and makes access easier for students and alumni.

Table 8. Sobel Test Results

Mediation Path	Indirect Effect	Standard Error	Z-value	p-value	Conclusion
QISS → Service Efficiency → Customer Satisfaction	0.1722	0.0275	6.253	0.0000	Mediation

The Sobel test showed that Service Efficiency mediated the effect of QISS on Customer Satisfaction, with $z = 6.2530$ and $p = 0.0000 < 0.05$. The mediation can be categorized as partial mediation because the direct path from QISS to Customer Satisfaction remained significant while the indirect path through Service Efficiency was also significant.

Table 9. Bootstrap Test Results

Mediation Path	Effect	Boot S.E.	LLCI	ULCI	Decision
QISS → Service Efficiency → Customer Satisfaction	0.1722	0.0367	0.1014	0.2466	Mediation

Bootstrap analysis was conducted to support the mediation result. The indirect effect was 0.1722, and the 95% confidence interval ranged from 0.1014 to 0.2466. Because the confidence interval did not include zero, the mediation effect was significant. The bootstrap result therefore confirmed the Sobel test finding that Service Efficiency served as a mediator between QISS and Customer Satisfaction.

Service Efficiency is thus an important intermediary, but it is not the only mechanism explaining the relationship between QISS and Customer Satisfaction. Quality of Information System Service affects satisfaction directly and also works through improvements in service efficiency. A high-quality digital diploma system improves service-process efficiency, and that improved efficiency subsequently strengthens user satisfaction.

The mediation result provides an important theoretical contribution to the information-systems-success literature. The significant indirect effect of QISS on Customer Satisfaction through Service Efficiency indicates that information-system quality influences satisfaction partly because it improves the efficiency of service delivery. However, the persistence of a significant direct relationship between QISS and Customer Satisfaction confirms partial rather than full mediation. This pattern suggests the existence of two complementary mechanisms. First, users directly develop satisfaction from positive perceptions of system, information, and service quality. Second, these quality characteristics generate operational improvements that subsequently enhance satisfaction. Thus, Service Efficiency explains an important part of the mechanism through which information-system quality produces favorable user outcomes, while other psychological and technological mechanisms may continue to operate simultaneously.

CONCLUSION

This study provides theoretical, practical, and managerial implications using the DeLone and McLean (2003) model as its foundation. First, the study provides empirical evidence that QISS has a positive and significant effect on user satisfaction in a web-based digital diploma system. Service Efficiency also plays an important role in increasing user satisfaction. In addition to its direct effect, Service Efficiency significantly mediates the effect of QISS on User Satisfaction. The resulting pattern is partial mediation, indicating that satisfaction can be improved in two ways: through users' perceptions of system quality and through the benefits of a more efficient service. The study therefore strengthens the application of the DeLone and McLean model by positioning Service Efficiency as a representation of net benefits in the context of a web-based information system, particularly a digital diploma service.

Second, the practical implication is that digital diploma administrators must improve system quality while ensuring that the system generates service efficiency. Priorities should include the integration of academic data across departments, automated graduation verification, certified electronic signatures, diploma-status tracking dashboards, and faster helpdesk response times. Diploma digitalization should not merely change the form of a document from physical to digital; it should also become a strategy for improving academic-service quality, particularly service efficiency, and thereby strengthen the satisfaction of users and alumni.

Third, from a managerial perspective, Service Efficiency is a strategic factor linking Quality of Information System Service with user satisfaction. Academic-service administrators should therefore improve the measurement and evaluation of performance metrics, especially document-verification speed, administrative error rates, total service-completion time, and the quality of the user experience. The findings can assist university leaders in establishing Quality of Information System Service development priorities that focus not only on technological aspects but also on the creation of service value for users.

The limitation of this study is that it focuses on a single institution and uses a quantitative cross-sectional design. The results cannot therefore be fully generalized to all higher education institutions. Future studies should involve multiple institutions, use longitudinal approaches, and include additional variables such as trust, perceived usefulness, digital literacy, security perception, and user readiness so that the success model for digital diploma systems can be explained more comprehensively.

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