Comparative Analysis of User Satisfaction of End User Computing Satisfaction, DeLone & McLean and Webqual 4.0 Methods

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Abstract: This study aims to analyze the level of user satisfaction of the SIAP Undip Mobile Application version 2.1.9 using three evaluation methods: End User Computing Satisfaction (EUCS), Delone and McLean, and Webqual 4.0. The study involved 100 Diponegoro University student respondents who used the application. Data was collected through a questionnaire distributed via Google Form and analyzed with SmartPLS 4.0 software to test validity, reliability, and research hypotheses. In this study, there were 11 hypotheses tested with three models. In the EUCS model, one hypothesis is accepted, namely Format has a significant effect on user satisfaction, while the other four hypotheses are rejected. In the Delone and McLean model, two hypotheses were accepted (Information Quality and System Quality) and one hypothesis was rejected (Service Quality). In the Webqual 4.0 model, one hypothesis is accepted (Service Interaction Quality) and two hypotheses are rejected (Information Quality and Usability Quality). The results of this study also provide suggestions for improvement for the development of the SIAP Undip version 2.1.9 application.

Keywords: Analysis; EUCS; DeLone & McLean; Smartpls 4.0; Webqual 4.0

Introduction

The importance of using information technology (IT) in modern organizations is increasingly recognized (Jie & Lin, 2019). especially in the era of globalization where companies are required to be more competitive and competitive (Dwi Pramesti et al., 2022). One important IT implementation in the academic environment is the Academic Information System (AIS)(Bina et al., 2022), which helps in organizing various academic activities. Diponegoro University has implemented a web-based Academic Information System to improve services to the academic community(Pascagama Nurrachman & Priyandari, 2022). Information technology really helps a lot in the scope of education itself. Various aspects of education

management, from student registration to monitoring academic progress. Online registration reduces complex bureaucracy, while automation systems accurately manage personal and academic information with Ready Undip, lecturers and academic staff can monitor students' academic progress in real-time. Information such as grades, attendance, and assignments can be accessed easily, allowing for quick intervention if there are academic issues that need to be addressed. The use of SIAP allows students, lecturers, and employees to access academic information quickly and accurately, thus supporting more efficient learning activities and academic administration(Susanto et al., 2022). However, the successful implementation of an information system depends not only on the technology itself, but also on the level of user satisfaction with the system. To measure

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user satisfaction with academic information systems at Diponegoro University, there are several methods that can be used, namely End User Computing Satisfaction (EUCS), DeLone and McLean Information Systems Success Model, and Webqual 4.0. Each of these methods has a different approach and focus in evaluating user satisfaction. This study aims to analyze the comparison between the End User Computing Satisfaction method, DeLone & McLean, and Webqual 4.0. in evaluating user satisfaction with the Academic Information System at Diponegoro University (Prasetya et al., 2020). By understanding the differences and advantages of each method, it is hoped that a clearer picture of the level of user satisfaction and the factors that need to be improved to support the successful implementation of academic information systems can be obtained. The theoretical framework that can be used in this research includes three main methods, namely EUCS (End User Computing Satisfaction), Delone and McLean and WebQual 4.0. The following is a brief theoretical framework that can be used:

EUCS is a method for measuring the level of satisfaction of users of an application system by comparing expectations(Doll & Torkzadeh, 1988). The following is an explanation of each dimension of measurement with the EUCS method according to. User satisfaction in a system can be measured through several key dimensions. The Content dimension evaluates how well the system's functions, modules, and information meet user expectations(Alfiansyah et al., 2020). The Accuracy dimension checks if the system processes data correctly, ensuring accurate outputs(Lestari & Setyadi, 2024). The Format dimension focuses on the application's visual appeal and layout(Alamsyah et al., 2023). The Ease of use dimension measures how user-friendly the system is for inputting, processing, and retrieving information(Purwandani, 2017). Finally, the Timeliness dimension assesses how quickly the system provides the necessary data and information(Manita & Wahyuni, 2020). Together, these dimensions shape overall user satisfaction.

(Hayatu Mazadu et al., 2022), The Delone and McLean model is a theoretical framework used to measure the success of information systems (IS). William (William H. Delone and Ephraim R. McLean., 2003) the DeLone and McLean Model underwent significant development in 2003, especially in the main dimension where Service Quality became important and influential in the success of an information system. Some academics argue that the "Net Benefits" dimension is not an influencing variable but rather an impact of the six dimensions previously mentioned. The following describes some of the main functions in developing the DeLone and McLean model referring to the 2003 model,

as follows: The evaluation of system success can be viewed through several key dimensions. System Quality assesses the system's capabilities, focusing on ease of use, and is measured by parameters such as usability, availability, reliability, adaptability, and response time. Information Quality evaluates the output produced by the system, considering factors like accuracy, timeliness, completeness, relevance, and format. Service Quality measures the comparison between user expectations and the actual services received, with components like tangible elements, reliability, quick responsiveness, assurance, and empathy. Users (Use) or Usage Intentions gauge how often and effectively users interact with the system, measured by usage frequency, time spent, number of accesses, usage patterns, and user dependence. User Satisfaction reflects user responses to system outputs, focusing on effectiveness, efficiency, and overall satisfaction. Lastly, Net Benefits represent the balance between the system's positive and negative impacts, serving as the most critical measure of success by highlighting the additional benefits brought by the system. Together, these dimensions offer a holistic perspective on the system's performance and its overall value to users.

(Rerung & Ramadhan, 2024) The WebQual 4.0 method is a method that has proven effective in measuring the quality of websites or applications based on user perceptions. With a focus on three main dimensions, namely Quality of Usability, Information Quality, and Quality of Interaction with Service(Villa Waru & Zulkifli, 2023), WebQual 4.0 is a method used to measure the quality of a website and the quality of mobile applications based on end-user perceptions. This method is a development of ServQual which is widely used to measure the quality of previous services(Muryan Awaludin et al., 2023). The development of the WebQual 4.0 instrument is based on the concept of Quality Function Development (QFD), a process whose development and implementation process is based on the "voice of the customer". The measurement of website quality with WebQual 4.0 is carried out by website users, so that the measurements taken will be a help and input for website managers to adjust the website according to the perceptions of its users. The purpose of this study is to determine the user satisfaction of the Undip Ready Version 2.1.9 Mobile application using the End User Computing Satisfaction (EUCS), DeLone and McLean and Webqual 4.0 methods. To find out the advantages and disadvantages of each method and provide input in the form of recommendations for improvement for the development of the Undip Ready Version 2.1.9 Mobile application.

Method

This research uses the EUCS (End User Computing Satisfaction) Method, Delone and Mclean Method, WebQual 4.0 Method. Population is an entire group of people or institutions, events, or other objects of study that want to be described and understood. Population is a set of units which are usually in the form of people, objects, transactions or events where we are interested in studying them. The population in this study are active students of Diponegoro University which has a population of around 47,000 students (Firmansyah et al., (2022). Samples are part taken from the number and characteristics possessed by the research population. In this study using one of the techniques in probability sampling is simple random sampling. Simple random sampling is the taking of sample members from a population that is carried out randomly without regard to the strata in that population.
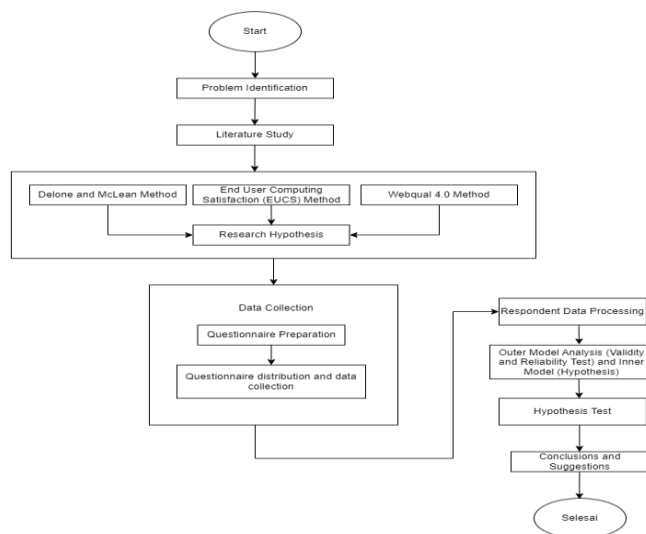

Figure 1. Research Procedure

$$n = \frac{N}{1 + Ne^2} \tag{1}$$

Description:
n: Number of samples
N: Total population
e : Limit of error tolerance

In using this formula, determine what the error tolerance limit is. This margin of error is expressed as a percentage(Maria & Sutabri, 2023). The smaller the tolerance of error, the more accurately the sample describes the population. In this study, the percentage of tolerance error limit was 10%(Kesehatan Masyarakat et al., 2020). The research subjects used in this study were active students of Diponegoro University who used the SIAP UNDIP Mobile Version application, namely 100 people obtained from the Slovin formula. The initial step

in carrying out the quantitative research process is to formulate and define the problem. In this case, the problem raised is how the level of User Satisfaction of the Undip Ready Mobile Application Version 2.1.9 Using the End User Computing Satisfaction (EUCS) Method, Delone and Mclean And Webqual 4.0.

The method of collecting data by making a questionnaire that is adjusted to several variables from the EUCS (End User Computing Satisfaction) method which consists of 6 variables, namely: Content, Accuracy, Format, Ease Of Use, Timeliness and user satisfaction, Delone and Mclean method which consists of 4 variables, namely: System Quality, Information Quality, Service Quality and user satisfaction, WebQual 4.0 method which consists of 4 variables, namely: Usability Quality, Information Quality, Service Interaction Quality and user satisfaction. And then test the questionnaire to get valid and reliable results, then distribute valid and reliable questionnaires to research respondents to fill out the questionnaire based on their individual assessments.

Result and Discussion

The Outer Model or measurement model aims to specify the relationship between latent variables and their indicators(Daud et al., 2021) Outer Model testing uses indicator Validity (Outer loadings) and Convergent Validity (AVE) testing, After the data is collected, then the data is tested on the Outer Model (Bagus Prasasta Sudiatmika & Ayu Oka Martini, 2022). Outer Model testing consists of validity testing and data reliability testing(Putri Mantika & Purwanto, 2022). The first thing to do in testing the Outer Model is to design the Outer Model. Outer Model design is carried out before processing data in smartPLS 4.0 software to provide an overview of the model when processing data (Nurmanto et al., 2024). on the Outer Model design results for testing the EUCS, Delone and McLean and Webqual Models in Figures 2, 3 and 4.
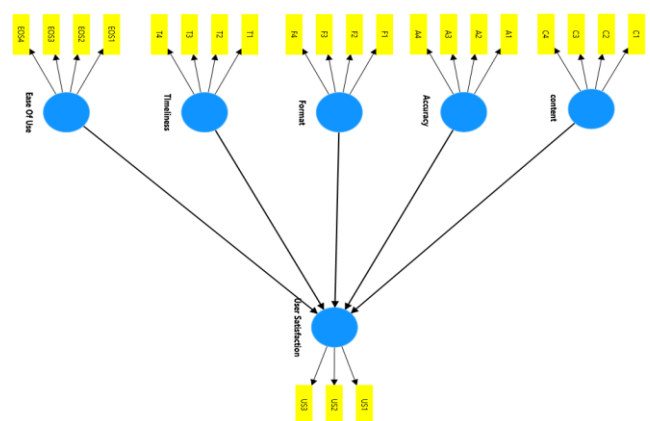

Figure 2. EUCS Outer Model Design

The proposed research model in Figure 2 there are 6 (Variable) latent variables among which are the variables Content (C), Accuracy (A), Format (F), Timelines (T), Ease Of Use (EOU) and User Satisfaction (US). Included in the exogenous variables in this study are the variables Content (C), Accuracy (A), Format (F), Timelines (T), Ease Of Use (EOU). which is indicated by the arrows coming from these latent variables to other latent variables. Meanwhile, what is included in the endogenous variable in this study is User Satisfaction (US). which is indicated by an arrow that leads to the latent variable. Where the latent variables will be interconnected and will produce a hypothesis of 5 (Five) hypotheses
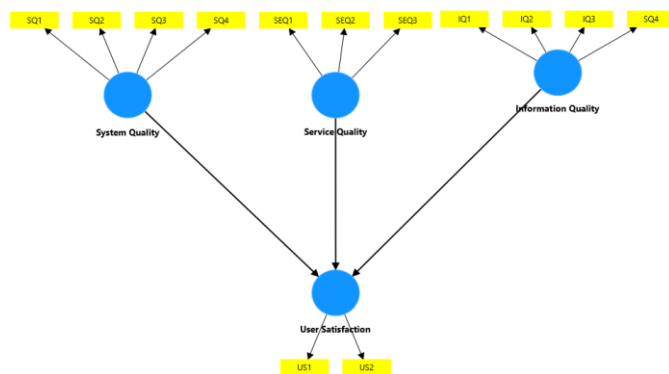
Figure 3. Delone and Mclean Outer Model Design

The proposed research model in Figure 3 there are 4 (four variables) latent variables including System Quality (SQ), Service Quality (SEQ), Information Quality (IQ), and User Satisfaction (US) variables. Included in the exogenous variables in this study are the System Quality (SQ), Service Quality (SEQ), Information Quality (IQ) variables. which is indicated by the arrows coming from these latent variables to other latent variables. Meanwhile, what is included in the endogenous variable in this study is User Satisfaction (US). which is indicated by an arrow that leads to the latent variable. Where the latent variables will be interconnected and will produce 3 (Three) hypotheses.
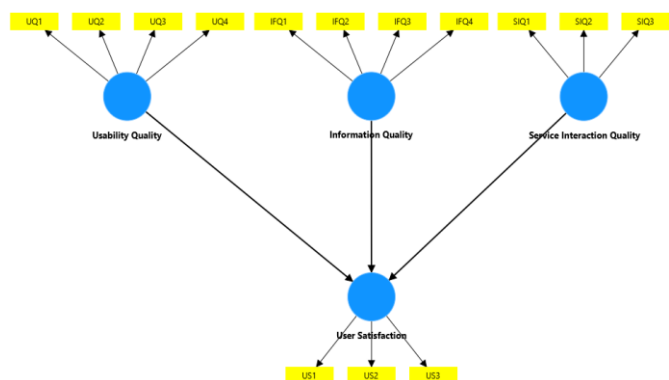

Figure 4. Outer Model Design Webqual 4.0

The research model proposed in Figure 4 there are 4 (four) latent variables among them, namely the Usability Quality (UQ), Information Quality (IQ), Service Interaction Quality (SIQ), and User Satisfaction (US) variables. Included in the exogenous variables in this study are the Usability Quality (UQ), Information Quality (IQ), and Service Interaction Quality (SIQ) variables, which are indicated by arrows coming from these latent variables to other latent variables. Meanwhile, the endogenous variable in this study is User Satisfaction (US). which is indicated by arrows leading to latent variables. Where these latent variables will be interconnected and will produce 3 (Three) hypotheses.

The minimum requirement for the Average Variance Extracted (AVE) value is a value greater than 0.50 (>0.50) (Nursyamsi et al., 2024). If the outer loading value on the test is below 0.70, the indication can still be considered acceptable if the minimum loading value is greater than 0.40 (Loading> 0.40) and the AVE value is greater than 0.50 (AVE> 0.50). If the value is below 0.40, it must be removed, the following is a table of validity (Outer loading) and convergent validity (AVE) of the EUCS, Delone and McLean and Webqual 4.0 models.

The following is a table of validity indicators (Outer loadings) and Convergent Validity (AVE) of the EUCS model when processing data on the results of designing the Outer Model for testing the EUCS, Delone and McLean and Webqual models in the following Tables 1,2,3.

Table 1. Indicators of validity (Outer loadings) and Convergent Validity (AVE) of the EUCS Model

Latent variable	Indicator	Loading (>0.70)	AVE (0,5)	Description
Content	C1	0,772	0,674	
	C2	0,906		
	C3	0,848		Valid
	C4	0,752		
Accuracy	A1	0,731	0,606	
	A2	0,725		
	A3	0,811		
	A4	0,843		Valid
Format	F1	0,881	0.639	
	F2	0,853		
	F3	0,800		Valid
	F4	0,718		
Ease Of Use	EOU1	0,777	0,700	
	EOU2	0,852		
	EOU3	0,830		
	EOU4	0,883		Valid
Timeliness	T1	0,881	0,605	
	T2	0,853		
	T3	0,800		Valid
	T4	0,718		

Latent variable	Indicator	Loading (>0.70)	AVE (0,5)	Description
User Satisfaction	US1	0,821	0,767	
	US2	0,895		Valid
	US3	0,910		

Table 2. Indicators of validity (Outer loadings) and Convergent Validity (AVE) of the Delone and Mclean Model

Latent variable	Indicator	Loading (>0.70)	AVE (>0,5)	Description
IQ	IQ1	0.840	0.739	
	IQ2	0.895		
	IQ3	0.821		Valid
	IQ4	0.880		
SQ	SEQ1	0.835	0.698	
	SEQ2	0.833		
	SEQ3	0.839		Valid
SQ	SQ1	0.786	0.615	
	SQ2	0.753		
	SQ3	0.758		Valid
	SQ4	0.837		
US	US1	0.907	0.825	Valid
	US2	0.910		

Table 3. Indicators of validity (Outer loadings) and Convergent Validity (AVE) of the WebQual 4.0 Model

Latent variable	Indicator	Loading (>0.70)	AVE (>0,5)	Description
IFQ	IFQ1	0.886	0.844	
	IFQ2	0.891		
	IFQ3	0.955		Valid
	IFQ4	0.941		
SIQ	SIQ1	0.843	0.644	
	SIQ2	0.735		Valid
	SIQ3	0.824		
UQ	UQ1	0.942	0.908	
	UQ2	0.922		Valid
	UQ3	0.975		
	UQ4	0.972		
US	US1	0.845	0,713	
	US2	0.812		Valid
	US3	0.875		

In the table above the information is as follows: Structures that score less than 0.70(Ingarianti et al., 2022). All average variance Extraction (AVE) values exceed the 0.50 threshold. After calculating the loading factor value, it is confirmed that the value is in accordance with the average variance (AVE). This shows that all variables and indicators have met the validity criteria and can be used further.

Construct Reliability (Cronbach's Alpha and Composite Reliability)

Cronbach's alpha and reliability are used to evaluate construct reliability(Yudhana & Peningkatan, 2022). A variable construct is considered reliable if the composite reliability value and Cronbach's alpha exceed 0.70(Nabilla & Afifi, 2023). Data processing on smartPLS 4.0 software for testing the EUCS (End User Satisfaction), Delone and McLean and Webqual models can be seen in tables 4 and 5 below.

Table 4. Construct reliability (Cronbach's Alpha dan Composite Reliability) Model EUCS

Latent variable	Cronbach's alpha	Composite reliability (rho_c)
Content	0.839	0.892
Accuracy	0.784	0.860
Format	0.832	0.887
Ease Of Use	0.858	0.903
Timeliness	0.783	0.859
User Satisfaction	0.847	0.908

Table 5. Construct reliability (Cronbach's Alpha dan Composite Reliability) Delone dan Mclean Model

Variabel laten	Cronbach's alpha	Composite reliability (rho_c)
Information Quality	0.883	0.919
Service Quality	0.785	0.874
System Quality	0.797	0.864
User Satisfaction	0.788	0.904

Table 6. Construct reliability (Cronbach's Alpha dan Composite Reliability) Model Webqual 4.0 Model

Variabel laten	Cronbach's alpha	Composite reliability (rho_c)
IFQ	0.945	0.956
SIQ	0.726	0.844
UQ	0.967	0.975
US	0.800	0.881

The data presented in the table above are as follows: All variables show Cronbach's alpha values exceeding 0.70. Composite reliability for all variables is greater than 0.70. Evaluation of construct reliability, namely Cronbach's alpha and Composite Reliability, shows that all variables meet the Cronbach's alpha requirements. In addition, the calculation of external loading, AVE, and composite reliability meets all criteria. Based on these criteria, the research model can be used in further testing.

Coefficient of determination (R2)

The coefficient of determination is used to measure prediction accuracy (Rian Marliana, 2020). In general,

the R2 value of 0.75 is considered to have a large estimation accuracy, R2 of 0.50 has a medium accuracy estimation, and the R2 value of 0.25 has a low accuracy of the estimation value (Hair et al., 2022,) The results of the coefficient of determination in Tables 7, 8 and 9.

Table 7. Coefficient Of Determination (R2) Model EUCS

variabel Laten	R-square	R-square adjusted
User Satisfaction	0.630	0.611

Table 8. Coefficient Of Determination Model Delone and Mclean

variabel Laten	R-square	R-square adjusted
User Satisfaction	0.734	0.726

Table 9. Coefficient Of Determination Model Webqual 4.0

variabel Laten	R-square	R-square adjusted
User Satisfaction	0.749	0.742

Based on the table above, the following information can be found:
The accuracy estimation of the coefficient of determination for User Satisfaction in three models,

namely EUCS, Delone and McLean, and Webqual 4.0, shows significant results. In the EUCS model, the R2 value of 0.630 indicates that User Satisfaction is influenced by 61.1%, with 38.9% influenced by other factors outside the model. In the Delone and McLean model, the R2 value of 0.734 indicates that 72.6% of User Satisfaction is explained by the model, while 27.4% is due to external factors. Meanwhile, in the Webqual 4.0 model, the R2 value of 0.749 indicates that 74.2% of User Satisfaction is influenced by the variables in the model, and the remaining 25.6% is influenced by other factors outside the research model.

Research Hypothesis Test

Structural model coefficient analysis is used to assess hypotheses by identifying the appropriate relationships that have a significant effect(Ramadhayanti et al., 2023). A relationship is considered statistically significant if the p-value is lower than the significance level (a) of 0.05(Amelia Agustin & Kadek Dwi Nuryana, 2022). Conversely, if the p-value exceeds 0.05, the relationship is considered statistically insignificant(Denai Alqawi et al., 2024). on hypothesis testing can be seen in Figures 10,11 and 12.

Table 10. Research Hypothesis Test Model EUCS

Hypothesis	Path Coefficient	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Description
H1	A -> US	1.086	0.923	0.178	Rejected
H2	EOU -> US	0.004	0.039	0.486	Rejected
H3	F -> US	0.443	1.901	0.029	Accepted
H4	T -> US	-0.722	0.624	0.266	Rejected
H5	C -> US	0.076	0.759	0.224	Rejected

Table 11. Research Hypothesis Test Model Delone and Mclean

Hypothesis	Path Coefficient	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Description
H6	IQ -> US	0.753	9.891	0.000	Accepted
H7	SQ-> US	0.207	1.791	0.037	Accepted
H8	SEQ-> US	0.078	0.751	0.226	Rejected

Table 12. Research Hypothesis Test Model Webqual 4.0

Hypothesis	Path Coefficient	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Description
H9	IFQ-> US	0.008	0.179	0.429	Rejected
H10	SIQ-> US	0.871	26.740	0.000	Accepted
H11	US-> US	0.031	0.606	0.272	Rejected

Based on the table above, the following information can be obtained:
H1 : Accuracy -> US has a t-value of 0.923 and a p-value of 0.178 higher than 0.05. Based on this value, it can be seen that there is no significant positive effect. Then H1 is rejected and H0 is rejected.

H2 : Format -> US has a t-value of 1.901 and a p value of 0.029 higher than 0.05. Based on this value, it can be seen that there is a significant positive influence. Then H2 is accepted and H0 is rejected.

H3 : A Ease Of Use -> US has a t-value of 0.039 and a p-value of 0.486 lower than 0.05. Based on this value,

it can be seen that there is no significant positive effect. So H3 is rejected and H0 is rejected.

H4 : Timeliness -> US has a t-value of .624 and a p-value of 0.266 higher than 0.05. Based on this value, it can be seen that there is no significant positive effect. Then H4 is rejected and H0 is rejected.

H5 : Content -> US has a t-value of 0.759 and a p-value of 0.224 higher than 0.05. Based on this value, it can be seen that there is no significant positive effect. Then H5 is rejected and H0 is rejected.

H6: Information Quality -> US has a calculated t-value of 9.891. and a p-value of 0.000 lower than 0.05. Based on this value, it can be seen that there is no significant positive effect. Then H6 is accepted and H0 is rejected.

H7 : System Quality -> US has a t-value of 0.751 and a p-value of 0.226 higher than 0.05. Based on this value, it can be seen that there is no significant positive effect. Then H7 is accepted and H0 is rejected.

H8 : Service Quality -> US has a t-value of 0.759 and a p-value of 0.224 higher than 0.05. Based on this value, it can be seen that there is no significant positive effect. Then H8 is rejected and H0 is rejected.

H9 : Information Quality -> US has a t-value of 0.179 and a p-value of 0.429 higher than 0.05. Based on this value, it can be seen that there is no significant positive effect. Then H8 is rejected and H0 is rejected.

H10 : Service Interaction Quality -> US has a t-value of 26.740 and a p-value of 0.000 lower than 0.05. Based on this value, it can be seen that there is no significant positive effect. Then H10 is accepted and H0 is rejected.

H11: Usability Quality -> US has a t-value of 0.031 and a p-value of 0.272 higher than 0.05. Based on this value, it can be seen that there is no significant positive effect. Then H11 is rejected and H0 is rejected.

This study evaluates the user satisfaction of the SIAP Undip application using three methods: End User Computing Satisfaction (EUCS), DeLone & McLean, and Webqual 4.0. The results showed that system and information quality had a significant effect on user satisfaction. In the EUCS model, only the hypothesis about format is accepted, in line with the findings of Doll and Torkzadeh (1988) who emphasize the importance of clear presentation of information. The DeLone & McLean model found that information and system quality had a positive effect, supporting the research of Prasetya et al. (2020) which shows that accurate information increases satisfaction. In addition, the quality of service interaction in the Webqual 4.0 model also has an effect, in line with Rerung and Ramadhan (2024) who emphasize the importance of user interaction. Overall, this study confirms that user satisfaction is influenced by the quality of the system, information, and service interactions. The recommendation for developers is to conduct periodic evaluations and pay attention to user feedback, as suggested by Hayatu Mazadu et al. (2022), to improve the quality of application services.

Conclusion

Based on the results of the research and discussion that has been carried out in the previous section, it can be concluded that the results of this study are from 100 respondents. respondents in this study are active students of Diponegoro University using the SIAP UNDIP Mobile application. The variable validity test results show that all statement items in the study can be used. In this study using 11 research hypotheses using 3 models 3 (Three) models to measure user satisfaction with the SIAP UNDIP mobile application, namely the EUCS (End User Computing Satisfaction) Model, there is 1 accepted hypothesis, namely Format has a significant effect on user satisfaction while 4 hypotheses are rejected, namely : Accuracy, Ease Of Use, Format and timesliness. In research using the Delone and McLean Model, there are 2 accepted hypotheses, namely: Information Quality and System Quality have a significant effect on user satisfaction while 1 hypothesis is rejected, namely: service quality has no significant effect on user satisfaction. In the Webqual 4.0 model research, there is 1 accepted hypothesis, namely: Service Interaction Quality has a significant effect on user satisfaction, while 2 hypotheses are rejected, namely: Information Quality and Usability Quality because they have no significant effect on user satisfaction. The results of this study indicate that the research on user satisfaction of the SIAP UNDIP Mobile application shows that the Delone and Mclean Model is better than the EUCS (End User Satisfaction) and Webqual 4.0 models.

Conflicts Interest

The authors declare no conflict of interes

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