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New Student Admission Website Evaluation Using WebQual 4.0 and Importance-Performance Analysis

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Abstract—An evaluation of the website quality must be considered on an ongoing basis by an institution because the website quality is part of the institution's image in cyberspace. As a higher education institution, Universitas Ahmad Dahlan (UAD) utilizes the website in the new student admission (NSA) process. Referring to the initial review process using a Blackbox method, it was found that the UAD NSA website had a function that was not working properly. It was also identified that the information content of the registration process displayed was incomplete. This study aims to determine the quality of the UAD NSA website based on the interpretation of the end-users with instruments adopted from the WebQual 4.0 method including usability quality, information quality, and service interaction quality variables. The evaluation process began with the instrument testing which included validity and reliability testing. The process of WebQual 4.0 statistical test was carried out through classical assumption testing which included normality, autocorrelation, multicollinearity, heteroscedasticity testing, t-test, and f-test. The final evaluation process was an importance-performance analysis (IPA) test with the level of conformity, gap, and quadrant analysis between performance and expectations. The results of testing the validity and reliability of 23 instrument items by 100 respondents got an overall value of r_{table} greater than the value of r_{count} , which was 0.195, and Cronbach's alpha value was greater than 0.6 so that the research instrument was valid and reliable. The results of the test involving 250 respondents obtained WebQual 4.0 statistical results, each independent variable (A) partially and simultaneously correlated with the dependent variable (B). The results of the IPA quadrant test indicates that the A2.5 variable related to providing easy-to-understand information needs to be optimized by NSA and web service managers at UAD.

Keywords—Web Evaluation, WebQual, Importance-Performance Analysis.

I. INTRODUCTION

Advances in communication technology have developed rapidly. It is marked by many interactions made by individuals or groups, such as companies, government agencies, and universities to have communication via the internet. The Internet is a communication technology connecting many computers so that complete information can be provided without being constrained by space and time [1]. Human activities in today's digital era cannot be separated from the use of internet technology. In 2019, internet users in Indonesia

reached 171.17 million. This number indicated that the internet users at that time were 64.8% of the total population in Indonesia [2]. Activities of using the internet in exchanging data and information can be carried out effectively and efficiently using websites. A website is a medium showing both visual and audio information on the internet [3]. Due to this phenomenon, universities use websites as promotional and service media.

The fast development of the website has brought significant changes to various service activities carried out by universities, for example, new student admission (NSA). The website of a university not only functions as a promotional and service medium but also as a barometer to measure the quality of the university [4]. Universities are required to do an evaluation process regularly in measuring the quality and success of the use of the website as a form of optimizing services and integrity of universities. Based on users' point of view, the website quality can be evaluated by implementing WebQual 4.0 approach or technique collaborated with importance-performance analysis (IPA).

WebQual 4.0 is one of the approaches or analysis techniques to measure website quality based on the assessment of users' perceptions [5]. It has been developed since 1998 and has undergone several adjustments in dimension arrangements or test instrument attributes. The WebQual 4.0 approach has three primary dimensions as a test process, namely quality of usability, information, and service interaction [5]. The WebQual 4.0 approach can be collaborated with the importance-performance analysis (IPA) approach to identify attributes requiring development at most [6].

The WebQual 4.0 approach has been adopted to analyze website quality. First, [7] analyzed the website quality of NSA in Universitas Gunadarma with five variables, namely tangibles, reliability, responsiveness, assurance, and empathy. Next, [8] analyzed the website quality of Universitas Hasanuddin resulting in a gap between perception and expectation that were not in line with users' expectation. Last, [9] also analyzed the website quality of NSA of Universitas Airlangga resulting in two perspective differences between perception and expectation so it proposed a recommendation to optimize website appearance to make it more attractive.

Several literature studies above used WebQual 4.0 or IPA approaches which were then used by this research as references. This research differs from research that have been mentioned terms of the research object, which is the UAD NSA website; three-dimensional test instruments; and instrument attributes suitable to the type of academic websites. Reference [7] only implemented WebQual 4.0, but not the IPA approach, which made it different from this research. The difference with [8] lies in the usability dimension, which did not include the

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suitability attribute for the type of academic website, and in the information service quality dimension, which did not include the website reputation level attribute. The dimension of customer satisfaction as the dependent variable of [9] only displayed one attribute, while this research added the attribute of access recommendations to other users.

UAD as one of the education institutions uses a website in its NSA activities. UAD always strives to improve its services using the evaluation process of activities carried out. In 2021, UAD conducted an evaluation to develop the NSA website. The initial test on the development of the NSA website was carried out using the black-box test method. This test indicated several issues, such as an unresponsive website display, the authentication to active email had not been integrated into the new user registration, the algorithm for a student's admission channels was not following the predetermined policies, and NSA activity notifications were not automatically carried out.

Based on the problem identifications from the development of the NSA UAD website, further studies were carried out to analyze the quality of the NSA website based on the results of user interpretation with the WebQual 4.0 and IPA approaches. This research proposes four hypotheses as to the conceptual basis for the NSA UAD website quality analysis process related to the independent variable (A) to the dependent variable (B). The first hypothesis is that the usability quality (A1) has a positive and significant relationship to user satisfaction (B). Second, the information quality (A2) has a positive and significant relationship to user satisfaction (B). Third, the service interaction quality (A3) has a positive and significant relationship to user satisfaction (B). Fourth, the integration between usability quality (A1), information quality (A2), and interaction service quality (A3) has a positive and significant relationship to user satisfaction (B).

II. METHODS

A. Diagram of Research Activities

This research was begun by identifying problems in the business process of NSA activities by studying the new student registration guidebook and performing a functional test on the website using the black-box test. The functional test process was complemented by a website usability test based on users' perceptions.

The website usability test was begun by determining research hypotheses, making and testing the validity as well as the reliability of research instruments. The second process of the usability test was to determine respondents and collect research data to be analyzed statistically using WebQual 4.0 and IPA.

The process of WebQual 4.0 statistical analysis implemented classical assumption tests, including multicollinearity, heteroscedasticity, autocorrelation, normality, and the implementation of multiple linear regression tests including t-test and f-test. The statistical analysis test for IPA was carried out by measuring the level of user satisfaction including analyzing the level of suitability and gaps, making a map of the IPA position quadrant, and dividing the assessed attributes into the IPA position quadrant.

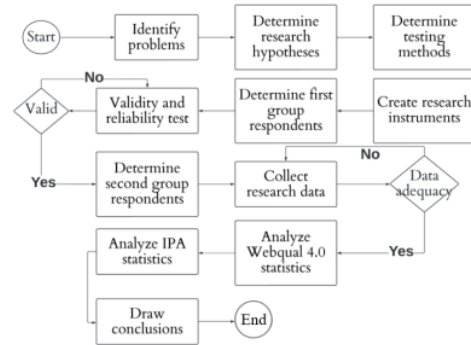


Fig. 1 Diagram of research activity.

The last process of the usability test was to draw research conclusions from WebQual and IPA statistical analysis results. The diagram of research activity is illustrated in Fig. 1.

B. Research Instruments

The research instrument modified the WebQual 4.0 instrument by adjusting it to the type of academic website. Results of the research instrument consisted of 21 question attributes for usability, information, and interaction services qualities as independent variables; and two question attributes for a user satisfaction dimension as dependent variables. A list of research instruments is presented in Table I.

C. Demography of Research Respondents

The total number of research respondents was determined based on the study of minimum sample size in the correlational research, which was 30 respondents [10], [11]. This research involved two respondent groups. The first group consisted of 100 respondents for the instrument test; meanwhile, the second group consisted of 250 respondents for the statistical analysis test. All respondents were prospective students registering in the even semester of the 2020/2021 academic year. Demographic details of the respondent in the first group are presented in Table II.

Table II shows that the majority of respondent demographic was female with an age range of 19 to 22 years old. They accessed the website via smartphone with the number of accesses of more than three times. Demographic details of the second group of respondents are presented in Table III.

Table III shows the majority of the respondents demographic was female with an age range of 15 to 18 years old. The result also shows that the respondents accessed the website via smartphone with the number of accesses more than three times. The demographic identification results for the first and second groups of respondents indicate that while both groups shared several characteristics, there is a difference in the characteristics of respondents' age.

III. RESULTS AND DISCUSSION

A. Results of Problem Identification

Problems were identified by studying a new student registration guidebook about the business process of NSA

TABLE I
RESEARCH INSTRUMENTS

Dimension	Label	Question
Usability Quality (A1)	A1.1	Website is easy to learn and operate
	A1.2	Interaction with the website is clear and easy to understand
	A1.3	Website has clear navigation/instructions
	A1.4	Website is easy to use
	A1.5	Website has attractive appearance
	A1.6	Website design is suitable for academic website type
	A1.7	Website can improve the competence of university
	A1.8	This website provides a positive experience for me
Information Quality (A2)	A2.1	Website provides accurate information
	A2.2	Website provides reliable information
	A2.3	Website provides up to date information
	A2.4	Website provides relevant information about the NSA
	A2.5	Website provides easy-to-understand information
	A2.6	Website provides detailed information
	A2.7	Website provides information in an appropriate format
Interaction Service Quality (A3)	A3.1	Website has a good reputation
	A3.2	Website provides a sense of security when carrying out NSA activities
	A3.3	I feel that my personal information is kept safe
	A3.4	Website provides space for user personalization
	A3.5	Website provides ease of communication with the university
	A3.6	Website provides services according to what is presented
User Satisfaction (B)	B1	I am satisfied with the overall functionality of the website
	B2	I will recommend others to use the website in NSA activities

activities and testing the NSA website using the black-box test method. The testing process was carried out by 10 respondents consisting of 2 lecturers, 2 staff, 2 undergraduate students, 2 post-graduate students, and 2 alumni. Results of problem identification using the black-box test are presented in Table IV.

Table IV depicts the functionality of the UAD NSA website was not in accordance with applicable regulations. Hence, the results of this test became the basis for further research.

B. Results of the Instrument Test

The instrument test was adopted to find the validity and reliability of an instrument using a validity and reliability test on 100 respondents from the first group. The research instrument is valid if the value of $r_{count} > r_{table}$ [12]. Results of the validity test on the research instrument are presented in Table V.

TABLE II
DEMOGRAPHIC OF RESEARCH RESPONDENTS IN THE FIRST GROUP

Gender	Male	40
	Female	60
Age	< 18 years old	10
	19-22 years old	87
	> 22 years old	3
Device	Smartphone	55
	Personal computer	45
Number of Access	1 time	21
	2 times	13
	> 3 times	66

TABLE III
DEMOGRAPHIC OF RESEARCH RESPONDENTS IN THE SECOND GROUP

Gender	Male	65
	Female	185
Age	< 18 years old	194
	19-22 years old	55
	> 22 years old	1
Device	Smartphone	146
	Personal computer	104
Number of Access	1 time	18
	2 times	13
	> 3 times	291

Table V shows that all question attributes have a value of $r_{count} > r_{table}$, so it is concluded that the test is valid. The reliability test on the research instrument was based on the value of Cronbach's alpha. If the Cronbach's alpha is higher than 0.6 then the instrument is reliable [12]. The result of the reliability test on 23 question attributes yielded a Cronbach's alpha value of 0.957 or higher than 0.6. Hence, results of the reliability test on the research instrument are concluded to be reliable.

C. Results of the Normality Test

A normality test was adopted to find whether the data used in the hypothesis testing were normally distributed. The test data results are normal when the significance value is higher than 0.50 [12]. Results of the normality test on performance and expectation data are presented in Table VI.

Table VI indicates that the significance value of the performance data was 0.379 and the expected data was 0.139. Both significance values are higher than 0.05, so the residual values of the performance data and the expected data are normally distributed.

D. Results of the Autocorrelation Test

The autocorrelation test was adopted to determine the regression model with the potential for error in period t to period $t-1$. The autocorrelation test was based on the Durbin Watson value. The results of the autocorrelation test on performance data and expectation data are presented in Table VII.

Table VII shows that the Durbin-Watson value of the performance data was 1.963 and the Durbin-Watson value of

TABLE IV
RESULTS OF THE PROBLEM IDENTIFICATION

No.	Test Form	Expected Result	Final Result
Scenario 1: First Test on the Login Page			
1.	Create a new account by clicking "register" button, fill in and submit your personal data	The system sent notification of successful registration	The system did not send notification email
2.	Fill in and submit account data such as username and password	The system redirected to the main page	The system redirected to profile data
Scenario 2: Second Test on the Registration Page			
1.	Complete the registration data and choose the PMDK and the graduation year is at least 2017 (more than 3 years)	The system provided an invalid registration notification because the PMDK was only for applicants who graduated maximum of the past 3 years	The system accepted the registration
Scenario 3: Third Test on the File Upload Page			
1.	Upload image document with format other than *.jpg/jpeg	The system gave an invalid notification because the format of the document accepted is only *.jpg/jpeg	The system accepted the document

the expected data was 1.835. The value of the free area for a sample of 250 respondents was 1.808 (dU) to 2.192 (4-dU). Both Durbin-Watson values indicate no autocorrelation based on the value of $1.808 < 1.963 < 2.192$ for performance data and a value of $1.808 < 1.835 < 2.192$ for expected data.

E. Results of the Multicollinearity Test

The Multicollinearity test was adopted to test the correlation between independent variables in a regression model. The multicollinearity detection could be assessed by the value of the variance inflation factor (VIF) or the value of tolerance. The criterion for the regression model without multicollinearity was the tolerance number close to one. The VIF value is limited to 10 and the VIF value is less than 10, so multicollinearity is not formed [13]. The results of the multicollinearity test of performance data and expectation data are presented in Table VIII.

Table VIII shows that the VIF score on performance data and expectation data was less than 10, so the multicollinearity was not formed on the regression model of performance data and expectation data. The results of this test will produce reliable hypothesis testing.

F. Results of the Heteroscedasticity Test

The heteroscedasticity test was adopted to identify variants that were not the same as other variants in the regression model [13]. The decision-making in this test was based on a

TABLE V
RESULTS OF THE VALIDITY TEST ON THE INSTRUMENT

Label	<i>r_{count}</i>	<i>r_{table}</i>	Description
A1.1	0.674	0.195	Valid
A1.2	0.755		
A1.3	0.698		
A1.4	0.722		
A1.5	0.649		
A1.6	0.732		
A1.7	0.661		
A1.8	0.764		
A2.1	0.695		
A2.2	0.596		
A2.3	0.685		
A2.4	0.675		
A2.5	0.746		
A2.6	0.708		
A2.7	0.812		
A3.1	0.794		
A3.2	0.757		
A3.3	0.700		
A3.4	0.791		
A3.5	0.747		
A3.6	0.780		
B1	0.656		
B2	0.727		

TABLE VI
RESULTS OF THE NORMALITY TEST

	Performance Data	Expectation Data
N	250	250
Kol. Smimov Z	0.910	0.910
Asymp. Sig. (2-tailed)	0.379	0.139

TABLE VII
RESULTS OF THE AUTOCORRELATION TEST

	R	R Square	Adjusted R Square	Std. Error	Durbin-Watson
Performance Data	0.463 ^a	0.215	0.205	0.999	1.963
Expectation Data	0.668 ^a	0.446	0.439	0.796	1.835

significance value which was higher than 0.05, so there was no heteroscedasticity [13]. The results of the heteroscedasticity test of performance data and expectation data are presented in Table IX.

Table IX shows that the significance value of the performance data and the expected data had values higher than 0.05, so there was no heteroscedasticity. The results of this test lead to unbiased hypothesis testing.

G. Results of the t-Test

The t-test process was adopted to identify the effect of the independent variable on the dependent variable partially [10].

TABLE VIII
RESULTS OF THE MULTICOLLINEARITY TEST

Performance Data			Expectation Data				
Model	Tolerance	VIF	Model	Tolerance	VIF		
1	A1	0.670	1.492	1	A1	0.697	1.434
	A2	0.577	1.732		A2	0.680	1.471
	A3	0.619	1.615		A3	0.671	1.491

TABLE IX
RESULTS OF THE MULTICOLLINEARITY TEST

Performance Data		Expectation Data			
Model	Sig.	Model	Sig.		
(Constant)	0.007	(Constant)	0.880		
1	A1	0.402	1	A1	0.235
	A2	0.293		A2	0.638
	A3	0.206		A3	0.154

TABLE X
RESULTS OF T-TEST

Performance Data		Expectation Data			
Model	Sig.	Model	Sig.		
(Constant)	0.223	(Constant)	0.369		
1	A1	0.000	1	A1	0.000
	A2	0.004		A2	0.003
	A3	0.000		A3	0.000

The test indirectly proved the first, second, and third hypotheses. The t-test results of performance data and expectation data are presented in Table X. Table X shows that the significance values of the variables A1, A2, and A3 were less than 0.05, so the first, second, and third hypotheses could be accepted.

H. Results of the f-Test

The f-test process was adopted to identify the effect of the independent variable on the dependent variable simultaneously [10]. This test aimed to prove the fourth hypothesis. The f-test results of the performance data and the expected data are presented in Table XI. Table XI shows that the regression significance value was less than 0.05, so the fourth hypothesis could be accepted.

I. Results of the Suitability Analysis

The suitability analysis was adopted to identify the level of user perception of the NSA website performance. The results of the suitability level analysis are presented in Table XII. Table XII shows that the average level of suitability between performance and expectations was 92%.

J. Results of the Gap Analysis

The gap analysis was adopted to identify the quality of performance and expectations of the NSA website. The results of the gap level analysis are presented in Table XIII. Table XIII

TABLE XI
RESULTS OF THE F-TEST

Performance Data		Expectation Data			
Model	Sig.	Model	Sig.		
1	Regression	0.000 ^a	1	Regression	0.000 ^a
	Residual	-		Residual	-
	Total	-		Total	-

TABLE XII
RESULTS OF THE SUITABILITY TEST

Label	Performance	Expectation	Suitability
A1.1	824	887	93%
A1.2	790	855	92%
A1.3	783	850	92%
A1.4	863	922	94%
A1.5	754	838	90%
A1.6	790	880	90%
A1.7	792	880	90%
A1.8	820	894	92%
A2.1	834	906	92%
A2.2	874	941	93%
A2.3	803	884	91%
A2.4	868	933	93%
A2.5	821	893	92%
A2.6	790	867	91%
A2.7	821	904	91%
A3.1	835	900	93%
A3.2	841	924	91%
A3.3	838	917	91%
A3.4	809	887	91%
A3.5	820	889	92%
A3.6	854	930	92%
B1	806	877	92%
B2	836	855	98%
Mean			92%

shows that there was a gap value with an average gap of -0.36 on the NSA UAD website.

K. Results of the IPA Quadrant Analysis

The IPA quadrant analysis was adopted to identify the data in the test variables that had values from the most optimal to least optimal values. The results of the IPA quadrant analysis are presented in Fig. 2. Results of the IPA quadrant analysis in Fig. 2 suggests that the NSA UAD website has met the most and least optimal attributes. Detailed information on attribute suitability based on Fig. 2 includes:

1) *The first quadrant:* It shows attributes that have met the user's expectations. The label details of the attributes contained in the first quadrant to be maintained are A2.2, A2.4, A1.4, A3.6, A3.2, A3.3, A2.1, A3.1, A2.7, and A1.8.

2) *The second quadrant:* It shows attributes requiring improvement and attention by NSA managers because they are still not in accordance with users' expectations. The label detail of the attributes contained in the second quadrant is A2.5.

TABLE XIII
RESULTS OF THE SUITABILITY TEST

Label	Perform.	Expect.	Gap	Description
A1.1	4.12	4.43	-0.32	Low
A1.2	3.95	4.27	-0.33	Low
A1.3	3.91	4.25	-0.34	Low
A1.4	4.31	4.61	-0.30	Low
A1.5	3.77	4.19	-0.42	Low
A1.6	3.95	4.40	-0.45	Low
A1.7	3.96	4.40	-0.44	Low
A1.8	4.10	4.47	-0.37	Low
A2.1	4.17	4.53	-0.36	Low
A2.2	4.37	4.70	-0.34	Low
A2.3	4.01	4.42	-0.41	Low
A2.4	4.34	4.66	-0.33	Low
A2.5	4.10	4.46	-0.36	Low
A2.6	3.95	4.33	-0.39	Low
A2.7	4.10	4.52	-0.41	Low
A3.1	4.17	4.50	-0.33	Low
A3.2	4.20	4.62	-0.42	Low
A3.3	4.19	4.58	-0.40	Low
A3.4	4.04	4.43	-0.39	Low
A3.5	4.10	4.44	-0.35	Low
A3.6	4.27	4.65	-0.38	Low
B1	4.03	4.38	-0.36	Low
B2	4.18	4.27	-0.10	Low
Mean			-0.36	Low

3) *The third quadrant:* It shows attributes that do not need special attention because users do not have high expectations. The label details of the attributes contained in the third quadrant are A3.5, A3.4, A2.3, B1, A1.6, A1.7, A2.6, A1.2, A1.3, and A1.5.

4) *The fourth quadrant:* It shows attributes that are not particularly important but have a good performance. The label details contained in the fourth quadrant are A1.1 and B2.

IV. CONCLUSION

This research was successful in developing a valid and reliable research instrument so that it had accuracy and consistency in the sustainability of the research. All research hypotheses could be accepted and each independent variable partially and simultaneously provided a significant and positive effect on the independent variable. Better usability, information, and interaction service qualities as independent variables led to a higher level of user satisfaction as the dependent variable. The results of other research identified attribute A2.5 related to the availability of easy-to-understand information as a top priority attribute to be improved by the NSA UAD website manager. Further research in the form of integration testing between the Kano model and IPA needs to be carried out to strengthen the analysis and research results related to the development of the NSA UAD website interface with a user-centered design approach.

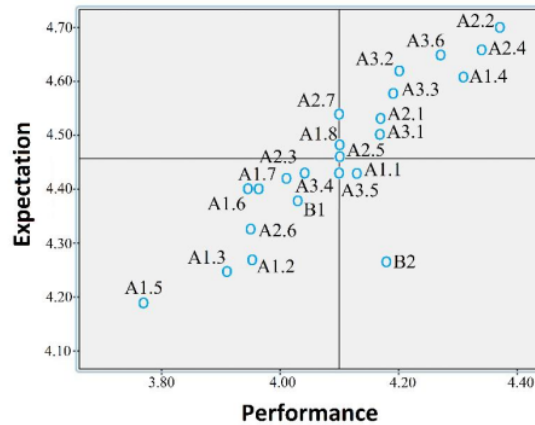


Fig. 2 Result of IPA quadrant analysis.

CONFLICT OF INTEREST

The author declares that the article is free from any personal conflict of interest and certain conditions.

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