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Measuring Quality of E-learning Websites Using WebQual 4.0 Method in Higher Education (Case Study : Institute Technology and Science Mandala)

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Abstract

The new normal era due to the Covid-19 pandemic has an impact on various sectors, one of which is the education sector. The Covid-19 pandemic has forced tertiary institutions to innovate by utilizing information technology in implementing higher education tridharma. The Mandala Institute of Technology and Science utilizes the LMS e-learning platform as an online learning medium. This research was conducted to measure the quality of e-learning using Webqual 4.0 approach to improve and maintain service quality based on user assumptions. The Webqual 4.0 method is an instrument used to assess website quality based on the end user's perspective of 3 (three) dimensions, namely usability quality, information quality, and service interaction quality. The results of this study indicate that usability quality, information quality and service interaction quality have a significant and positive effect on user satisfaction

Keywords : Website Quality, Webqual 4.0, Learning Management System

1 INTRODUCTION

The Covid-19 pandemic has had many impacts on various sectors that are directly related to people's daily mobility, including the education sector in Higher Education. Distance learning is one of the policies issued by the government through a Circular Letter from the Minister of Education and Culture Number 36962/MPK.A/HK/2020 concerning online learning and working from home in the framework of preventing the spread of covid-19. The Ministry of Education and Culture instructs distance learning so that students can learn from their respective homes. Universities in Indonesia are required to utilize information technology for distance learning processes. The use of this information technology changes the face-to-face learning process directly into online/online learning methods. Universities in Indonesia implement various types of learning media, including E-learning, zoom, google classroom, google meet, and other media.

The Covid-19 pandemic has forced tertiary institutions to innovate by utilizing information technology in implementing higher education tridharma. Information technology according to Williams & Sawyer [1] in [2] is a technology that is the result of a combination of high-speed communication lines with computers, where these lines carry video, voice and data. According to the results of a survey from the Directorate General of Higher Education conducted in April 2020 that 98% of tertiary institutions throughout Indonesia from Sabang to Merauke have conducted online learning. This survey was conducted on 237,193 students out of the total number of students in Indonesia based on the Higher Education Data Base (PDDikti), which totaled 8,325,013 students. It was found that the learning process was carried out using various methods, namely face-to-face learning using video conferencing as many as 20.11 %, indirect learning through voice recordings, video recordings or written teaching materials as much as 34.7% and a combination of the two methods as much as 39.39%. This shows that universities have followed policies from the government to support the prevention of Covid-19 and it is hoped that universities can produce quality learning equivalent to before the Covid-19 pandemic.

This condition also occurs at the Institute Technology and Science Mandala, Institute Technology and Science Mandala issues regulations regarding online learning that requires lecturers to use the LMS E-learning platform in the teaching and learning process. Utilization of information technology can provide convenience for lecturers and students in implementing higher education tridharma [3]. One of them is in the learning process because it can carry out the teaching and learning process without being limited by space and time.

This policy indirectly changes the culture of the teaching and learning process in the current education sector. Several tertiary institutions apply blended learning methods, one of which is Institute Technology and Science Mandala which applies blended learning by combining face-to-face strategies in classrooms and online/online learning using e-learning. Blended learning is divided into two ways of learning, namely synchronous and asynchronous. Synchronous learning is guided by the schedule or time frame of the lesson. Students can access materials and assignments within a certain time. While asynchronous has a more flexible time.

The use of e-learning in the new normal era has made the evaluation process for e-learning websites one of the main requirements for every educational institution [4]. Evaluation of e-learning media is important to maintain the sustainability of the use of e-learning media. The quality e-learning will have a positive influence on user satisfaction, both students and lecturers. One of the higher education institutions that has used e-learning since the beginning of the Covid-19 pandemic era is the Institute Technology and Science Mandala. The main problem in this research is that the university has not been able to measure the quality of its e-learning website. Website is one of the technologies currently developed to disseminate information very quickly and reachable [5]. This makes the tertiary institution unable to know which quality dimensions of e-learning must be improved to ensure the continued use of e-learning. Therefore, this study aims to evaluate the quality of e-learning at the Mandala Institute of Technology and Science by using the three main dimensions in Webqual 4.0.

2 RESEARCH METHOD

This study uses a quantitative approach. This study aims to determine the quality of the e-learning website that is used as an online learning media for students of the Institute Technology and Science Mandala. The stages of the research carried out in this study can be seen in Figure 1.

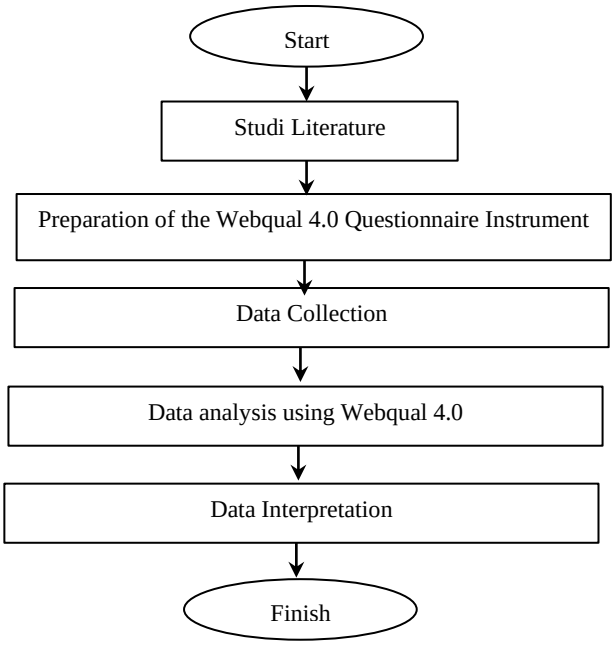

Figure 1 Research Stages

The initial stage of this research was to collect research sources and references that were used as supporting data from the background and when conducting research. The literature study aims to add insight to researchers according to the chosen topic. The research sources and theoretical basis needed are websites, e-learning, website measurement and Webqual 4.0. The next stage is the process of compiling a website quality evaluation instrument that refers to the dimensions contained in the Webqual 4.0 approach. Webqual 4.0 is a technique that can be used to measure the quality of a website. Three main dimensions in Webqual 4.0 are used as a benchmark for the quality of a website, including Information Quality, Usability Quality, and Service Interaction Quality.

Sample data collection in this study used the probability sampling method with a proportional random sampling technique for the population of students at the Institute Technology and Science Mandala who are

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studying for the 2021/2023 academic year who are active users of e-learning which are divided into 7 study programs. Data on the population of students and lecturers from 5 study programs totaled 1523 students (data source: sipadu.itsm.ac.id). The minimum number of samples is obtained by calculating the Slovin formula with an error tolerance limit of 5% (0.05). Based on calculations using the Slovin formula, the number of samples that will be used in this study is obtained, namely 317 respondents with the following calculation details.

$$n = \frac{N}{1 + N\,e^2} = \frac{1523}{1 + 1523.(0{,}05)^2} = 316{,}7 \quad (1)$$

Where n is a number of samples, N is a population size an e is a percentage of tolerable erro

This study used a research instrument in the form of a questionnaire which was cor Webqual 4.0 dimensions and variables which had been adapted to the research object. The results of the data collection will be analyzed based on the Webqual 4.0 approach. The process of compiling a website quality evaluation instrument that refers to the dimensions contained in the Webqual 4.0 approach. Webqual 4.0 is a technique that can be used to measure the quality of a website. There are three main dimensions in Webqual 4.0 which are used as a benchmark for the quality of a website, including Information Quality, Usability Quality, and Service Interaction Quality which has 21 indicators.

Webqual is a tool used to assess the usefulness (benefits) of information, information quality, and the quality of service interactions from web pages on the internet. Webqual is a method or technique for measuring website quality based on the perceptions of site users. This webqual method exists and was developed in 1988 by Barnes and Vidgen which is on e-commerce and e-government sites [6]. The development of the webqual method began with the compilation of Webqual 1.0 until finally Webqual 4.0. In Webqual 4.0, the usability variable is growing. This version emphasizes indicators of user perception rather than the design of the site itself. Webqual 4.0 replaces the site quality dimension with a usability dimension. The three parameters measuring website quality using Webqual 4.0 in this study can be described in the following conceptual model.

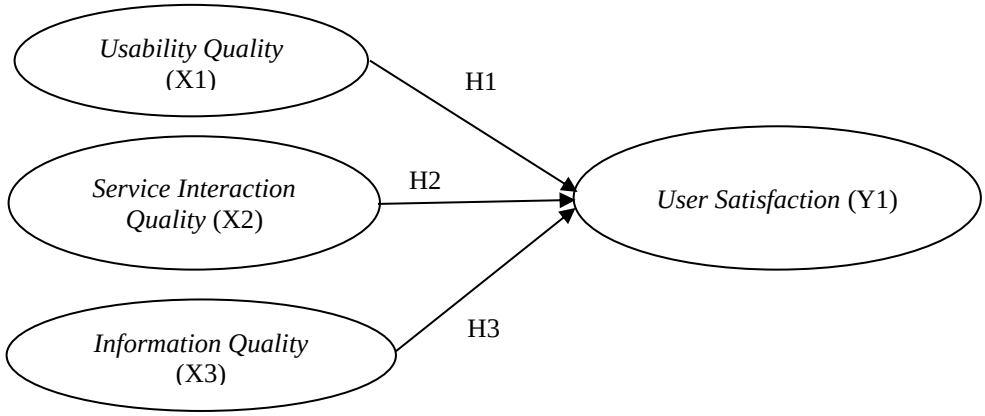

Figure 2 Conceptual Model

The conceptual model in Figure 2 illustrates the hypothesis that there is a relationship between usability quality, service interaction quality and information quality on user satisfaction. These four variables will be the variables in this study. Some explanations regarding the indicators for each variable are as follows:

1. Usability Quality
   Usability Quality is a quality associated with websites such as ease of operation of e-learning, ease of understanding and navigation, attractive appearance of e-learning and providing a positive experience for users.
2. Service Interaction Quality
   Service Interaction Quality is a quality related to service interactions received by users when accessing e-learning.
3. Information Quality
   Information Quality is the quality related to the information displayed in e-learning, whether the information provided can be trusted and has proper accuracy.
4. User Satisfaction
   Information Quality is the quality related to the information displayed in e-learning, whether the information provided can be trusted and has proper accuracy.

In the next stage, data analysis was carried out using Partial Least Square - Structural Equation Model (PLS-SEM). The final stage of this research is data interpretation which is the result of the data analysis process that was carried out in the previous process. At this stage, it will be known to what extent the quality of the e-learning website is owned by the Institute Technology and Science Mandala.

3 RESULTS AND ANALYSIS

3.1. Respondent Characteristics

The number of respondents in this study was 317 students consisting of 114 men and 203 women. Respondents in this study represented 7 (seven) study programs, namely 115 S1 Management, 67 S1 Accounting, 46 S1 Development Economics, 5 S1 Systems and Information Technology, 1 S1 Software Engineering, 41 D3 Finance and Banking, and 2 Masters in Management.

3.2. Outer Model Testing

Testing the outer model with reflective indicators is evaluated by convergent and discriminant validity of the indicators and composite reliability for the block of indicators. The validity test in this study was carried out to find out whether the research instrument measures what it should measure. The reliability test was carried out to measure the consistency of the measuring instrument in measuring a concept.

a. Convergent Validity

Convergent validity test is carried out to measure the level of accuracy of an indicator or dimension by measuring the magnitude of the correlation between constructs and latent variables. The loading factor value above 0.7 is indicated. The outer loading value in this study can be seen in Table 1.

Table 1 Outer Loading Value

Indicator	Outer Loading	Information
X1.1	0,818	Valid
X1.2	0,876	Valid
X1.3	0,802	Valid
X1.4	0,839	Valid
X1.5	0,721	Valid
X1.6	0,714	Valid
X2.1	0,775	Valid
X2.2	0,805	Valid
X2.3	0,872	Valid
X2.4	0,839	Valid
X2.5	0,829	Valid
X2.6	0,828	Valid
X3.1	0,856	Valid
X3.2	0,773	Valid
X3.3	0,850	Valid
X3.4	0,856	Valid
X3.5	0,757	Valid
X4.1	0,890	Valid
X4.2	0,930	Valid
X4.3	0,928	Valid
X4.4	0,868	Valid

Data source: SmartPLS Processed Data 2023

Based on Table 1, it shows that the results of the outer loading value for each indicator have a value above 0.7, so it can be concluded that all indicators are declared valid.

b. Discriminant Validity

The discriminant validity test is used to find out whether the indicators in a construct are not highly correlated with indicators from other constructs. The discriminant validity test can be assessed by

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comparing the AVE root value in each construct with the correlation between the construct and the other constructs in the model.

Table 2 Fornell-Lacker Criterias

	Information Quality (X2)	Service Interaction Quality (X3)	Usability Quality (X1)	User Satisfaction (Y1)
Information Quality (X2)	**0,825**			
Service Interaction Quality (X3)	0,814	**0,820**		
Usability Quality (X1)	0,805	0,774	**0,797**	
User Satisfaction (Y1)	0,799	0,781	0,741	**0,905**

Data source: SmartPLS Processed Data 2023

Based on Table 2, it shows that the roots in the construct have a greater AVE root value than the correlation value of the latent variable. The value of AVE Information Quality (X2) is 0.825 higher than the correlation between the constructs Service Interaction Quality (X3), Usability Quality (X1) and User Satisfaction (Y1).

c. Composite Reability

Composite reliability is a statistical technique used to test reliability that measures the actual reliability value of the construct. Reliability test on partial least squares can be done with 2 (two) methods, namely Cronbach's alpha and composite reliability. According to [7] the value of alpha or composite reliability on an indicator must be greater than 0.70, while a value of 0.6 is still acceptable [8].

Table 3 Construct Reliability and Validity Test Results

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Information Quality (X2)	0,906	0,909	0,928	0,681
Service Interaction Quality (X3)	0,877	0,883	0,911	0,672
Usability Quality (X1)	0,884	0,885	0,912	0,635
User Satisfaction (Y1)	0,926	0,926	0,947	0,818

Data source: SmartPLS Processed Data 2023

Based on Table 3, shows that each construct has a Cronbach's alpha value and composite reliability above 0.70. The results obtained from the construct reliability and validity test showed that the indicators used in the variables in this study are said to be reliable.

3.3 Inner Model Testing

The structural model (inner model) can be evaluated using the R^2 value for the dependent construct which is used to measure the level of variation of changes from the independent variable to the dependent variable and the path coefficient values (t-values) on each path which are used to test the significance between constructs in the inner model. The R Square value in this study can be seen in Table 4.

Table 4 R Square Value

	R Square	R Square Adjusted
User Satisfaction (Y1)	0,697	0,694

Data source: SmartPLS Processed Data 2023

Based on Table 4 regarding the results of R^2 on the variable user satisfaction (Y1) of 0.697 or 69%, it is influenced by the variables usability testing (X1), information quality (X2) and service interaction quality (X3).

3.4 Hypothesis test

The hypothesis testing carried out in this study aims to statistically test the truth of a statement and draw conclusions whether the statements that have been made are accepted or rejected. Testing the hypothesis on the partial least squares was carried out using the resampling bootstrapping method by looking at the t-statistic

value which must be above 1.96 (significance level 5%) and the hypothesis can be accepted if the p-value <0.05 is obtained. The following are the results of the t-statistic test shown in Figure 3.

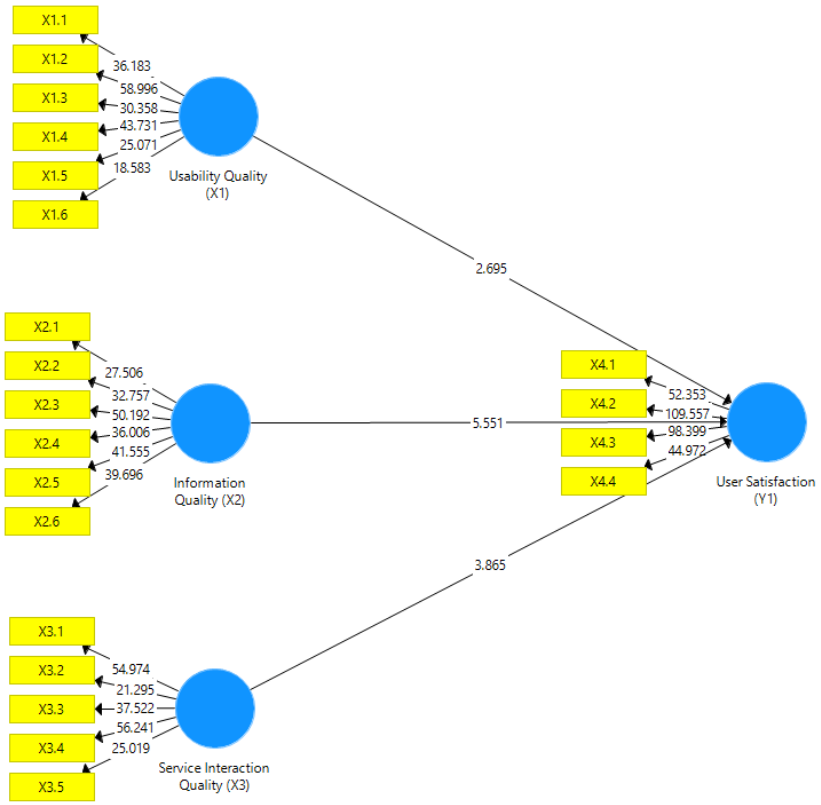

Figure 3 The results of the t-statistical test
Source: SmartPLS Processing Data 2023

Testing this hypothesis aims to test how strong the direct influence of the independent variable on the dependent variable is. The following results of the direct influence can be seen in Table 5.

Table 5 Hypothesis Testing

	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Information
Information Quality (X2) -> User Satisfaction (Y1)	0,396	5,551	0,000	Accepted
Service Interaction Quality (X3) -> User Satisfaction (Y1)	0,329	3,865	0,000	Accepted
Usability Quality (X1) -> User Satisfaction (Y1)	0,167	2,695	0,007	Accepted

Data source: SmartPLS Processed Data 2023

Based on Table 5 regarding the results of direct hypothesis testing, the following hypothesis results can be obtained:

1. Hypothesis 1: Quality of use affects user satisfaction on the e-learning website of the Institute Technology and Science Mandala.
   Hypothesis testing showed a t-statistic value of 2.695 > 1.96 and a P value of 0.007 <0.05. Based on the results of the hypothesis testing, it can be concluded if the hypothesis is accepted and it is stated that the quality of use affects user satisfaction.
2. Hypothesis 2: The quality of information affects user satisfaction on the e-learning website of the Institute Technology and Science Mandala.
   Hypothesis testing shows a t-statistic value of 5.551 > 1.96 and a P value of 0.000 <0.05. Based on the results of the hypothesis testing, it can be concluded that the hypothesis is accepted and it is stated that the quality of information affects user satisfaction.

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3. Hypothesis 3: The quality of interaction affects user satisfaction on the e-learning website of the Institute Technology and Science Mandala.
   Hypothesis testing shows a t-statistic value of 3m856 > 1.96 and a P value of 0.000 <0.05. Based on the results of the hypothesis testing, it can be concluded if the hypothesis is accepted and it is stated that the quality of the interaction affects user satisfaction.

3.4 Discussion

1. The quality of use affects user satisfaction on the e-learning website of the Institute Technology and Science Mandala

   Based on the parameter coefficient value for usability quality on user satisfaction of 0.167 which indicates there is a positive influence between usability quality on user satisfaction. This explains that the higher the usability quality value, the user satisfaction value will also increase, which means that an increase in one usability quality unit will increase the user satisfaction value by 17%.

   Students of Institute Technology and Science Mandala have used e-learning in their learning process. This is evidenced by the most respondents answers to the question of the intensity of access to e-learning as many as 161 students answered often, 92 students answered very often, 54 students answered moderately, 10 students answered moderately and no students answered very rarely. This shows that students have used e-learning as a means of learning in higher education. Based on the results of the questionnaire for the usability quality variable, the smallest value was obtained on the X1.5 indicator, namely the display of e-learning with an average value of 3.886. This shows that it needs improvement in terms of the appearance of e-learning to make it more attractive. The highest indicator of usability quality is found in indicator X1.4, namely e-learning is easy to use with an average value of 4.399. This shows that students can easily operate e-learning as a learning medium. This indicator gives the highest contribution to the effect of usability quality on user satisfaction. This is also in line with research conducted by [9] that usability quality gives a high value to user satisfaction.
2. The quality of information affects user satisfaction on the e-learning website of the Institute Technology and Science Mandala

   Based on the parameter coefficient value for information quality on user satisfaction of 0.369 which indicates that there is a positive influence between information quality on user satisfaction. This explains that the higher the value of information quality, the value of user satisfaction will also increase, which means that an increase in one unit of information quality will increase the value of user satisfaction by 37%.

   Based on the results of the respondents' answers, it shows that the value of the information quality indicator that gives the highest contribution to satisfaction is X2.4. This indicator contains e-learning providing information that is easy to understand, which means that students can easily receive information provided by lecturers through e-learning. This is in line with research conducted by [10] related to measuring quality using website 4.0. This research suggests that information quality has a significant influence between information quality and user satisfaction on e-learning websites.
3. The quality of interaction affects user satisfaction on the e-learning website of the Institute Technology and Science Mandala

   Based on the parameter coefficient value for service interaction quality on user satisfaction of 0.329 which indicates that there is a positive influence between service interaction quality on user satisfaction. This explains that the higher the value of service interaction quality, the value of user satisfaction will also increase, which means that an increase in one unit of service interaction quality will increase the value of user satisfaction by 33%.

   Based on the respondents' answers to the questionnaire, it shows that the value of the indicator that contributes the highest is indicator X3.2 where students feel safe when uploading and downloading on e-learning. This proves that students feel safe in using e-learning as a learning medium. This is also in line

with research conducted by [11] which explains that the service interaction quality variable factor has the highest influence on user satisfaction by 35%. Based on these studies indicate that the quality of the website has an influence on user satisfaction.

4 CONCLUSION

Based on the results and discussion, it can be concluded that the three Webqual 4.0 dimensions used show that usability quality, information quality and service interaction quality have a significant and positive effect on e-learning user satisfaction at the Institute Technology and Science Mandala. The variable that most influences e-learning user satisfaction is the information quality variable with an effect of 37%. Then followed by the service interaction quality variable of 33% and the usability quality variable of 17%. This research was conducted as one of the steps to measure the quality of the e-learning website used at the Institute Technology and Science Mandala. It can be concluded that website quality has an influence on e-learning user satisfaction at the Institute Technology and Science Mandala. Based on the results of this study, further research can combine other methods as a comparison of the WebQual 4.0 method, so that it can increase references and make comparisons with current research results.

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