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Research paper

Usability Efficiency Analysis on E-Learning Websites

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Abstract

The challenge of website-based information technology is how to channel information globally quickly and precisely. The goal is that the website is not still visited by visitors, especially for e-learning website. But many challenges for e-learning service administrators. E-learning website should provide good usability, so that interaction with learners can be done quickly and precisely. The purpose of this study is to analyze the efficiency level of usability on e-learning website in case of sasmoko.com by using Nielsen model. Data analysis was carried out using the descriptive analysis technique and the next percentage was assessed for the efficiency criteria. The results of the analysis proved to improve usability on sasmoko.com site, so it can support lectures of Research Methods as blended learning.

Keywords: *Efficiency, Usability, e-learning Website, Nielsen.*

1. Introduction

The basic function of a website is to be able to provide information services online quickly so that it can meet the needs of its users. Therefore, the website should always be up to date, especially the website used to support the learning, that is e-learning. The development of e-learning now focuses on how to meet the needs of students [1]

E-learning has various concepts and e-learning that are applied to universities relevant to the concept of lifelong learning [2]. A study that presents gamification introduction to the field of e-learning in higher education finds that proper integration has a positive impact on the learning process, namely higher satisfaction and motivation and greater student involvement [3].

Of the various benefits provided, e-learning has several challenges, especially for website managers. The challenge is how to attract users to their e-learning website services [4]. The e-learning website interface is a starting point for website users to interact to build a learning process that is sustainable and highly prioritizes access to information [5]. It depends on the layout, content, information, and other attributes of the website [6].

From these benefits and challenges, the usability of the website opens the door to the development of teaching and learning activities. The usability development process can be simplified into two stages, namely information extortion and information transformation [7]. A study found varied correlations in each assignment and website between task completion time and user satisfaction level [8]. In another study also mentioned that the use of forums is more effective to attract students' attention because they prefer the use of external messaging systems they know rather than those available in e-Learning [9]. Improving usability can reduce errors and improve positive attitudes, while also being proven to increase the user's intention to use computers and their subsequent use behavior [10]. Control of the quality of the website was also carried out by other studies using the Nielsen Model with several usability factors suggested, namely learnability, efficiency, memorability, error and satisfaction [11].

By looking at the importance of control over the usability of the website, this study was conducted to assess the usability of Sasmoko.com e-learning website as a case study. The Sasmoko.com e-learning website was created to support the teaching and learning process supporting the Research Methodology course at Binus University as a blended learning. This website has various facilities that support lectures in the classroom, namely references, online discussions, chat rooms, uploading and downloading material, online quizzes and so on.

Researchers also want to know how the efficiency level of usability in Sasmoko.com e-learning website and how the assessment of efficiency criteria. By using usability analysis from Nielsen, it is hoped that users of this e-learning website can provide an evaluation of the e-learning website to increase the use of the website.

2. Literature Review

2.1. E-Learning

The growth of internet-based technology has resulted in the emergence of various approaches aimed at the education sector and implemented through learning methods [12]. Electronic Learning (e-learning) is a network-based learning model that is internet or intranet whose implementation is supported by technology services such as telephone, audio, videotape, satellite transmission or computer devices [13]. The e-learning method is used to complement conventional learning methods so that students can interact from anywhere [14]. The European

Commission defines e-learning methods as an Internet and multimedia technology-based method that serves to improve the quality of teaching through providing access to resources, education services and enabling remote evaluation, information exchange and collaboration between students and lecturers [1 ,6, 15].

2.2. Usability

One of the factors that influence the quality of e-learning web can be seen from the usability of the website. Therefore, designers and educational administrators must consider the characteristics of reusability so as to maintain user engagement and produce successful e-learning [6]. Usability is needed because it can measure the extent to which a product can be used easily to achieve certain objectives, and prioritize aspects of effectiveness, efficiency, and satisfaction in the context specified for use [6, 16]. Usability can see the level of user satisfaction in learning and use the product to obtain its purpose [17]. While the definition of usability is based on the experience felt by users when interacting with a product, in the form of a website, software, mobile device, or other equipment, and measuring the product in the form of a website will assess how easy the application can be used, and the design of the interface created with good so that it has an impact on the ease of interacting [18]. Another impact can increase value in terms of user satisfaction. Here are some aspects of quality according to Nielsen:

1. Learnability, measures convenience, especially for novice users in using an application for the first time.
2. Efficiency, measuring how quickly users can complete their tasks after learning the interface of the application.
3. Memorability measures the strength of the user in remembering the use of the application, after a period that is not used long enough, or the new application is used once by the user.
4. Errors measure the error rate on an application, the smaller the error rate the better the application. When the user uses the application, how many errors occur, the extent of the effect of the error, and how easily a user can resolve the error.
5. Satisfaction, measuring satisfaction, this is subjective for the user which includes feelings, opinions, and others when using the application.

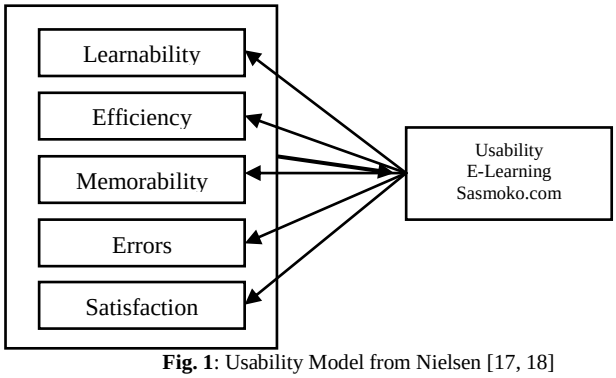

Fig. 1: Usability Model from Nielsen [17, 18]

3. Research Methodology

All The research method used is neuroresearch. Measurements were made using a questionnaire method with a usability model from Nielsen, to measure the usability level of e-learning websites. This study also uses several statistical approach methods. Furthermore, analysis can be done to improve the performance of the Sasmoko.com e-learning website to support the learning process. The research conducted, intends to prove the hypothesis that will be tested from the results of the questionnaire given to users to assess how far the level of efficiency of users on the e-learning website.

The results of this study are the level of usability efficiency of e-learning websites. The results of this study can also be used as input for the development of the e-learning website interface.

4. Results and Discussion

Hypothesis 1 Test: Student Assessment of Sasmoko.com e-Learning is significantly Useful and Easy to Use

Proving each variable, the researcher, in this case, establishes 3 (three) categories whose results are like the following table. Based on these results, it can be concluded that the assessment of students towards sasmoko.com e-learning tends to be useful and easy to use significantly at $\alpha < 0.05$.

Table 1: Trends in Student Responses to the Use of Sasmoko.com E-Learning

Variable	Categories	95% Confidence Interval for Mean		Analysis Results
		Lower Bound	Upper Bound	
Usability e-learning www.sasmoko.com (Y)	1. Students judge too difficult to use 2. Students assess useful and easy to use 3. Students rate very useful and very easy to use	82,6683	90,5698	Student assessment that e-learning at www.sasmoko.com is useful and easy to use significantly at $\alpha < 0.05$

Hypothesis 2 Test: Efficiency (X_2) is the Most Dominant Significant Dimension Determining the Realization of E-Learning Usability Sasmoko.com (Y)

In proving hypothesis 2, 2 stages are analyzed: first, self-analysis of variables and indicator of Usability E-Learning Sasmoko.com (Y). And secondly, the joint analysis of variables and indicators of Usability E-Learning Sasmoko.com (Y). The analysis is done 2 (two) times in order to see consistency of the most dominant indicator in realizing Usability E-Learning Sasmoko.com (Y).

First, the Self-Influential Analysis of exogenous variables includes Learnability (X_1), Efficiency (X_2), Memorability (X_3), Errors (X_4) and Satisfaction (X_5) against Usability E-Learning Sasmoko.com (Y)

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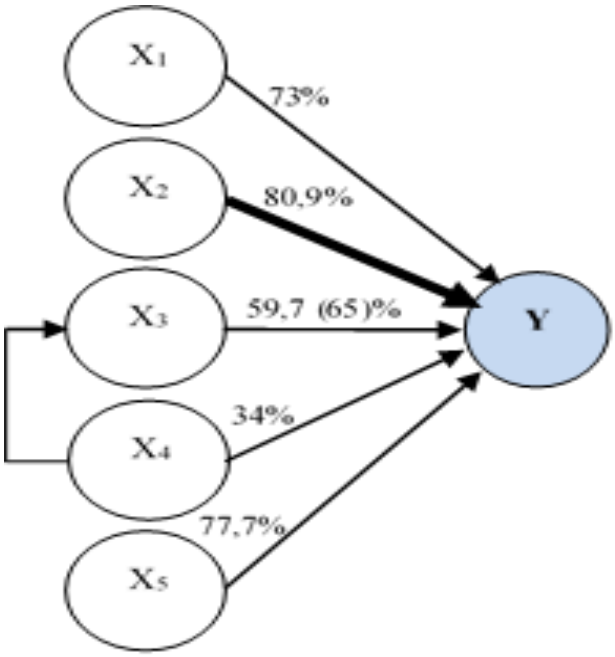
Table 2: Results of Calculation of Variable Exogenous Individual Effects Including Learnability (X_1), Efficiency (X_2), Memorability (X_3), Errors (X_4) and Satisfaction (X_5) on Usability E-Learning Sasmoko.com (Y) as Endogenous Variable

No.	Analysis	Symbol	$X_1 \rightarrow Y$	$X_2 \rightarrow Y$	$X_3 \rightarrow Y$	$X_4 \rightarrow Y$	$X_5 \rightarrow Y$
1.	The relationship of X to Y in the sample	r_{yn}	0,858	0,902	0,779	0,597	0,884
2.	Variance determination	r^2_{yn}	0,730	0,809	0,597	0,34	0,777
3.	The relative contribution of X in forming Y	r^2_{yn} (%)	73	80,9	59,7	34	77,7
4.	Relationship of X to Y in	t	10,581	13,203	7,852	4,704	11,988

	the population						
5.	Significance value	Sig.	0,000	0,000	0,000	0,000	0,000
6.	The effect of X on Y in the sample	Ŷ	$3,13X_1$	$2,91X_2$	$4,711X_3$	$3,495X_4$	$3,075X_5$
7.	The effect of X on Y in the population	F_{Reg}	111,962	174,332	61,655	22,129	143,707
8.	Significance value	Sig	0,000	0,000	0,000	0,000	0,000
9.	The largest pure relationship	$r^2_{yn.m}$	-	-	0,806	-	-
10.	A relatively pure donation of X with Y	$r^2_{yn.m}$ (%)	-	-	65	-	-

Description:
Endogenous Variable:
Y : Variabel Usability E-Learning Sasmoko.com
Exogenous Variables (indicator):
X_1 : Learnability
X_2 : Efficiency
X_3 : Memorability
X_4 : Errors
X_5 : Satisfaction

The results of the analysis of the effect of individual exogenous variables include Learnability (X_1), Efficiency (X_2), Memorability (X_3), Error (X_4) and Satisfaction (X_5) on Usability E-Learning Sasmoko.com (Y) can be seen in Table 1. It can be explained that Efficiency (X_2) is the most dominant indicator determining the realization of Sasmoko.com (Y) Usability E-Learning. His ability to contribute 80.9% in forming usability E-Learning Sasmoko.com (Y). The conclusions of the analysis in a simple way can be shown by the following picture.



Description:
Endogenous Variable:
Y
:
Variable Usability E-Learning Sasmoko.com
Exogenous Variables (indicator):
X_1
:
Learnability
X_2
:
Efficiency
X_3
:
Memorability
X_4
:
Error
X_5
:
Satisfaction

Second, the Effect Analysis Together exogenous variables include Learnability (X_1), Efficiency (X_2), Memorability (X_3), Error (X_4) and Satisfaction (X_5) against Usability E-Learning Sasmoko.com (Y). The second hypothesis test is done by Binary Segmentation

analysis approach called Classification and Regression Trees. In this analysis, the researchers set the Prunning of Depth by 2, Parent 2, and Child by 1, with significance level α <0,05. The results of the analysis are as shown below.

what is currently happening. Graphically can be seen in the picture below.

The picture above proves that Efficiency (X_2) e-learning website Sasmoko.com is an indicator that determines the realization of Usability E-learning Sasmoko.com (Y). If the efficiency of the website is reorganized to become more efficient, students will be more easily facilitated through the Sasmoko.com e-learning web site and increase by 133.75 times from the current condition. In summary, can be seen in the picture below.

Based on the results of the analysis individually and together it turns out consistent. So it can be concluded that the second hypothesis which reads the assessment of the efficiency aspects of the e-learning website Sasmoko.com (X_2) is the most dominant indicator determining the success of Sasmoko.com (Y) Usability E-Learning in this study.
When viewed from the background of students, then what determines the success in realizing Sasmoko.com (Y) Usability E-Learning is from the frequency aspect of using this website. It is evident in this study that the more students are given assignments and activate themselves through this e-learning, then the usability of Sasmoko.com e-learning will increase 7,296 times compared to

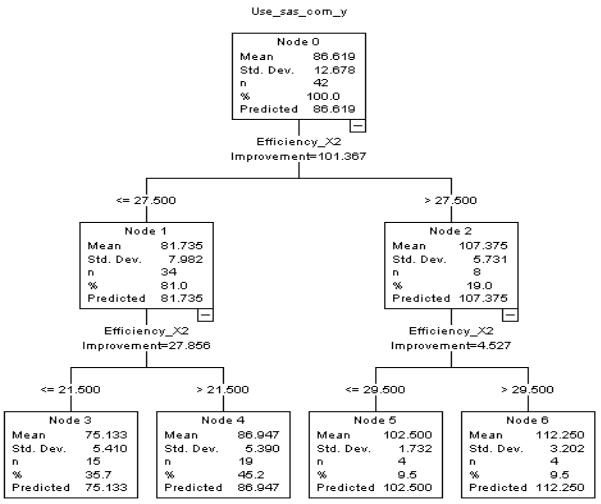


Fig. 2: Calculation Result of Classification and Regression Trees from Exogenous Variable ie Learnability (X_1), Efficiency (X_2), Memorability (X_3), Error (X_4) and Satisfaction (X_5) The Most Dominant Forming Usability E-Learning Sasmoko.com (Y)

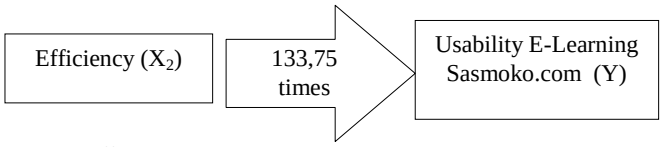


Fig. 3: Efficiency (X_2) is the Most Dominant Indicator Determining the Establishment of Success in Usability E-Learning Sasmoko.com (Y)

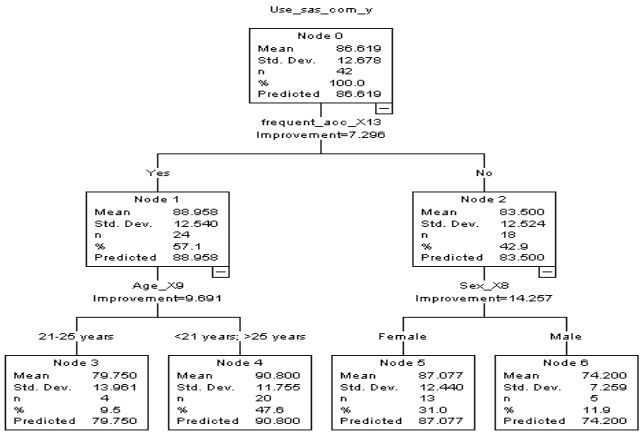


Fig. 4: Increased Frequency of Students Assigned to Tasks and Using E-Learning, then Usability E-Learning Sasmoko.com will increase by 7,296 times compared to current

5. Conclusion

In Based on the results of the hypothesis testing that has been done in this study it can be concluded that, the student's assessment of sasmoko.com e-learning is useful and easily used significantly [6].

Whereas from the results of the analysis of influence individually or jointly, exogenous variables include Learnability, Efficiency, Memorability, Error and Satisfaction of Usability E-Learning Sasmoko.com, then Efficiency is the most dominant indicator determining the realization of usability e-learning. Improved usability can be predicted if efficiency is improved again, and further facilitates the learning process through the Sasmoko.com e-learning website, with an increase of 133.75 times from the current condition.

On the other hand, the success in realizing usability of Sasmoko.com is a frequency aspect of student activity in accessing the Sasmoko.com e-learning website. The increase can occur by 7.296 times compared to the current state.

Thus, the analysis of e-learning websites using the Nielsen model can prove that Learnability, Efficiency, Memorability, Error, and Satisfaction are indicators that determine the realization of Sasmoko.com Usability E-learning. And efficiency is the most dominant indicator.

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