

Evaluating the Usability of Virtual Tour Application Using the System Usability Scale (SUS) Method

a Case Study: Virtual Tour UPN Veteran Jawa Timur

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Abstract— UPN "Veteran" Jawa Timur Virtual Tour is a campus virtual application that offers digital information about the university's buildings, rooms, and facilities. It is required to examine usability in order to determine whether the virtual campus tour of UPN "Veteran" Jawa Timur is useful to students. Numerous issues were discovered in the virtual campus tour of UPN "Veteran" Jawa Timur based on observational research by several students. users-friendly The System Usability Scale is a technique for evaluating information systems that involves end users and looks at three aspects: adjective rating, grade scale, and acceptability. Ten statement items are employed as an evaluation measure in the process of evaluating the usability scale system. The ultimate outcome of the evaluation was a 64 on a scale of one to ten. According to these criteria, the Virtual Tour of UPN "Veteran" Jawa Timur belongs to the high adjective rating group, group D on the grading scale, and group good on the acceptability scale. If the Virtual of UPN "Veteran" Jawa Timur Tour is still used, it can be stated that the usability component of the virtual tour has to be improved.

Keywords— *Usability, System Usability Scale, Virtual Campus Tour, Virtual Tour.*

I. INTRODUCTION

A virtual tour is a 360° panoramic photo (reality photography) recreation of a site based on reality that provides an overview of a location in real-world settings [1]. Virtual Tours have also been employed in multiple studies as a way of introducing campuses from various Indonesian universities,

whether in the form of 360° panoramic photos or 3D animation. In this regard, the University of Pembangunan Nasional "Veteran" Jawa Timur also feels compelled to deliver the greatest information and digital advertising in introducing the campus's position and condition.

It is required to test usability in order to determine whether the virtual campus tour of UPN "Veteran" Jawa Timur provides usability value for students. "effectiveness, efficiency, and satisfaction in a specified context of usage to which a product may be utilized by defined users to achieve stated goals" according to the International Standard Organization (ISO). In this regard, the University of Pembangunan Nasional "Veteran" Jawa Timur also feels compelled to deliver the greatest information and digital advertising in introducing the campus's position and condition [2].

The virtual campus tour of UPN "Veteran" Jawa Timur revealed various issues based on observational studies of several students, including: "(1) inconsistent navigation buttons, such as only having a right-hand navigation button and no left-hand navigation button, and the menubar in mobile mode is too small; (2) there are still faculties that have not been displayed in detail, and the place name information displayed looks small, making it almost unreadable; (3) when minimizing the menu bar, you must first refresh the page so that it can bring up the menu bar again; and the menubar that appears in mobile mode, the menubar is too small; (4) there are still facult

The virtual campus tour of UPN "Veteran" Jawa Timur must be examined in terms of usability to determine whether

the system is usable for users, according to the explanation of the problem from the usability perspective. There are numerous methods for evaluating system usability. The System Usability Scale is one of them (SUS). Brooke designed SUS in 1996 as a "fast and dirty" survey scale [3]. SUS has three advantages: it can be used to test a wide range of technologies, it is quick and simple to use, and the survey score is straightforward [4].

The usability scale method offers several advantages, including: (1) a simpler evaluation procedure for responders, (2) the capacity to employ a small sample size while describing maximum results, and (3) the ability to clearly distinguish between programs that can and cannot be used. accustomed to [5]. The System Usability Scale (SUS) is translated into an adjective rating to better clarify a system's usability, which is then translated into a level of user acceptance (acceptability range) to assess whether the system is acceptable or not by the user [6]. By doing usability testing with a usability scale system, it is hoped that it will produce an overview of the user's perspective on the virtual campus tour of UPN "Veteran" Jawa Timur, making it easier for repairs or other related matters.

II. THEORITICAL BACKGROUND

A. Virtual Campus Tour

A location simulation consisting of a series of 360-degree panoramas is now called a virtual tour. Virtual tours are often used to provide a virtual experience of visiting a place.

Virtual campus tours are virtual tours that are created by integrating photography and information technology with the goal of providing detailed information about locations in an interactive mode. [7] [8] [9].



Fig. 1. Virtual campus tour UPN "Veteran" Jawa Timur

Virtual Tour UPN "Veteran" Jawa Timur is a campus virtual application that contains digital information related to buildings, rooms, and facilities at the UPN "Veteran" Jawa Timur. Virtual Tour UPN "Veteran" Jawa Timur is a promotional media in the Millennial Era at the UPN "Veteran" Jawa Timur, using customized panoramic images so that users get a more real experience at the UPN "Veteran" Jawa Timur online and feels realistic

B. Usability

The definition of usability according to the International Standard Organization (ISO) is how a work can be used by users to get a goal effectively, efficiently, and feel satisfied in using it. [2] [10].

Usability is defined by Nielsen in terms of five quality components:

- Learnability refers to a product's ability to teach users how to use it for the first time.
- Knowing how quickly users can finish their tasks is efficiency.
- Memorability refers to how well people recall the steps they took to complete their tasks.
- The error is the amount of time the user made an error, the size of the error's consequence, and if the user can readily correct the error.
- User satisfaction refers to how a user feels about a product as a whole.

The basic goal of usability is to answer questions regarding whether a product meets the demands of its users [11].

III. RESEARCH METHODOLOGY

To get true and accurate research results, the research method used in testing the Virtual Campus Tour UPN "Veteran" Jawa Timur can be explained as follows:

A. Method of Collecting Data

This study uses a questionnaire as a technique for collecting data. In measuring each answer to the questionnaire instrument using a Likert scale, the questionnaire in this study used a soft-copy form with a Google form and was addressed to active students at the University of Pembangunan Nasional "Veteran" Jawa Timur. The questionnaire was made according to the system usability scale technique as shown in Table 1.

B. Measurement Method

In testing the virtual campus tour of UPN "Veteran" Jawa Timur, the method used was the system usability scale (SUS).

A usability testing concept introduced by John Brooke The System Usability Scale (SUS) is a reliable and inexpensive usability scale that can be used to evaluate the usability of a system globally [3]. In conducting the SUS test, it has ten instruments as shown in Table 1.

TABLE I. SYSTEM USABILITY SCALE

No.	Item	Scale
1.	I think that I would like to use this system.	1-5
2.	I found the system unnecessarily complex.	1-5
3.	I thought the system was easy to use.	1-5
4.	I think that I would need the support of a technical person to be able to use this system.	1-5

No.	Item	Scale
5.	I found the various functions in the system were well integrated.	1-5
6.	I thought there was too much inconsistency in this system	1-5
7.	I would imagine that most people would learn to use this system very quickly.	1-5
8.	I found the system very cumbersome to use.	1-5
9.	I felt very confident using the system	1-5
10.	I needed to learn a lot of things before I could get going with this system.	1-5

^a. Original Item SUS by John Brooke (1986)

This instrument can also be used to assess the usability of various products [4]. A recent study showed that it can be divided into two subscales of usability and ability [3]. SUS consists of 10 items, the overall SUS score is the result of adding up the contribution of the item scores multiplied by 2.5, ranging from 0 to 100 [12]. The formula for calculating the SUS score is as follows:

$$\text{Skor SUS} = ((R1-1) + (5-R2) + (R3-1) + (5-R4) + (R5-1) + (5-R6) + (R7-1) + (5-R8) + (R9-1) + (5-R10) \times 2.5) \quad (1)$$

SUS is also interpreted into an adjective rating to further clarify the level of usability of a system, which is then translated into the level of user acceptance of a system (acceptability range) to determine whether the system is acceptable or not. [6].

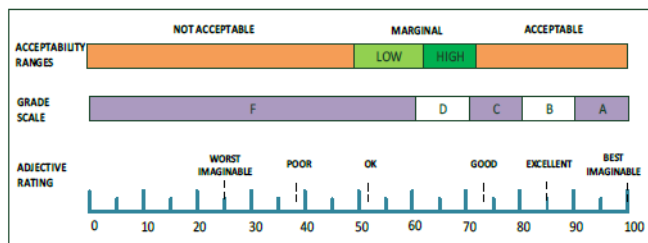


Fig. 2. Determination of assessment results

The SUS scale, with a value of 50, is classified as "not acceptable." It falls into the "low" group if it is between 50 and 60. It is regarded to have "good" usability if it is between 60 and 70. If the scale has a value more than 70, it is classified as "acceptable" [13]. If the overall SUS score is equal to or higher than 68, a product is deemed to have good usability [14].

C. Population and Sample

Purposive sampling was used in this study, where the researcher only selected students from the East Java "Veteran" National Development University who had taken a virtual tour as a sample. By using the original population theory from previous research [15], the population in this study was determined to be active students from the 2017-2020 class so that it had a total of 12,386 students.

The Isaac and Michael tables are also used by researchers to determine the minimum number of samples required when employing a standard error of 10%. The minimal number of

samples is 266 according to the Isaac and Michael table, which has a population of 12,386.

IV. RESULT

In accordance with the usability testing method of the virtual campus tour of UPN "Veteran" Jawa Timur, the research that has been described, the results of the study can be explained as follows.

A. Demographic Characteristic Respondents

The respondents collected for this study were 266 respondents. This amount has met the value of the minimum response that must be met.

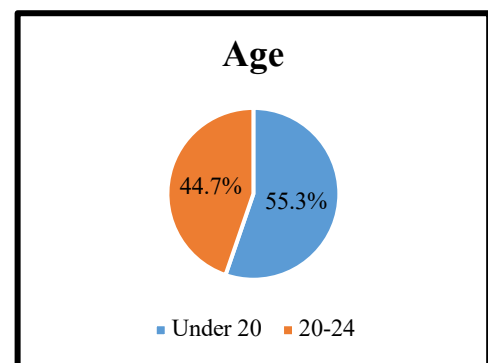


Fig. 3. Pie chart of the respondent's age

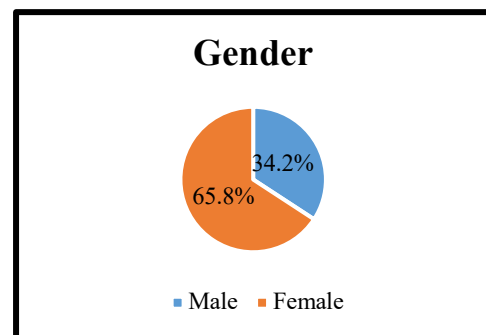


Fig. 4. Pie chart of the respondent's gender

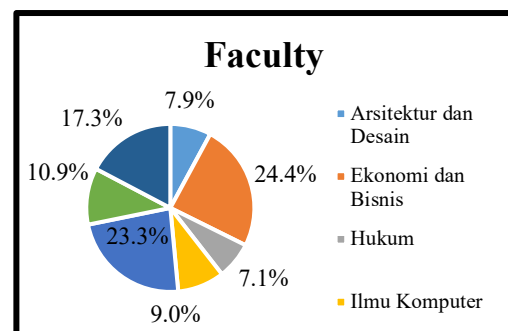


Fig. 5. Pie chart of the respondent's faculty

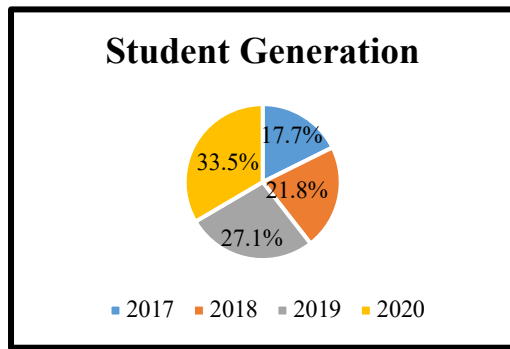


Fig. 6. Pie chart of the respondent's student generation

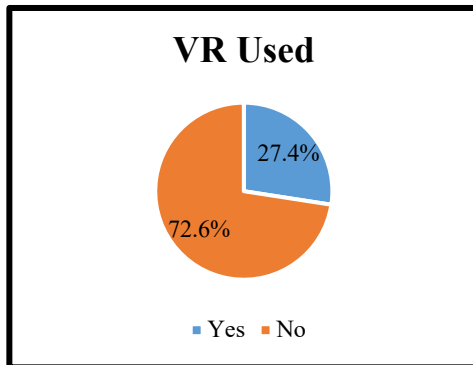


Fig. 7. Pie chart of the respondent's student generation

The analysis answers in this study are dominated by the perceptions of users who are less than 20 years old, female, and have the most faculties, namely the faculty of economics and business, batch 2020, and users accessing virtual tours without using VR glasses, according to the demographic results of respondents.

B. Validity Analysis

This study uses the Bivariate Pearson formula to test the validity with a significance level of 0.05 and the following test criteria: (1) If the r count r table (two-sided test with sig 0.05) shows a significant correlation with the total score, the question instrument is declared valid. (2) If r count r table (two-sided test with 0.05 significance), the question instrument is not significantly correlated with the total score (invalid).

Based on the criteria with the provisions of df or degree of freedom obtained, namely 28 with a sig of 5%, it can be concluded that the r table is 0.3610 [16]. So to assess the validity of a question item, the value of r count > 0.361 . The results of the validity test for the first 30 samples will be described based on the variables and will be presented in table 2.

TABLE II. VALIDITY ANALYSIS RESULT

Item	r count	r table	Description
Q1	0,664	0,361	Valid
Q2	0,777	0,361	Valid
Q3	0,798	0,361	Valid
Q4	0,688	0,361	Valid
Q5	0,799	0,361	Valid
Q6	0,609	0,361	Valid
Q7	0,820	0,361	Valid
Q8	0,756	0,361	Valid
Q9	0,695	0,361	Valid
Q10	0,392	0,361	Valid

^b. SPSS 25.0, 2021

Table 2 shows the results of the validity test on the System Usability Scale where there are ten indicators that have an r -count > 0.361 , which is between 0.392 and 0.820. Based on the results of the validity test on the System Usability Scale, these items are feasible to be used as research measuring tools.

C. Reliability Analysis

After testing the validity, the next step is the reliability test, reliability test is used as an indicator measurement of a variable or construct, Cronbach's alpha coefficient is used as a reliability test method. A questionnaire is declared reliable if the value of Cronbach's alpha is greater than 0.70 [18]. The results of the questionnaire reliability test for the variables studied in table 3 are as follows:

TABLE III. RELIABILITY ANALYSIS RESULT

Cronbach's alpha	Description
0,875	Reliable

^c. SPSS 25.0, 2021

The test results above are accepted because Cronbach's alpha value is greater than 0.70, so it can be concluded that the 10 questionnaire items meet the reliability test requirements.

D. Measurement Result

Based on the results of the questionnaire given to the respondents, namely the students of the UPN "Veteran" Jawa Timur, the results of the recapitulation of respondents' answers are as in Table 2. The questionnaire given to respondents is based on the usability scale system instrument as shown in Table 1. The answer scale used is from 1 to 5, where 5 states strongly agree with the instrument statement and 1 state strongly disagrees with the instrument statement. Where column Q indicates a statement and row R indicates a respondent.

TABLE IV. RESPONDENT'S ANSWER

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
R1	3	3	3	3	3	3	3	3	3	3
R2	4	4	5	4	4	3	4	4	4	4
R3	3	3	3	3	3	3	3	4	3	4
R4	5	2	5	2	5	2	5	2	5	2
R5	4	2	4	2	4	3	5	2	4	3
R6	4	3	3	3	3	3	4	4	4	4
R7	4	1	4	1	5	3	5	1	5	2
R8	5	5	5	5	5	5	5	5	5	5
R9	4	3	4	3	4	3	4	3	4	5
R10	4	1	4	2	4	4	4	2	3	2
R11	3	5	4	3	3	4	3	4	2	3
R12	4	1	4	3	4	2	4	2	4	4
R13	5	5	5	5	5	5	5	5	5	5
R13	5	3	4	2	4	3	4	3	4	3
R14	3	3	3	3	3	3	3	3	3	3
R15	5	1	5	1	5	1	5	1	5	3
R16	5	1	5	1	5	3	5	1	5	2
R17	5	4	4	1	4	5	5	1	5	1
R18	3	2	4	4	4	2	4	1	4	4
R19	4	4	4	4	4	4	4	4	4	4
R20	3	3	3	3	3	3	3	3	3	3
...	...	...	...	...	...	...	...	...	...	...
R266	4	4	4	2	2	2	2	3	2	4

^d Microsoft Excel, 2021

Respondents' answers as shown in Table 2 are respondents' answers that have not been calculated according to measurement techniques using a usability scale system. For this reason, from the answers in Table 2, calculations are carried out for the steps for calculating the system usability scale. "(1) The answer scale's odd-numbered instrument is reduced by one.(2) The even-numbered instrument is 5, minus the answer scale. (3) A scale of 0 to 4 (the four most positive responses). " The example of calculating the SUS score from one of the respondents (R1) is as follows:

$$\begin{aligned}
 \text{Skor SUS} &= ((R1-1) + (5-R2) + (R3-1) + (5-R4) + (R5-1) + \\
 &\quad (5-R6) + (R7-1) + (5-R8) + (R9-1) + (5-R10) \times \\
 &\quad \sqrt{2.5}) \\
 &= ((3-1) + (5-5) + (3-1) + (5-1) + (2-1) + (5-5) + \\
 &\quad (3-1) + (5-4) + (4-1) + (5-2) \times 2.5) \\
 &= ((2 + 0 + 2 + 4 + 1 + 0 + 2 + 1 + 3 + 3) \times 2.5) \\
 &= 18 \times 2.5 \\
 &= 45
 \end{aligned}$$

From the provisions of 1, 2 and 3, the results of the conversion or calculation with 266 respondents are as shown in Table 3. In the table, it can be seen that the multiplication process for each respondent's answer is multiplied by 2.5, and then the average number is determined as the final result.

TABLE V. RESPONDENT'S ANSWER CALCULATION

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total
R1	2	2	2	2	2	2	2	2	2	2	20
R2	3	1	4	1	3	2	3	1	3	1	22
R3	2	2	2	2	2	2	2	1	2	1	18
R4	4	3	4	3	4	3	4	3	4	3	35
R5	3	3	3	3	3	2	4	3	3	2	29
R6	3	2	2	2	2	2	3	1	3	1	21
R7	3	4	3	4	4	2	4	4	4	3	35
R8	4	0	4	0	4	0	4	0	4	0	20
R9	3	2	3	2	3	2	3	2	3	0	23
R10	3	4	3	3	3	1	3	3	2	3	28
R11	2	0	3	2	2	1	2	1	1	2	16
R12	3	4	3	2	3	3	3	3	3	1	28
R13	4	0	4	0	4	0	4	0	4	0	20
R13	4	2	3	3	3	2	3	2	3	2	27
R14	2	2	2	2	2	2	2	2	2	2	20
R15	4	4	4	4	4	4	4	4	4	2	38
R16	4	4	4	4	4	2	4	4	4	3	37
R17	4	1	3	4	3	0	4	4	4	4	31
R18	2	3	3	1	3	3	3	4	3	1	26
R19	3	1	3	1	3	1	3	1	3	1	20
R20	2	2	2	2	2	2	2	2	2	2	20
...	...	...	...	...	...	...	...	...	...	...	...
R266	3	1	3	3	1	3	1	2	1	1	19
Average Score											64

^c Microsoft Excel, 2021

The overall SUS score obtained from the average SUS score of the individual respondents is 67.29. After getting the overall SUS score, the next step is to determine the grade of the assessment results seen in Figure 2. To determine the grade of the assessment results in terms of the level of user acceptance, the grade scale and the adjective rating, which consists of the level of acceptance.

The determination of acceptability ranges, grade scale, and adjective rating are used to see the extent of the user's perspective on the Virtual Tour UPN "Veteran" Jawa Timur. The assessment results of the average respondents were compared. For this reason, from the results of the assessments given by respondents, the results of the assessment of the Virtual Tour UPN "Veteran" Jawa Timur are as follows:

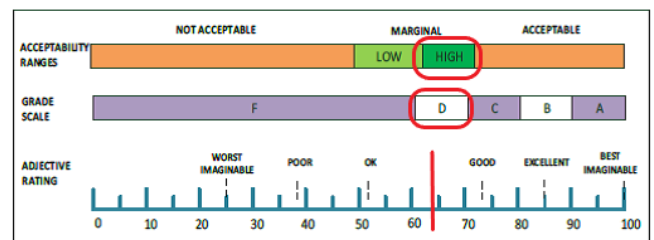


Fig. 8. Acceptability ranges, grade scale, and adjective rating on the Virtual Tour of UPN "Veteran" Jawa Timur.

- a. Acceptability ranges are the level of acceptance of the website. The Virtual Tour UPN "Veteran" Jawa Timur has a usage acceptance rate that is included in the Marginal High category, which means that the virtual tour has the potential to be easily used by users to obtain information services related to campus situations and conditions.
- b. The grade scale shows the usability level of classes from A to F, where A is the best class and F is the worst class. With this score, the usability level of the Virtual Tour of UPN "Veteran" Jawa Timur is included in class D, which means that the website needs to be evaluated and developed further by paying attention to usability aspects.
- c. Adjective ratings are an assessment of the usability level described as adjectives to make it easier to interpret the SUS score. Virtual Tour UPN "Veteran" Jawa Timur in the measurement of Adjective Ratings is in the GOOD category.

V. CONCLUSION AND RECOMMENDATIONS

Based on the results of the research conducted, conclusions and recommendations can be drawn from this research.

A. Conclusion

The usability value obtained from the calculation of the System Usability Scale (SUS) score is 64, which means that the Virtual Tour UPN "Veteran" Jawa Timur is included in the Marginal High category, which means that the virtual tour has the potential to be used easily by users and has a D-value scale and has a rating of "good." It can be concluded that there needs to be improvements related to the usability aspect of the UPN "Veteran" Jawa Timur Virtual Tour if this virtual tour is still used.

B. Recommendations

Based on the conclusions that have been drawn, some suggestions can be recommended as follows:

- a. Based on the results of the discussion, it is proven from the grade scale that is included in class D, that it is necessary to improve the features of the Virtual Tour UPN "Veteran" Jawa Timur which are more user-friendly. For example, in the mobile mode display, the menubar button is too small, so it is very difficult for users with large thumbs. The menubar that appears in mobile mode and the menubar in desktop web mode are not the same. In mobile mode, it is not as complete as in desktop web mode. When minimizing the menu bar, if you want to bring it back, you have to refresh the page so it can appear again. There are pictures or content that is displayed but not in too much detail, like the rooms in the faculty building. In some places, in front of the location, there is no signboard, but

the information about the place names shown below is so small that it is almost unreadable.

- b. The Virtual Tour UPN "Veteran" Jawa Timur is more accepted by users as evidenced by the acceptability ranges that fall into the marginal high category, such as the userguide feature/menu to display any information or directions needed to assist users in accessing virtual tours, the overall map to show the point where the user's location is currently, per building is given a brief description of the building's location, and in front of the building is given a feature which, with a click, can display photos of what activities are usually carried out in the building or a short video from the dean of the faculty may appear.

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