

# User Satisfaction Analysis of SUS Method of Virtual Tours Website for Semarang Chinatown Tourism Experience

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**Abstract:** This article analyzes the satisfaction of website-based virtual tour users using the usability scale system method for tourism experiences in Chinatown Semarang for respondents who use the virtual tour application both in the initial and final applications. This research aims to compare user satisfaction by analyzing the score calculation results from 80 respondents from each virtual tour application using the system usability scale method where the virtual tour in the initial application and the virtual tour in the final application have differences in the addition of a simple interactive website and a guide in the form of a manual book and video tutorial in the final application. The system usability scale calculation score was obtained with an increase in value of 7.875. This proves that modifying the application and adding a guide feature in the form of a manual book and video tutorial can help respondents use a virtual tour in Semarang's Chinatown village. The advice obtained in this research is that it is hoped that for future research, you can use paid hosting because, in the study here, the virtual tour application still uses free hosting, which still has limitations in processing files, so it takes longer for users to access the virtual tour in Semarang Chinatown Village.

**Keywords:** Cultural Tourism; Semarang Chinatown; System Usability Scale; User Experience; Virtual Tour

## Introduction

Semarang Chinatown existed during the Dutch colonial era, which began with the influx of Chinese immigrants who came to trade via sea. The number of Chinese traders increased yearly, coinciding with the Dutch expansion of the VOC (Vereenigde Oostindische Compagnie) into the Semarang area, making it a significant trading center for European explorers, (Nusaputra *et al.*, 2022), (Science, 2021). Semarang's Chinatown evolved, marked by the construction of temples for Buddhist and Confucian worship. Chinese adhere to Buddhist and Confucian beliefs and have established various Chinese-owned businesses, including shops and restaurants (Dwisusanto *et al.*, 2022), (Purnamasari *et al.*, 2022). After Indonesian independence, Semarang's Chinatown continued to be a

vital center of economic activity while preserving its cultural identity despite changes in its social and political landscape (Widjajanti *et al.*, 2020).

This study involved creating a website-based virtual tour featuring six temples in Semarang City's Chinatown. This virtual tour displays a 360-degree view of the temples, facilitating navigation and user awareness of their location (Wu *et al.*, 2022), (Cinnamon *et al.*, 2023). One of the main benefits of a virtual tour is its ability to provide comprehensive information, allowing users to explore the temple via their computers and smartphone devices (Udayana *et al.*, 2023), (Petousi *et al.*, 2023). This interactive experience offers a deeper understanding of the temple than traditional methods, such as looking at photos in brochures or social media, which often provide only partial information. Researchers chose the System Usability Scale (SUS)

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analysis to evaluate this study because the assessment process is easy and fast. SUS is known for providing highly consistent results with accurate evaluation (Ilyas *et al.*, 2022), (Ependi *et al.*, 2019), (Mol *et al.*, 2020). This feedback will measure user satisfaction and the impact generated by the virtual tour of the six temples in Chinatown. Higher levels of user satisfaction are expected to correlate with more significant overall effects.

Virtual tours are divided into two applications: virtual tours in the initial application and virtual tours in the final application. The virtual tour in the initial application was created to be used as a medium for introducing temples in Semarang Chinatown Village in an informative and interactive manner where a description menu feature is used to provide brief information regarding the description and brief history of Semarang Chinatown Village (Argyriou, 2020), (Abidin *et al.*, 2020) (Lestari & Sunarso, 2024). The scope of the virtual tour in the initial application is also very detailed, so users can be invited to enter it to find out what is inside the temple building without having to go directly to the location (Kyrilitsias *et al.*, 2020), (Bogicevic *et al.*, 2021). The researcher also created a virtual tour with the name of the final application, which has been refined by adding updates to the initial display. This is expected to help users use the virtual tour application at six temples in the Chinatown village of Semarang. The new feature found in the final application is that before entering the application, the user will be directed to a simple interactive website which contains information and a brief history of the Chinatown village of Semarang City, where users are also allowed to use the application guide in the form of a manual book and video tutorial before using the virtual tour in the final application.

The literature study on the research belonging to (Mardainis *et al.*, 2020) explained that the researcher created a virtual tour using the Pano2VR application with the image stitching technique. In designing the application, this research used the MDLC method. Based on the research results, it was found that the existence of information media in the form of a virtual tour at STMIK Amik Riau can help prospective students who want to register to get an overview of the STMIK Amik Riau campus (Mardainis, Mardainis Arifin, M. Rahmadden, Rahmadden Efendi, 2020). The following research, used as a literature study is research belonging to (Indrianti *et al.*, 2021), was proprietary research where researchers carried out SUS testing at the Tiktok Shop to determine the satisfaction level with application services. The results of this research show that the average obtained for user satisfaction with the Tiktok Shop application is around 74.57%, where this value can be included in the "Acceptable" category with category C on the value

scale, and the assessment results are "Good" (Indrianti *et al.*, 2021).

Research on website-based virtual tours in the initial and final applications makes it easier to provide information to the public about the six temple buildings in the Chinatown village of Semarang City because virtual tours can give a more detailed range of information. The system usability scale (SUS) is used as an analysis to evaluate the satisfaction of users who have tried using the virtual tour both in the initial and final applications. Then, user satisfaction results were used to measure the impact of the virtual tour at six temples in the Chinatown village of Semarang city.

## Method

### Literature Study

Creating a virtual tour begins with conducting a literature study regarding previous research related to each other before collecting data at the research location (Guntoro *et al.*, 2023). The literature study was done by reading articles and journals regarding the last research on virtual tours and system usability scale (Bogicevic *et al.*, 2021).

### Data Processing

After carrying out the following literature study, namely collecting data using an Insta360 camera to capture a 360-degree panoramic image of six temples in Chinatown Semarang (Wadji & Yuliza, 2023) then, the captured image was processed using the horizon key to perfect the 360-degree panorama image before being used as a component, in creating a virtual tour (Prokop & Polap, 2024).

### Application Evaluation

After processing the image, namely designing a virtual tour application using software from 3Dvista where the enhanced 360-degree panoramic image will be used as the main component in designing the virtual tour after the application is created, an evaluation is carried out first to check whether there are errors or bugs in the application (Eiris *et al.*, 2020), (Rahayu & Wulandari, 2024).

### Deploy Hosting

Deploy Hosting is carried out after the application evaluation is deemed complete because to be accessed by users, namely, the virtual tour application must be deployed to hosting. In hosting here, the researcher uses the default hosting from GitHub called Netlify. The researcher uses this hosting because it is easy to obtain, which can save time and costs in conducting research (Wiriasto *et al.*, 2024).

10 Respondent Questions

During the testing, the researcher made 10 Likert scale questions which were asked to respondents where the researcher chose a target of 80 respondents domiciled in the city of Semarang with profiles of those who had and had never come to the Semarang Chinatown village location directly (Guntoro et al., 2023). The analysis will focus on assessing user satisfaction using the System Usability Scale (SUS). This assessment will be based on responses from users who have tried the virtual tour through the initial and final applications, with which respondents can fill in 10 questions based on their experience in trying the virtual tour application that was created. Apart from that, the researcher also added additional questions regarding whether the virtual tour application made respondents feel helped or not. Then, the virtual tour application interested them in coming directly to Semarang's Chinatown (Deshmukh *et al.*, 2025). Table 1. explains (10) research questions that will be asked to respondents with answer choices 1-5.

**Table 1.** (10) System Usability Scale questionnaire questions

Question	Evaluation				
	1	2	3	4	5
I felt helped by the virtual tour of these six temples					
I still need to learn how to operate a virtual tour of these 6 temples					
I think the virtual tour of these six temples does not need to be made in a complicated way					
I need help from technicians in operating virtual tours at these six temples					
I feel the features in it have a sound integration system					
I think there is a mismatch in the virtual tour of these six temples					
I found it challenging to use the virtual tour of these 6 temples					
I found it easy to learn about the virtual tour of these six temples					
I feel confident when using the virtual tour of these six temples					
I feel that the virtual tour of these 6 temples is easy to operate					

SUS Calculation

The SUS calculation has a different process for each question, giving a score of 0 to 4. In the SUS method, odd-numbered questions will have a deduction of 1 in the calculation. In contrast, even-numbered questions are considered to have a perfect score of 5, which is then deducted from the value chosen by the respondent. After all scores are calculated, the scores are multiplied

by 2.5 to get the final result by the SUS calculation methodology (Sanjaya *et al.*, 2021). The SUS score ranges from 0 to 100, which explains the formula used to calculate the respondent's score according to the SUS method. Formula (1) explains the SUS calculation where ( $\bar{x}$ ) the average value is, ( $\sum x$ ) is the total value of the system usability scale, and (n) explains the number of users who are respondents.

$$\bar{x} = \frac{\sum x}{n}$$

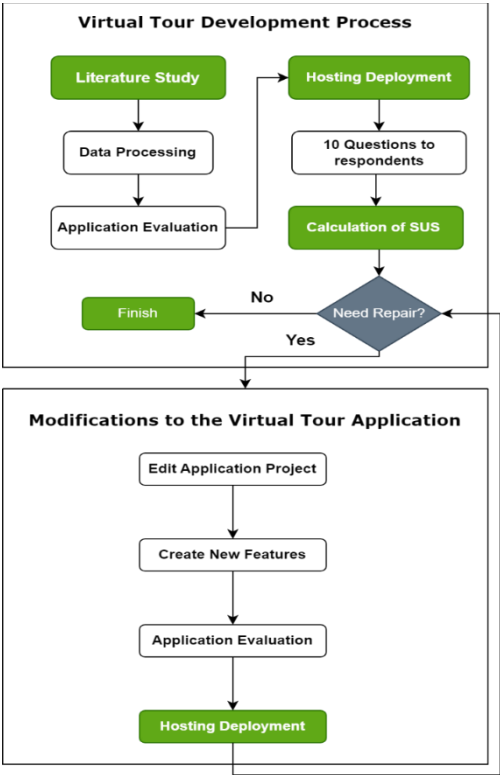
$\bar{x}$  = Average score  
 $\sum x$  = Total System Usability Scale (SUS) score  
n = Number of users who are respondents

(1)

*Skor SUS* If the value is odd, then it is calculated using the formula (Value - 1)

*Skor SUS* if the value is even, then it is determined using the formula (5 - Value)

Next, the obtained value is multiplied by the factor (2.5). After calculating the SUS on the virtual tour application, 80 respondents felt helped by the virtual tour application at six temples in Semarang's Chinatown village. If the results of additional questions addressed to respondents show many complaints, the researcher will carry out the second option by modifying the virtual tour application. Otherwise, the SUS calculation process in the virtual tour application can be completed. Figure 1. Explains the steps to a virtual tour of Chinatown village in Semarang City.







al., 2021). The Validity Test includes a Case Processing Summary containing the answers to 10 questions filled in by 80 respondents. The respondents' answers are valid if the total percentage is 100%. Table 2. shows the results of the case processing summary of the reliability test on the initial application.

**Table 2.** Case Processing Summary of Initial Application

		N	%
Cases	Valid	80	100.0
	Total	80	100.0

a. Listwise deletion based on all variables in the procedure.

The Case Processing Summary contains the answers to 10 questions filled in by 80 respondents. The respondents' answers are valid if the total percentage is 100%.

*Reliability Test on Initial Application*

The Cronbach's Alpha value is a reliability test with a minimum value that must be obtained around 0.60. If the results are below 0.60, then it is said to be unreliable because there is a possibility that one or more than 1 item in the respondent's questions will have inconsistent

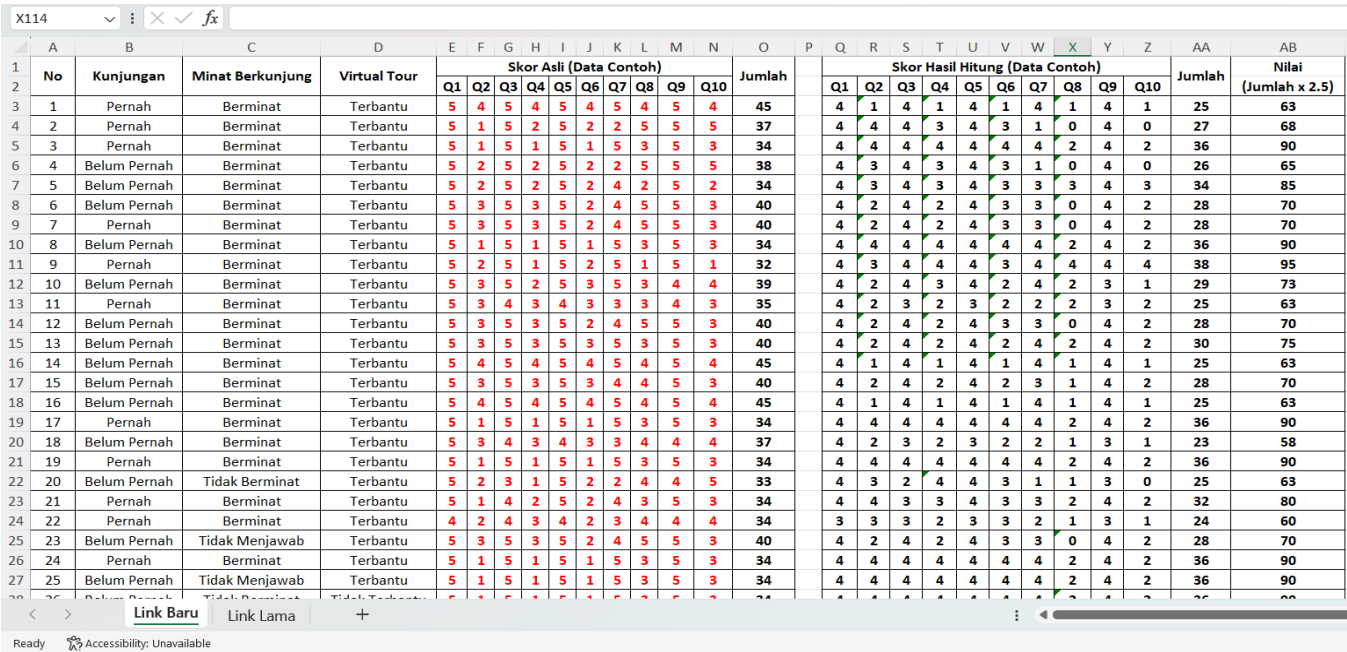
results (Amalia et al., 2022). The results of the Cronbach's Alpha value in the initial application were 0.612, so the results were said to be reliable. Table 3. Shows the results of the Cronbach's Alpha value in the initial application.

**Table 3.** Cronbach's Alpha value in the initial application

Cronbach's Alpha	N of Items
.612	10

*Respondents on Final Application*

As with the initial application, the final application process requires an additional questionnaire filled out by 80 respondents who have tried the virtual tour in the final application. The profiles chosen are the same as those in the virtual tour in the initial application. These include respondents who have already come to the location and respondents who have never come to the location. From this, the answers from 80 respondents will also be calculated using calculations from the usability scale system. Figure 3. Displays the answers from 80 respondents, which have been collected in Excel form



**Figure 3.** Respondent's answers in Excel in the final application

*Validity Test on Final Application*

Based on the results of respondents' answers to the final application shown in Figure 3 above, before further calculations using the usability scale system, a validity and reliability test is required to measure the questions and answers in the questionnaire created to determine the level of validity and reliability (Rosita et al., 2021). The Validity Test includes a Case Processing Summary

containing the answers to 10 questions filled in by 80 respondents. The respondents' answers are valid if the total percentage is 100%. Tabel 4. shows the results of the case processing summary of the reliability test on the initial application.

**Table 4.** Case Processing Summary of Final Application

		N	%
Cases	Valid	80	100.0

Total	80	100.0
a. Listwise deletion based on all variables in the procedure.		

The Case Processing Summary contains the answers to 10 questions filled in by 80 respondents. The respondents' answers are valid if the total percentage is 100%.

Reliability Test on Final Application

The Cronbach's Alpha value is a reliability test with a minimum value that must be obtained around 0.60. If the results are below 0.60, then it is unreliable because there is a possibility that one or more than one item in the respondents' questions will have inconsistent results (Amalia et al., 2022). The Cronbach's Alpha value in the initial application was 0.644, so the results were reliable. Table 5. Shows the results of the Cronbach's Alpha value in the final application.

Table 5. Cronbach's Alpha value in the final application

Cronbach's Alpha	N of Items
.644	10

System Usability Scale Calculation

After completing the validity and reliability test to evaluate the initial and final application results, the next

step is to carry out calculations using the System Usability Scale (SUS) method (Sanjaya *et al.*, 2021). Researchers use the system usability scale (SUS) because it is easier and has accurate results in knowing the level of user satisfaction with the system. Apart from that, the SUS method is also easy and efficient (Huda, Nurul Habrizons, Frans Satriawan, Andre Iranda, Muhammad Pramuda, 2023). The SUS method also has high validity and reliability in its testing; the SUS method can also be used in various satisfaction level tests to be applicable in decision-making on services and other products. The SUS method provides The exact numerical score in the range of 0 to 100, and the SUS method can also be applied simply so it does not require special training for the user.

Initial Application User Satisfaction Score

Respondent's answers to the virtual tour in the initial application were calculated using the system usability scale method, resulting in the highest result with a score of 100 and the lowest with a score of 50. Figure 4. Displays a graph of scores from respondents' answers, which have been calculated using the usability scale system in the initial application.

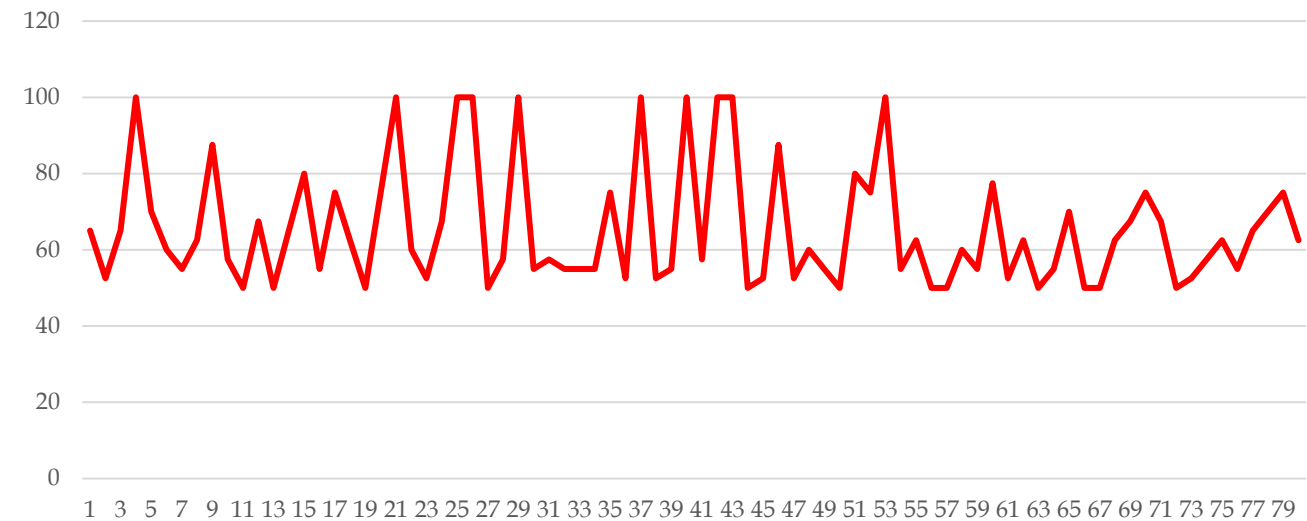


Figure 4. Initial Application User Satisfaction Score

Initial Application Mean, Median, Modus

In calculating the usability scale system in the initial application, it is necessary to calculate the mean, median, and mode to measure how consistent the score of the respondents' answers to the distributed questionnaire is. Table 6. shows the results of the Mean, Median, and Mode from the calculation of respondents' scores on the virtual tour in the initial application, where

the mean score obtained was around 65. The median score was around 60, and the mode score was around 55.

Table 6. Initial Application Mean, Median, Modus

Mean	Median	Modus
65	60	55

Final Application User Satisfaction Score

Simultaneously calculating virtual tour respondents' answers in the initial application calculated using the system usability scale method, the virtual tour application in the final application displays differences

in the design and components, so it is necessary to retest using the usability scale system. Figure 5. Displays a graph of respondents' answer scores and the usability scale system in the final application.

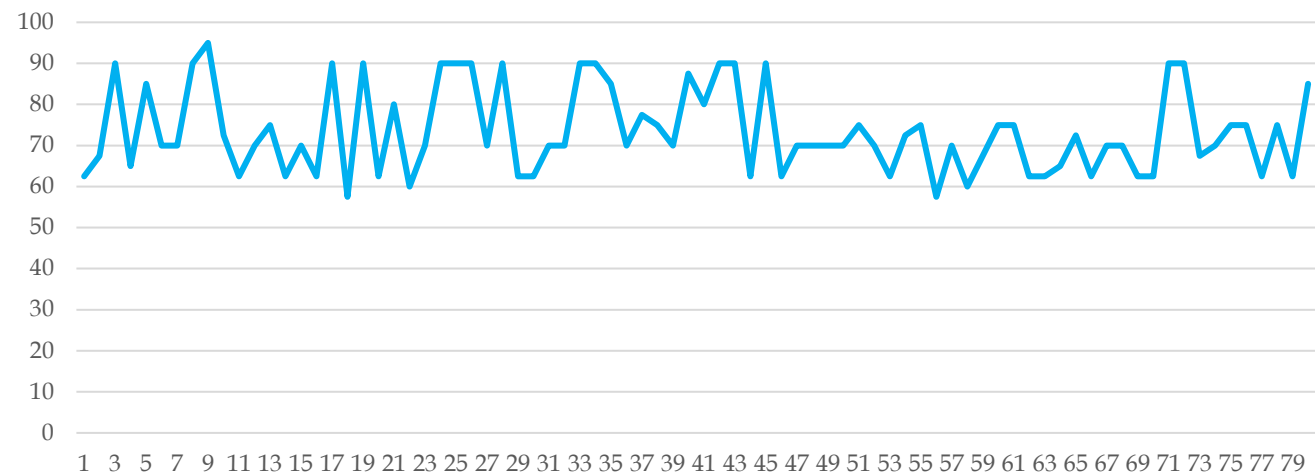


Figure 5. Final Application User Satisfaction Score

Final Application Mean, Median, Modus

Simultaneously with the respondents' answers to the virtual tour in the initial application, which had passed calculations using the system usability scale method, the results of respondents' answers from the virtual tour application in the final application obtained the highest result with a score of 95 and obtained the lowest result with a score of 58. Table 7. shows the results of the Mean, Median and Mode scores of respondents from the virtual tour application in the final application, with the mean score being around 73, then the median score around 70, and the mode score around 70.

Table 7. Final Application Mean, Median, Modus		
Mean	Median	Modus
73	70	70

Features in initial application and final application

The difference in scores between the virtual tour application in the initial application and the virtual tour in the final application is influenced by the differences in the features contained in the virtual tour application, where the virtual tour in the final application has more updated features than the virtual tour application in the initial application. Table 8. Shows the features of the initial application and final application

Table 8. Differences in features in the initial application and the final application

Part	Initial Application	Final Application
Simple Interactive Website	X	✓

Manual Book	X	✓
Video Tutorials	X	✓

Mean, Median, and Mode at the initial application and final application

Table 8 shows one feature change that is not in the virtual tour in the initial application but is in the virtual tour in the final application. These results will influence user satisfaction with the application because they feel more helped by adding these features, as proven by the results from Table 9. This shows that comparing the mean, median, and mode of the virtual tour in the initial application to the virtual tour in the final application showed a significant increase in the consistency of respondents' answers after adding features. Overall, the virtual tour in the final application obtained much better results than the virtual tour in the initial application, with an increase in mean from 65 to 73 of 8, then an increase in median from 60 to 70 of 10, and an increase in mode from 55 to 70 of 15.

Table 9. Comparison of Mean, Median, and Mode in Initial Application and Final Application

Result	Initial Application	Final Application	Increase
Mean	65	73	8
Median	60	70	10
Modus	55	70	15

SUS table results on initial application and final application

The results of adding features to a website-based virtual tour for a tourist experience in Chinatown Semarang have been proven to increase user satisfaction in the final application. In calculations using the

usability scale system in the initial application, a total score of 5248 was obtained, which was then shared with a total of 80 respondents to obtain a result of 65.6, which in the system usability scale table obtained "acceptability ranges" with a result of "High", but in the "grade scale" results obtained a value of "D" and in the "adjective ratings" the result was "OK". Meanwhile, the calculation of the system usability scale in the final application increased with a total score of 5878, which was then divided by the number of 80 respondents to obtain a result of 73.475, which in the system usability scale table obtained "acceptability ranges" with the result "Accepted", then the "grade scale" result obtained a value of "C" and in the "adjective ratings" the result was "Good". Figure 6. Displays the results of the system usability scale table from the virtual tour in the initial application and the virtual tour in the final application.

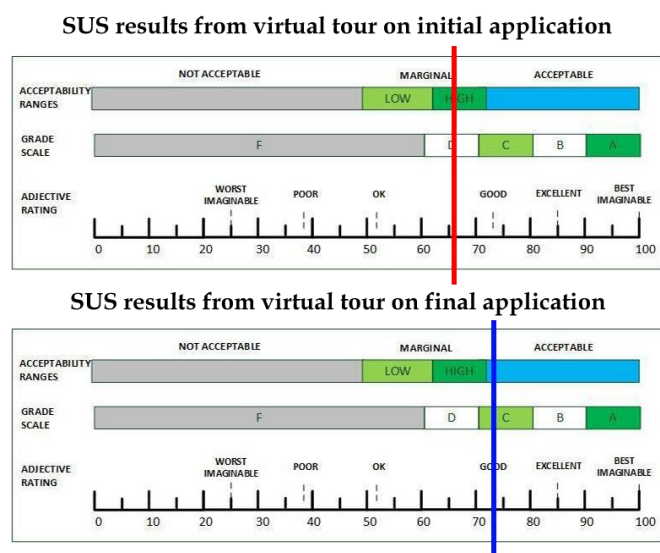


Figure 6 SUS table on initial application and final application

## Conclusion

Based on the results of this research, the calculations using the usability scale system in the virtual tour in the initial application obtained a result of 65.6. In the virtual tour of the final application, features were added in the form of a simple interactive website, and guide features were added in the form of manual books and video tutorials, which users can access before using the virtual tour in the final application. Calculations were carried out using the usability scale system, which obtained a result of 73.475 from the results of the virtual tour in the initial application, and the virtual tour in the final application experienced an increase in value of 7.875 (Purnama et al., 2024) (Safiatuddin & Asnawi, 2023). This proves that modifying the application and adding a guide feature as a manual book and video tutorial can help respondents

use a virtual tour in Semarang's Chinatown village (Ginting et al., 2023) (Syam et al., 2023). The advice obtained in this research is that it is hoped that for future research, you can use paid hosting because, in the study here, the virtual tour application still uses free hosting, which still has limitations in processing files, so it takes longer for users to access the virtual tour in Semarang Chinatown Village.

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## Author Contributions

Muhammad Reza Setiawan: Initial Draft, Writing – Review & Editing, Research Objectives, Collecting Data, Methodology, Design, Analysis. Dinar Mutiara Kusumo Nugraheni: Writing – Review & Editing, Reviewing & revising articles. Oky Dwi Nurhayati: Writing – Review & Editing, Reviewing & revising articles.

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## Conflicts of Interest

The authors declare no conflict of interest.

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