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## Tourists' Perception on Virtual Reality Application of Traditional Malay House

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### Abstract

Preserving the Malay heritage, like traditional Malay houses, through virtual reality (VR) technology benefits tourists in terms of learnability and initial experience. Through this technology, tourists have the opportunity to experience the surroundings of a traditional Malay house without being physically present in it. To investigate the tourists' experience towards the virtual traditional Malay house, their perception needs to be studied. Hence, this study was conducted to investigate the six measurements: (i) functionality, (ii) learnability, (iii) usefulness, (iv) perceived ease of use, (v) sense of immersion, and (vi) outcome/future application of VR to a traditional Malay house. Prior to the investigation, an application that consists of virtual environments of traditional Malay houses was developed. Next, this application, called the "virtual reality application of traditional Malay house," was presented to 30 tourists to assess their perception. To assess the tourists' perception, they need to use and experience the surroundings of the traditional Malay house via the VR application. As a result, the virtual application of the traditional Malay house was reliable for the six measurements, and the use of VR technology was useful to preserve the traditional Malay house in its 3-dimensional form. VR will make it easier for future generations to enjoy and experience traditional Malaysian homes. This will help them appreciate and enjoy them.

**Keywords** Virtual reality, Virtual reality application, Traditional Malay house, Malay heritage

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## Introduction

Many valuable treasures and other cultural heritage forms are in danger of disappearing threatened by the modernisation and development (Rahimah 2017). This disappearing brings a long-standing issue and challenge to heritage conversation due the modernisation and development that altered people's views and thinking to experience current lifestyle like having modern house. Having a modern house means old or traditional house is no longer priority in housing development. People or homeowners usually prefer to build or buy modern, concrete and terrace house rather than traditional house. Besides that, the factors of the rapid urbanisation, industrialisation, evolutionary processes, lack of maintenance cause to slowly disappearing of traditional Malay house (Yasmin Nur Amirah, Rohaslinda & Nor Rima, 2021; Ismail & Sani 2002). The transformation of social change and cultural structure also cause to the disappearing of traditional Malay house (Salem et al., 2019). According to Yasmin Nur Amirah, Rohaslinda and Nor Rima (2021), the original construction including materials and architectural style of traditional Malay house can hardly be seen.

In other perspective, costly maintenance (Elita, Dalhar & Kemas, 2018), high prices of timbers and woods, lack of skilled craftsmen and problem in maintenance also make this traditional Malay house continue to disappear (Ullah, 2018). According to Yazid, Mohmadisa, Hanifah and Nasir (2018), although traditional Malay houses were not well preserved, they were still in firm physical condition. However, these traditional Malay houses seemed unstable due to the abandonment, eaten by termites and destruction. Besides that, young generation increasingly indifferent to Malay heritage and slowly lose their ethics heritage and identity under the onslaught of adopting more modern values (Rahimah, 2017). Hence, traditional Malay houses no longer attract as much attention and are not preserved because most of the houses were not taken care of despite being inhabited (Yazid et al., 2018). Eventually, future generations will be unable to learn about and experience the unique legacy of the Malay traditional dwelling. According to this occurrence, the traditional Malay house's dwelling activities are predicted to decline and suffer preservation challenges.

Therefore, to overcome the issue of disappearing and challenge of preservation, VR technology can be one of the solutions to maintain traditional Malay house. Through this solution, the VR is utilised as an alternative way to preserve it in three-dimensional (3D) environmental form. The virtual environment notion refers to the display of 3D graphical representations of the surrounding environment. It enables users to engage with their surroundings by allowing them to walk about in 3D areas produced by the

computer. It is one of the technological assistances in maintaining traditional Malay house for the purpose of preservation. Through this technology, people will be aware of the heritage value and subsequently will increase their sense of appreciation toward the Malay heritage of traditional Malay house. The sense of responsibility is cultivated and developed in protecting the heritage for the benefit of future generations.

To develop a sense of responsibility, the present generation must live in a traditional Malay house in order for the knowledge to be passed down to future generations. Due to the young generation's lack of respect, the traditional Malay home would most likely vanish in the near future (Salem et. Al, 2019). Other purpose of VR of traditional Malay house is for education and learning among people who slightly less experience to traditional Malay house. Accordingly, to know people perception regarding the traditional Malay house is important. Therefore, this study was conducted to gain people perception as well tourist regarding the importance of traditional Malay house. To gain their perception, a ready-made application of virtual traditional Malay house was tested among the tourists. Through the VR application of traditional Malay house, they can experience and immerse traditional Malay houses' surroundings.

### Traditional Malay House

Traditional Malay home constructed with wood, bamboo, or thatched walls and a thatched roof by a master carpenter skilled in Malay traditional architecture (Sabrizaa, Nurfaisal & Kartina, 2021). There are several distinguishing features, such as cross-ventilation, curved patterns, and the overall architecture of the home, that make it stand out. Traditional Malaysian houses are designed with a common architectural trait, which is that all of the home structures are placed on stilts, for the purpose of the design (The Star, 2021). There are many distinct types of traditional Malay houses, such as Rumah Bumbung Panjang, Rumah Negeri Sembilan (Negeri Sembilan), Rumah Gajah Menyusu (Penang), Rumah Perabung Lima (Kelantan, Terengganu and Perak) Rumah Serambi Melaka (Melaka), Rumah Limas (Johor) and Rumah Kutai (Perak) (Perfect Livin, 2021). Table 1 shows other examples of traditional Malay house that exist in certain states in Malaysia.

Table 1 Example of traditional Malay houses (The Star, 2021; Saleh et al., 2018; Kamarudin & Said, 2008)

No.	Type of House	Year Built	State
1	Rumah Bujang Berserambi Dua Beradik	1850's	Kelantan

2	Rumah Bumbung Limas	1914	Terengganu
3	Rumah Bumbung Perabung Lima	1920's	Kelantan
4	Rumah Kutai	1890's	Perak

Two common types of timber that used in the construction of traditional Malay house are cengal and meranti wood (The Star, 2021). These woods commonly used to build three basic elements of architectural design which are floor, wall and roof. They are built and designed to suit the tropical weather and to improve performances of thermal comfort and ventilation for cooling (Mohd Amirul et. al, 2020). For example, its raised floor can be safeguard against flood disaster (The Star, 2021; Elita, Dalhar & Kemas, 2018). Figure 1 illustrates common architectural features of traditional Malay House.



Figure 1 Traditional Malay House

Traditionally, woodcarvings adorn the interior of traditional Malay houses, where they are a part of traditional Malay home architecture for the purpose of beauty and acute observation of the natural surrounds, as is customary in the Malay culture (Said, 2002). Those intricately carved elements of a typical Malay home served both utilitarian and aesthetically pleasing purposes. Moreover, without woodcarvings within a typical Malay home, the Malay architecture would be incomplete, as woodcarvings constitute a component of the language of Malay architecture and are therefore essential to its completion (Said, 2002). The traditional Malay home, as seen by the division of the parts into various zones, demonstrates a strong distinction between the elements.

## Virtual Reality (VR) Application

The virtual restoration of cultural heritage, according to Happa et al. (2010), was concerned with portraying geometry through the use of lighting models. The media, film, and computer gaming industries, as well as museums and researchers, achieve the goal of employing the VR idea to immerse themselves in realistic virtual settings by using VR technology. VR applications require strong interactivity in terms of the subjective quality of system response noticed by the users in order to maintain the users' feeling of immersion and presence in order for them to be fully experienced. Because VR incorporates some type of 3D representation that is utilised to display it, which can range from still images to immersive VR, and it leverages the immersive VR technology to reproduce cultural heritage items, it is considered to be more realistic. It is a method of providing formative educational experiences through the manipulation of time and location by technological means.

The use of VR provides users with access to digital reconstructions of cultural heritage that would otherwise be unavailable owing to the location of objects of the heritage or the delicate state of such relics if they were in their natural environment. Users are able to stroll around a 3D environment of a typical Malay house while experiencing its architectural textiles with the use of a VR application. Ancient and historical artefacts from the heritage will be represented in 3D and shown via the use of a VR application. Figure 2 is a virtual representation of a traditional Malay dwelling.



Figure 2 Virtual Reality of Traditional Malay House

The virtual traditional Malay home's surrounds depict significant construction elements, demonstrating that it is as accurate as the original traditional Malay house. The house fundamentally consists of wooden structures including stairs, pillar, tilt, floor, wall, window and others. All significant features and parts of the virtual reality environment of traditional Malay houses enable tourists to interact with and traverse between building areas. This use of virtual reality enables global access to cultural richness, with clear benefits for tourism and increased valorisation of historical treasures.

## Methodology

The impression of local and foreign tourists toward the virtual reality application of a typical Malay home was evaluated. To ascertain the perception of the VR application, a quantitative technique was adopted in this study, in which data was gathered using a survey questionnaire. This survey questionnaire was used as a tool to assess tourists' perception towards the virtual application of traditional Malay house. It was a close-ended questionnaire which divided into demographic background and six measurements (dimensions) of perception. The measurements were fill in the blank and Likert Scale questions. They are learnability (Nielsen, 1993), usefulness, perceived ease of use (Davis, 1986), functionality and effectiveness (Marsh, 1999), sense of immersion (Kalawsky, 1998), and outcome or future usage. The perceived ease of use and usefulness metrics were developed from the Technology Acceptance Model (TAM). Subsequently, the questionnaire was tested to gain its reliability by using Cronbach Alpha test. Cronbach Alpha values were calculated to determine data collecting inter-item reliability, which is a measure of the degree of internal consistency between numerous measurements of a dimension in a survey questionnaire. Table 2 shows the Cronbach Alpha values of the six measurements.

Table 2 Cronbach alpha values of the six measurements

No.	Measurement	Number of Items	Cronbach Alpha
1	Functionality & Effectiveness	5	0.843
2	Learnability	5	0.787
3	Usefulness	10	0.838
4	Perceived Ease to Use	7	0.863
5	Sense of Immersion	7	0.784
6	Outcome / Future Use	6	0.702

According to Table 2, the alpha values are more than 0.700 and range between 0.702 to 0.863. Thus, the reliability of the instrument is satisfying (Santos, 1999). Next, survey questionnaire was conducted in fieldwork. During this phase, the VR of a typical Malay home was showcased to both domestic

and international tourists. They were chosen at random from the Langkawi International Airport, the Langkawi Cable Car, and various public areas across Langkawi. About 30 respondents were participated in the survey questionnaire. During the session, they were given a short brief about the study of VR application of traditional Malay house. Then, they were asked to experience virtual environment of traditional Malay house. Each responder spent around 10-20 minutes on a laptop experiencing virtual reality of a traditional Malay dwelling. Then, based on the experience, they need to answer and complete questions in paper-based questionnaire. After the survey was completed, the data in the returned questionnaires were distributed in SPSS statistical software.

## Result and Discussion

Descriptive statistic was conducted to show respondents' demographic background that participated in the survey. Based on the descriptive statistic, number of tourists are 15 local tourists and 15 foreign tourists respectively. The 15 foreign tourists are from England (2), India (2), Australia (2), Saudi Arabia (2), Japan (2), United State of America (1), Germany (1), Hong Kong (1), Nepal (1) and Belarus (1). Genders of all the respondents are 17 males (56.7 percent) and 13 females (43.3 percent). Their age distribution is as follows: five respondents aged 10-20 years (16.7 percent), thirteen respondents aged 21-30 years (43.3 percent), seven respondents aged 31-40 years (23.3 percent), three respondents aged 41-50 years (10.0 percent), two respondents aged 51-60 years (and no respondents aged 61 years and above).

The responses to all measuring items were then subjected to a one-way Chi-Square test for homogeneity. The test was used to examine if there is a good match between the observed data and the predicted or theoretical (Larson, 1982) frequencies, or if there is a connection between variables (Wu, 2010). The result is positive for all metrics except Outcome/Future Use, which has a p-value less than 0.01 as indicated in Table 3.

Table 3 Descriptive statistics for all measurements

No.	Measurement Items	N	Mean	Standard Deviation	P (Chi-Square)
1	Functionality & Effectiveness	30	20.1333	2.7131	0.055
2	Learnability	30	20.5333	2.8129	0.029
3	Usefulness	30	39.1333	5.9696	0.274
4	Perceived Ease to Use	30	28.3333	3.8176	0.100
5	Sense of Immersion	30	27.4000	3.8470	0.133
6	Outcome / Future Use	30	24.1000	2.2795	0.002

Then, descriptive statistic of all items of the measurements were conducted. Table 4 summarises the descriptive statistics for all questionnaire-based metrics. The totality of the items demonstrated that respondents agreed on the adoption of traditional Malay houses with mean values larger than three (3).

Table 4 Descriptive statistic for all items of the six measurements

Measurement Items	Mean	Standard Deviation
<b>Functionality &amp; Effectiveness</b>		
1- I found it easy to access all the functionality (control) of the application	3.9000	0.7588
2- The functionality provided by the application was clear	4.2000	0.4842
3- It was easy to remember all the functions available	4.1000	0.7119
4- Information was presented in a meaningful way	3.8667	0.8193
5- I could achieve what I wanted in the application	4.0667	0.6396
<b>Learnability</b>		
1- It was easy to learn to use the application	4.2000	0.6643
2- The information provided by application was easy to understand	4.1333	0.7760
3- The information provided helped me in learning of VRATMH	3.9333	0.7396
4- It provides clarity of 3D environment	4.1333	0.7760
5- Model of VRATMH is reasonable for the learning	4.1333	0.8603
<b>Usefulness</b>		
1- I would be comfortable using this application for long periods	3.8929	0.7859
2- I thought that the application worked for me	4.0000	0.6666
3- I felt in control of the application	3.7143	0.8967
4- I can see a real benefit in this style of man-machine interface	4.1786	0.8189
5- I enjoyed working with the application	4.1786	0.7228
6- I have a clear idea of how to perform a particular function	4.0714	0.5394
7- The overall application response time affect my performance	3.8214	0.6696
8- The application worked as expected	4.0714	0.8132
9- I enjoyed working with the application	4.0000	0.7698
10- The VRATMH was very robust and reliable	4.1071	0.6852
<b>Perceived Ease to Use</b>		
1- Learning to use this application would be easy for me	4.1000	0.8030
2- I would find it is easy to get VRATMH to what i want it to do	4.0000	0.8709
3- Interaction with VRATMH are clear and understandable	3.9667	0.7184
4- I would find VRATMH to be flexible to interest with	4.0000	0.7427
5- It is easy for me to becomes skillful when i use the application	3.9667	0.7648
6- I would find the application is easy to use	4.1000	0.5477
7- I found it easy to work in 3D	4.2000	0.6643
<b>Sense of Immersion</b>		
1- Objects in the virtual environment were very realistic	3.8333	0.8742
2- I felt a sense of being immersed in the virtual environment	3.9333	0.9802
3- I got a sense of presence as being there	3.9667	0.8899
4- I thought that the field of view enhanced my sense of presence	3.8333	0.7466
5- I had a good sense of scale in the virtual environment	4.2000	0.8469
6- The simulation appeared to freeze or pause at intervals	3.5000	0.9001
7- I found it easy to move or reposition myself in the virtual environment.	4.1333	0.5074
<b>Outcome / Future Use</b>		
1- I was able to complete my experience of VRATMH	4.0000	0.6546
2- I could effectively complete my experience using the application	4.0345	0.4987
3- I was able to efficiently complete the experience of VRATMH	3.3910	0.6508
4- I believe i could become productive using the application	4.1379	0.5808
5- Based on current experience with using this application, i think i would use it regularly	3.8276	0.5391
6- I was impressed and satisfied with the way I could interact with the simulation	4.1724	0.7105

Based on the mean values of all the items, the VR application of traditional Malay house resulted a good perception among tourists. As shown in Table 5, the mean of the six measures taken from both domestic and international visitors was 4.0041 with a standard deviation of 0.5528.

Table 5 Descriptive statistics result for all measures

No.	Measurements	N	Mean	Standard Deviation
1	Functionality & Effectiveness	5	4.0266	0.6827
2	Learnability	5	4.1066	0.5625
3	Usefulness	10	3.9133	0.5969
4	Perceived Ease to Use	7	4.0476	0.5453
5	Sense of Immersion	7	3.9142	0.5495
6	Outcome / Future Use	6	4.0166	0.3799

Local and foreign tourists alike agreed and expressed satisfaction with the virtual reality application of a typical Malay home. It can be proven when all mean values of the six measurements are greater than three (3). The measurement on learnability is the highest value and the most satisfied among the tourists with the mean value is 4.1066. The measurement of usefulness is the lowest, with a mean value of 3.9133, indicating that it is not very popular with visitors. The mean values for the other three criteria are: 4.0476 for perceived ease of use, 4.0266 for functionality and effectiveness, 4.0166 for outcome/future usage, and 3.9142 for sense of immersion. As a result, travellers' perceptions of traditional Malay houses via virtual reality are reliable.

## Conclusion

Traditional Malay house is a heritage asset for future generations in term of learning and cultural experience. It also become a valuable experience for tourists to know Malay heritage that unavailable to experience in their places. However, traditional Malay house becoming less and slowly extinct from time to time. To overcome these issues, preservation of traditional Malay house must be taken. The efforts to preserve this Malay heritage are important. One of the efforts is through VR technology where traditional Malay house in physical form was transformed and virtualised into 3D form. This endeavour attempted to aid in the preservation of the Malay heritage. Developing traditional Malay house into a virtual environment is meaningful as one of the actions to preserve this cultural heritage for future generations and tourism. Therefore, documentation, transformation, and virtualisation of traditional Malay house into a VR application becomes a necessity for the purpose of preservation.

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