

## **AN APPRECIATION OF HISTORICAL HOUSES IN MALAYSIA THROUGH THE USABILITY OF VIRTUAL REALITY: A CASE STUDY OF MALAY HOUSES IN KAMPUNG BARU**

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**Abstract:** *In the last half of the twentieth century, historical building preservation had become an increasingly important issue and had been recognized on local, state, national and international level. The environmental, economic, educational, social and psychological benefits of preservation had been proven from time to time, and should not be underestimated. The purpose of this paper is to explore the role of usability on using virtual reality photography application in a way to appreciate and preserve Malay houses at Kampung Baru in Kuala Lumpur. Attention was given to propose a guideline and educational potential of walkthrough simulations of Malay houses in Kampung Baru through linked virtual reality photography system. One of the most obvious applications of virtual reality was the familiar architecture walkthrough of the structures and the other interior parts of the buildings through a mouse pointer. The possibilities of applying virtual reality technology in city simulations can be used for city planning practice will include the cooperation of Internet GIS and VRML (Virtual Reality Modelling Language). Users can walk around and fly through the real scene of Malay houses in Kampung Baru in Kuala Lumpur. This research would be pleased to conclude with a short consideration of future development and recommendation relating to the delivery of information and documentations of preserving our historical buildings through virtual environments. Furthermore, through virtual reality, we will discuss how interactive messages can be delivered to the public in a way to appreciate, to protect and to educate the people about our valuable Malay houses in Malaysia. To address these issues, this project will focus on improving and facilitating current methods of recording and documenting historical buildings.*

**Keywords:** *Virtual Reality Photography, Usability, Malay Houses, Appreciation*

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## **Introduction**

In this study, the researcher was based on a case study of Malay houses in Kampung Baru, Kuala Lumpur. This research also had also focused the meaning of Kampung Baru that holds a unique case of a struggle to preserve local identities. Furthermore, the environment of Malay houses in Kampung Baru had represented the physical and social environment of Malay lifestyles. The Malay village is characterized by a relative tranquillity and a neat layout of traditional Malay houses. The village is still located according to the traditional Malays houses which were built since 1900s. A glimpse of the past can be seen in traditional houses as these are beautiful old architecture portraying Malay cultures and heritages.

Visualization, in particular of past cities, historical buildings and sites will definitely help us to understand more of the situation of the past and present appearances of the cities, buildings and sites either inside or outside from different angles and dimensions of interaction more effectively. Presently, virtual reality is catching up with the public each day where it creates a lot of ideas and imaginations. We can see and view almost anything and everything via a computer at any time without going to the museum. The use of virtual reality is more than a tool. It is very advance technology and can create vast impacts on social relations amongst the public. It is now widely used in realistic simulation where it's useful for educating and training the public of the historical and social interaction on our heritage values. Another frequent response from experts is that visual reality photography provides viewers with access to difficult information which are almost impossible to obtain through videos or still images or texts.

Furthermore, through virtual reality, we will discuss how interactive messages can be delivered to the public in through of appreciation, to protect and educate the people about our valuable Malay houses in Malaysia. To address these issues, this project will focus on improving and facilitating current methods of recording and documenting historical buildings.

## **Research Problem**

The problem of this study on Malay houses in Kampung Baru is basically associated with records and documentations. The Malay traditional houses at Kampung Baru can be transformed into a totally the new modern centre within the Kuala Lumpur metropolitan or development that intertwine the old and new where the historic characters of the place remain sustainable. The values and identity of Malay houses can disappear or vanish if the excessive and rapid developments of Kuala Lumpur are ignored. Almost 60% of the local Kampung Baru residents do not live there but they prefer their houses to be rented out (Lim, 2015). Norshidah Ujang (2016) agreed that the heritage values and the social cohesiveness defining the uniqueness of the place should not disappear alongside the emerging redevelopment. Social unity, social coherence, place identity and quality of life can influence the people's well-being and therefore, should be equally emphasized in any future redevelopment initiatives. The works of social appreciation toward Malay houses in Kampung Baru need to be a future guide. According to Jamshed (2016) in her CNN report of 'A village lost in time: Inside Kampung Baru' had a leverage of history with a local context which needs to preserve the tradition, history and stories within the Kampung Baru areas. She believed by documenting Kampung Baru in contexts of cultural, lifestyle, belief and architecture could save the history for the future generation. The cultural and the lifestyle of Malay village in Kampung Baru can immediately be visible or lost which provides the locals a strong sense of belonging to capture the Malaysia roots and origin if there's no effort to appreciate it. The

new generation especially former and present Kampung Baru residents are therefore encouraged to develop awareness and deeper appreciation which is believed can save identity, heritage, culture and land.

These records and documentations are few and limited in numbers and on top of that they are not readily available. However, if these records and documentations are made available, there are normally made and produced in 2D presentation (graphics and images) and not in their normal original form. By constructing the virtual reality through panoramic photography for Malay houses at Kampung Baru it can help to appreciate and preserve our Malay houses and site environments in virtual space and at the same time using other data to support the development and the implementation of Malaysia Tourism. Using virtual reality in tourism portal or website will help to bring out information and edutainment from other industries and thereby giving a realistic interactive impression to potential visitors of our Malaysia tourism industry. To uptake these technologies, virtual reality may make a single contribution to the understanding and preservation of our collective heritage.

### **Objective**

To examine the usability of VR photography application in preserving the Malay house at Kampung Baru areas. It can be used as storage in historical archives so that information can be preserved and appreciated easily at any time for the next generations studies.

### **Aim**

This research aims of this research is to propose a guideline for appreciating the Malay house at Kampung Baru areas by using VR photography. It could be the pocket land of symbol to the past Kampung Baru as a lost village in time.

### **Hypotheses**

- H1:** Compare to still photo, virtual reality will help viewers to understand more about historical building appreciation.
- H2:** The system of virtual reality is its reliability in perceive information of the historic buildings.
- H3:** Virtual reality is capable of producing accurate results than still photos.

### **Significant of Study**

The use of virtual reality application will allow for new research possibilities. Presently advances in computer powered imaging and communication will allow for the creation of many forms of digital photographs, virtual reality environments, three-dimensional textured computer models and the means of transmitting these digital resources around the world. The results which can be virtualized and made real by virtual reality are unique and remarkable. It can illustrate exactly similar with reality and on top of that gives a clear and detailed impression of the existing situations. Multi-disciplinary research investigations will also involve the associated human factor issues.

There will be good significant to conduct research training and public education program, archaeologist, Museum-based educational applications (Department of Museum and Antiquities), tourism and Department of Heritage (Malaysian Ministry Culture, Art and Heritage). At the same time, it can help to boost tourism and provide tourists the opportunity to admire and values of heritage buildings (Lim, 2015).

## Literature Review

### *Re-Presenting Cultural Heritage with VR Panoramic Photography*

Based on a study conducted by Thompson (2017) on Re-Presenting Cultural Heritage with Virtual Reality (VR) Panoramic Photography it stated that for a more robust history when developing VR panoramic photography, it involves not only the development of illusion and immersion, but also its contents. As the medium develops, a greater critical discourse may take place and those who are working within VR panoramic photography will not reinvent the existing technology. Thompson (2017) also stated that past disruptive immersive deliverables included the *vue d'optique*, panorama and stereo view. In any case, a repeating theme, which ties the substance utilized in these deliverables with VR panoramic photography, is the re-presentation of a cultural heritage. In his study, he explored how we can use past innovations for the preservation, interpretation and the dissemination of cultural heritage with the example of re-presentation of Middle Eastern cultural heritage using VR panoramic photography and he also gave useful recommendations to inform current and future initiatives in developing artistic projects (Thompson, 2017).

### *Augmented, Virtual, and Mixed Reality System for Cultural Heritage*

According to a survey of augmented, virtual and mixed reality for cultural heritage by Bekele, Pierdicca, Frontoni et al. (2018), the use of well-established trend of multimedia approach in cultural heritage can enhance how culture is experienced. The advantages of this approach because they can increase the number of people who can have access to knowledge and improve the quality of the diffusion of the knowledge. These combined technologies have been used widely including in reconstruction, education, virtual museums, exploration and exhibition enhancement which can be accessed digitally especially when the physical access is limited. Bekele, Pierdicca, Frontoni et al. (2018) also identified application areas in digital cultural heritage and make suggestions as to which technology was most appropriate in each case and predicted future research directions for augmented and virtual reality, with a particular focus on interaction interfaces and explored the implications for the cultural heritage domain.

### *Photography in Social Context*

Based on research conducted by Bank and Zeitlyn (2015), photography in the context of social life is more easily detected through our daily life and practices. Whether we realized or not, we see and use this photography technology almost every day. Furthermore, with today's technology in this century, it is getting easier for us to practice the use of photography technology for instance, smart phone or gadgets that are taken anywhere and users will capture images or anything that they think interesting or important to them. Those images will be uploaded into website, blog, social medias and so on for them to share their life with the public. Clearly this photography is used by every level of society regardless of age, whether children, youngsters or even adults. The tourism industry has grown tremendously with the presence of photography gadgets in smart phone whereby the tourists are now just capturing memories and images by using camera in their smart phones. It has become a trend to visit tourist attractions when everyone wants to show their where about in social websites such as Facebook, Instagram and others. Photography technology in smart phone can also be used by students in schools and higher-level institutions to complete photography, videography or even other tasks (Berry & Schleser, 2014).

### *The Usability Measurement*

According to Shackel (1991), approaches raised questions about usability measurements at an operational level, usability objectives and relationship between usability, utility, product acceptance and the effects in relation to the interaction. The usability has been much used and modified. Shackel defined a model where a product acceptance was the highest concept. The user has to make a trade-off between utility, the match between user needs and functionality, usability, ability to utilize functionality in practice and likeability, effective evaluation versus costs, financial costs as well as social and organizational consequences when buying a product. Furthermore, the usability has two sides which consist of the usability in a relative property of the system and being relative in relation to its users. Therefore, evaluation is context dependent, resulting in a subjective perception of the product and on the other side, usability relates to objective measures of interaction. Furthermore, Shackel recognized the ambiguousness of the definition and suggested a set of operational criteria. For a system to be usable it has to achieve defined levels on the following scales:

- *Effectiveness*: meaning the results of interaction in terms of speed and errors.
- *Learnability*: meaning the relation of performance to training and frequency of use, i.e. the novice user's learning time with specified training and retention on the part of casual users.
- *Flexibility*: allowing adaptation to tasks and environments beyond those first specified.
- *Attitude*: user satisfaction with system.

Another pioneer in the field of usability that recognized the importance of usability engineering was Jakob Nielsen (1993). Nielsen defined usability as a quality attributes that assesses easy use of interface by the user. The word “usability” also refers to methods for improving ease-of-use during the design process. Usability is one of the focuses of the field for Human-Computer Interaction. As the name suggests, usability has to do with bridging the gap between people and machines. In human-computer interaction and computer science, usability usually refers to the elegance and clarity of the interaction with a computer program or a web site design. The term is also used often in the context of products like consumer electronics, or in the areas of communication, and knowledge transfer objects (such as a cookbook, a document or online help). Besides, usability and utility; there is also the ability to help users to carry out a set of tasks, together form the usefulness of a system.

Different from Shackel, Nielsen did not give a precise definition of usability, but presented the operational criteria that clearly defined the concept. Nielsen defined usability measurement in five quality components by conducting usability testing:

- *Learnability*: systems should be easy to learn. Users can rapidly start getting some works done with the system.
- *Efficiency*: systems should be efficient to use. When a user has fully learned the system, productivity will be possible on a high level.

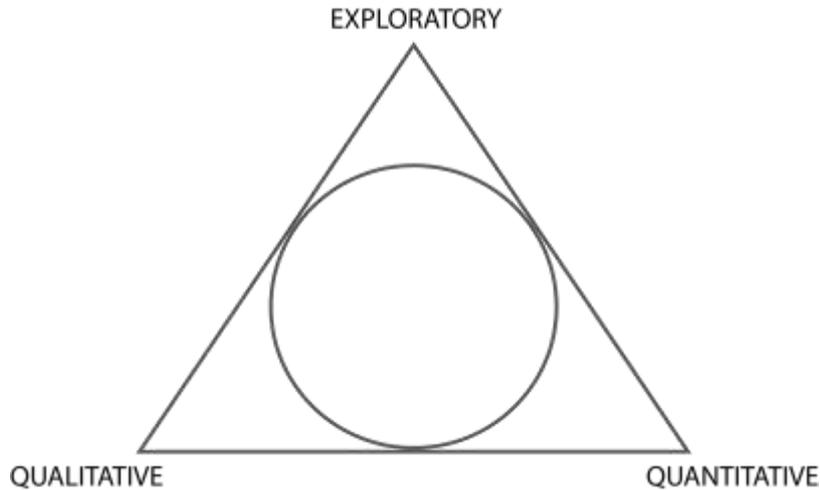
- *Memorability*: systems should be easy to remember, making it possible for casual users to return to the system after some period of not using the system, without having to learn everything all over again.
- *Errors*: the system should have a low error rate, which enables users to make few errors during the use of the system. When they do make errors they can easily recover from them.
- *Satisfaction*: systems should be pleasant to use; which make users subjectively satisfied when using it.

In fact, there are different definitions can be made. The usability attributes can be divided into objective operational criteria which a user can performance attributes such as efficiency and learnability to the task given. In terms of subjective operational criteria, the user can view attributes for the satisfaction and effectiveness. Usability is important because from the user's perspective, usability can make the difference between performing a task accurately, completely or not, and enjoying the process or being frustrated. From the developer's perspective, usability is important because it can mean the difference among success or failure of a system. From a management point of view, software with poor usability can reduce the productivity of the workforce to a level of performance worse than without the system. In all cases, lack of usability can cost time and effort, and can greatly determine the success or failure of a system.

### **Research Methodology**

Throughout this study, the researcher will use Qualitative and Quantitative research methods to construct the framework of a research study. Quantitative and qualitative research methods involve very different assumptions about how research should be conducted and the role of the researcher. The major research approach in this study will be a quantitative data. Quantitative research focuses on gathering numerical data and generalizing it across groups of people or to explain a particular phenomenon. There were be two different variable to measure in this research. Your goal in conducting quantitative research in this study is to determine the relationship between effectiveness images and the usability measurement within a population.

The exploratory research as a methodology to formulate this investigation. Researcher constructed a base on the prototype of historic buildings using virtual reality application in order to experiment the usability of the product. The idea of using the prototype approach is to help the respondents oriented more to discover more of the new ideas than to evaluation of existing ideas of still image of Malay houses at Kampung Baru, Kuala Lumpur.

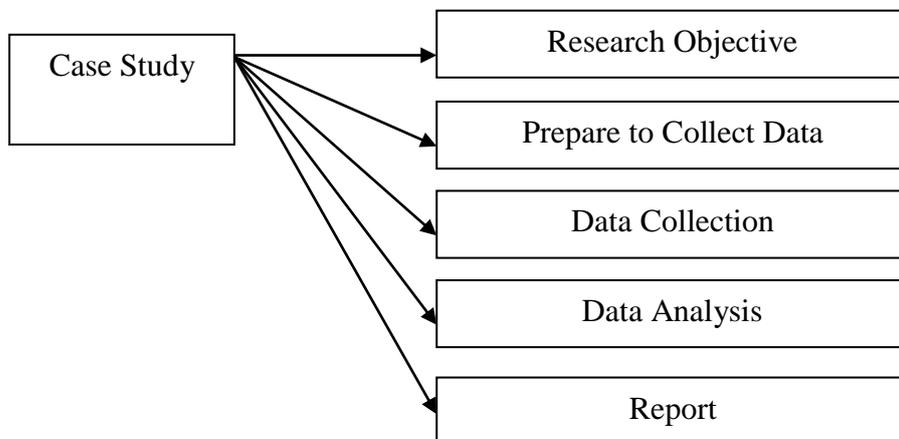


**Figure 1: Cresswell J.W (1994) Research Design.**

Exploratory research helps diagnose the dimensions of problems so that successive research projects will be on target. It helps to set priorities for research. In some cases, exploratory research provides an orientation for researcher by gathering information on a lesser known topic. Although a research project has not yet been planned, information about an issue is needed before the appropriate diagnosis of the problem can be developed.

***Research Design***

The case study of Kampung Baru Kuala Lumpur is important for evaluating the usability of virtual reality application for preserving historical buildings in virtual space. Case studies are useful for providing an in-depth understanding of complex situations and also for suggesting models and mechanisms to integrate with theories. Case studies are powerful in providing demonstrations that are counter examples to theories (Kirkley, 2005). Many well-known case study researchers such as Robert E. Stake, Helen Simons, and Robert K. Yin (2006) had written about a case study research and suggested techniques for organizing and conducting the research successfully. This introduction to case study research draws upon their work and proposes six steps that should be used:



**Figure 2: The Case Study as A Research Method by Robert E. Stake, Helen Simons, and Robert K. Yin (2006)**

The researcher was asked on the usability of VR application in terms of presenting information for historic buildings in context of preservation. There are varieties of approaches to usability evaluation that can be chosen. The approach of choice to take depends on cost of usability evaluation. In this project a combination of two types of usability evaluation (the instruments) will be used:

- Questionnaires in Usability Engineering by Kirakowski (2000)
  - i. Two types of close-ended questions style which are likert scale and multiple – choice question.
  - ii. Three type of questionnaires for usability evaluation:
    - a) *Factual-type questions*: for objective data that it would be uneconomic to obtain another way.
    - b) *Opinion-type questions*: directing the respondents thought outward, basically determining the popularity of something.
    - c) *Attitude questions*: directing the respondents thought inwards, determining their satisfaction with an artefact and design detail.
  
- Usability Testing Measurement
  - i. Effectiveness
  - ii. Memorability

#### ***Sample and Population***

In this study, the researcher used stratified random sampling for the populations. A total of 150 respondents were recruited for this research. There were tourists with age between 25 to 56 years old. Using focus groups to evaluate a system is a very efficient way to get users feedback and gauge initial reactions to a design. Focus groups are also good at discovering how the system is being tested differs from the user's current expectations (Foraker, 2000).

#### ***Research Setting***

The effectiveness and usability testing session were conducted to observe respondents in using the VR of historic building project prototype. During the usability test, both verbal and nonverbal behaviours could be observed. In such situations, the methods and procedures adopted would require the ergonomist to use specialized equipment for recording and monitoring this information. The effectiveness and usability testing were performed remotely using a laptop in a different location. Expected locations were at the international public transport centre, tourism centre and Kampung Baru, Kuala Lumpur. These locations were chosen because of high density people with different types of profession. Feedback from different types of people will lead to a better result for this report writing. Respondents were instructed to navigate the two different types of images of Kampung Baru consisting of still photo and virtual reality panoramic photography. Before the testing, the respondents were informed about the purpose of the research and the testing measurement for usability of virtual reality in historic building appreciation. They were also informed about the current scenario of historic building preservation using a lot of still photos.



**Plate 1: Outdoor View of Kampung Baru Malay house by using VR photography**

### **Data Analysis**

This chapter will analyze in detail on all the data collected. The data analyzed will be divided into two categories which are based on effectiveness and usability. The data will be based on questionnaires given to 150 tourists who were divided into two groups. The first group was for tourists who had not visited to Kampung Baru or historical place before. They were asked on questions based on the effectiveness of the images. The second group was for tourists who had already visited Kampung Baru or historical places. They were asked on questions about the usability measurement. Each category will be analyzed based on the respondent's profiles and actual data measurement.

#### ***The Effectiveness of Images Data Analysis***

Still Photo	Virtual Reality Photography
4.2%	87.4%

**Table 1: The Effectiveness of Images Data Analysis**

Visualization of historical buildings through virtual reality photography is the most suitable method when used in the presentation of our culture and heritage values. Images and information through virtual reality photography provide users with a highly interactive experience to explore virtual environments in a unique and dynamic way. In fact, the use of virtual reality photography will encourage viewers to process the rich information provided by virtual reality worlds, and assist them to recall their new knowledge of historic building appreciation.

#### ***The Usability Measurement Analysis***

Effectiveness	70%
Memorability	64.1%

**Table 2: The Usability Measurement Analysis**

In conclusion, usability is the quality that enables easy access to users' interface when in use. The usability also refers to methods for improving ease-of-use during the design process. Besides that, usability and utility provide the ability to help users to carry out a set of tasks, together to form while using the system. The result of the usability testing can be treated as a baseline or control measurement to indicate improvement. Overall this usability testing can be concluded that each usability measurement metric is defined as follow:

1. *Effectiveness* is accuracy and completeness where specified users can achieve specified goals in a particular environment. The user's ability to successfully use the system to find information and accomplish his tasks.

2. *Memorability* is a system which should be easy to remember, making it possible for casual user to return to the system after some period of not using the system, without having to learn all over again.

### **Findings**

From the respondent's feedback, VR system had recently received a lot of attention and wide coverage which this system could be the main method of delivering information on appreciation our historical buildings. The effectiveness of images provided by this system could easily surpass and replace still photo which was an old conventional method of documenting historical buildings. The respondents without doubt agreed that this system of VR would be the most ideal and suitable method for presentation of our culture and heritage values compare to still photo. The effectiveness of virtual reality photography would enable it to provide viewers with the flow of information in an interactive and dynamic media which would be difficult or almost impossible to get through still photos or texts. Through this system again and in its context of usability, the respondents were made and felt more enhanced of its effectiveness on the perceive information. The respondents were able to experience and later accomplished the task of walkthrough the historical building. The respondents were able to gain access to information easily, quickly and without any frustration while using the system. The longer the respondents accessed and navigated through the system, the productivity and performance of respondents would be possible on the high level. Most of the respondents had also agreed that the degree of remembering the task materials with this system was basically simple and easy even after some period of time. The respondents did not have to start learning all over again about the system. Overall, the respondents were also satisfied that with this system they were able to experience many ideas and gained valuable new knowledge. Thus, upon completing their tasks they were able to meet and achieve their goals; they got the experience and plentiful of new and valuable knowledge. With this system it was also found to be suitable and reliable in areas of visual communication and transfer of knowledge amongst the public on almost any subject such as that on saving and preserving our valuable historical building in the country. Generally, old but valuable buildings should not be left to rot and decay through time and all steps should be taken to salvage them. The public at large generally would play their part to save, protect and finally preserve those buildings. This way, those buildings could be saved and preserved for the next generation of future modern societies to appreciate and to be proud of their national and cultural heritage.

### **Conclusion**

Thus, using VR in appreciation of our historical buildings, the simulations of real or imaged environment that can be experienced visually in 3D and may provide additional provide interactive experience in full real time motion with sound and possibly with tactile and other form of feedback compare to still photo. Usability in VR is now reliable and recognized in appreciating our heritage values as an important software quality attributes, earning its place amongst the most traditional attributes such as performance and accessibility. Furthermore, this system allows people to complete their task easily, quickly, satisfied and without frustration will save time and money for people to achieve their goals. Appreciation via VR will allow us to restore the artefacts and monuments either to their presumed 'as built' buildings, or to a particular time period since that time. The VR system can serve as promotional tools for enhancing heritage tourism and cultural awareness and education.

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