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Faculty of Cognitive Sciences and Human Development

A DIGITAL XR - STORYTELLING FOR CAT MUSEUM KUCHING: BYOD MODEL

Cheam Huey Wen

Bachelor of Science with Honours (Cognitive Science)
2021

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UNIVERSITI MALAYSIA SARAWAK

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Masters ☐

PhD ☐

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A DIGITAL XR - STORYTELLING FOR CAT MUSEUM KUCHING: BYOD MODEL

CHEAM HUEY WEN

This project is submitted
In partial fulfilment of the requirements for a
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(Cognitive Science)

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The project entitled ‘A Digital XR - Storytelling For Cat Museum Kuching: BYOD Model’ was prepared by Cheam Huey Wen and submitted to the Faculty of Cognitive Sciences and Human Development in partial fulfillment of the requirements for a Bachelor of Science with Honours (Cognitive Science).

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ABSTRACT

The emergence of technology such as Augmented Reality (AR) have been actively exploited for the improved user experience including museums visitation. Nevertheless, mobile augmented reality can be implemented with various added functionalities such as storytelling, Bring Your Own Device (BYOD), navigation, tour guiding, and many more. Several studies have highlighted the application with navigation and tour guiding; however, storytelling and Bring Your Own Device (BYOD) remains least explored. The current study presents a combination of storytelling with local contents and Bring Your Own Device (BYOD) model used in a Mobile Augmented Reality application and its overall usability evaluation at indoor settings. The research uses marker-based Augmented Reality with Rapid Application Development (RAD) and evaluate the usability using System Usability Scale (SUS) questionnaire. This study shows that mobile augmented reality application can portray information of the Sarawak Cat Museum to potential visitors.

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter reviews the background of study, problem statement, research questions and objectives, definition of terms, conceptual framework, significant of study, scope, and limitation.

1.2 Background of the study

The museums had used different manner to present the exhibition objects and its information within the museum itself physically. Then, there were transitions of the museums over the years from advertising themselves by sending out physical and digital brochures, catalogues, pamphlets, or flyers to visitors to develop applications that are accessible on different mobile devices for visitors to better interact with. The intention of this research study was to overcome problems of one-way interactions and excessive small text readings by incorporating the local contents into storytelling methods with augmented contents using the Bring Your Own Device (BYOD) approach. The augmented elements bring greater effects when it is collaborative with both the storytelling and BYOD methods. There are concerns of implementing augmented reality such as the type of markers, environment conditions, weather conditions, ergonomics, location, and technical conditions, that should be well studied and decided beforehand to develop a practicable prototype. However, limiting factors such as the duration of development time, costs, types of software development kits and application used will affect the feasibility of the prototype. Not only that, but the contents also used for storytelling should be analyzed by identifying the targeted audience for a better outcome. The BYOD method is useful in such a way that it addresses the personalization issue whereby it allows the visitors to better concentrate on interested objects since visitors are more familiar to begin with personal devices, and it will also promote the acceptance of augmented reality technology in Malaysia. Overall, this research is conducted to design and implement a mobile augmented reality system for the Sarawak Cat Museum using marker-based, storytelling, and BYOD approaches.

1.3 Problem Statement

It is crucially important to preserve any functional museum to show appreciation of cultural, scientific, and artistic values that potentially educates the public. From the conventional method, exhibitions bring up concern as it is least attractive and interactive for the public as it is mostly held with one-way interaction. Additionally, the exhibitions were below expectations since it restricts visitors to photographical or audio experiences only while there is a lack of emergence of technology to address the current demands of delivering rich and interactive content to potential (national and international) visitors. Subconsciously, the museums would have tension to bear with sustainable operating performance. However, it is advantageous for museums to improvise with the help of modern technological tools such as augmented reality by including unique local contents and cultural artefacts. As a result, it provides an interactive platform not only to reformat the existing information from the museum but also provides the museum with a greater chance of expansion economically, technologically, informatively, and more aesthetically. Not only that, the use of augmented reality brings more potential visitors even closer from before, by adapting and implementing suitable techniques to display visual information into more dimensions in accustomed new ways of experience. The proposed approach of implementing augmented reality into museum exhibitions in this research study is due to cost-effective implementation, reservation of existing display space of the museum, and potentially avoids large scale renovation and reconstruction of the existing museum.

1.4 Research Questions

1. How to portray information of the Sarawak Cat Museum to potential visitors?
2. How to present the information in storytelling using Mobile Augmented Reality?
3. How practical is the Mobile Augmented Reality storytelling method for the Sarawak Cat Museum?

1.5 Research Objectives

1. To collect the cultural information about Sarawak Cat Museum and digitize it to implement into a Mobile Augmented Reality system.

2. To design and implement the digital cultural information in Mobile Augmented Reality prototype using the storytelling and Bring Your Own Mobile (BYOM) model.
3. To test and evaluate the usability of the Mobile Augmented Reality prototype using System Usability Scale (SUS).

1.6 Definition of Terms

Table 1

Listed definition of terms

No	Terms	Conceptual definition
1	Augmented reality	A technology that enhances user experience by the mixture of a real and virtual environment with real-time interaction and digital elements (Linowes & Babilinski, 2017).
2	Museum	A non-profit organization that provides a platform for acquiring, conserving, researching, and communicating unique humanity and its environment to serve the community (International Council of Museums, 2007).
3	Storytelling	A process to better engage communication using facts and narrative methods to improvise explanation in a series of contextualized information (Pavlik & Bridges, 2013).
4	Bring Your Own Device (BYOD) model	This concept indicates the usage of personal mobile devices to connect to any related system provided by the organization (Martinelli, Mori & Saracino, 2016).
5	Unity 3D	A development platform that provides a graphic engine and full-featured editor to create applications suited in different physical devices (Linowes & Babilinski, 2017).
6	Software Development Kit (SDK)	A software development tools comprises of various collections of algorithms and device management that aids developers to create applications (Cheng, Chen & Chen, 2017).

1.7 Conceptual Framework

This is an illustrated concept map created by Alexander (2019) that comprises of six superpower that is correlated with six user journeys useful for the organization of creative components added for the Mobile Augmented Reality development (*Figure 1*.). In this research study, it is used to clarify, state, and apply selected superpowers (teleportation) at different user journeys (discovering, considering, and using) since it has clear perspectives and between different development stages and allows appropriate considerations to be made for each element, respectively. Teleportation was selected to present digital or augment objects which brings people closer to the futuristic visions on par with local contents and stories, storytelling, and Bring Your Own Device (BYOD) model.

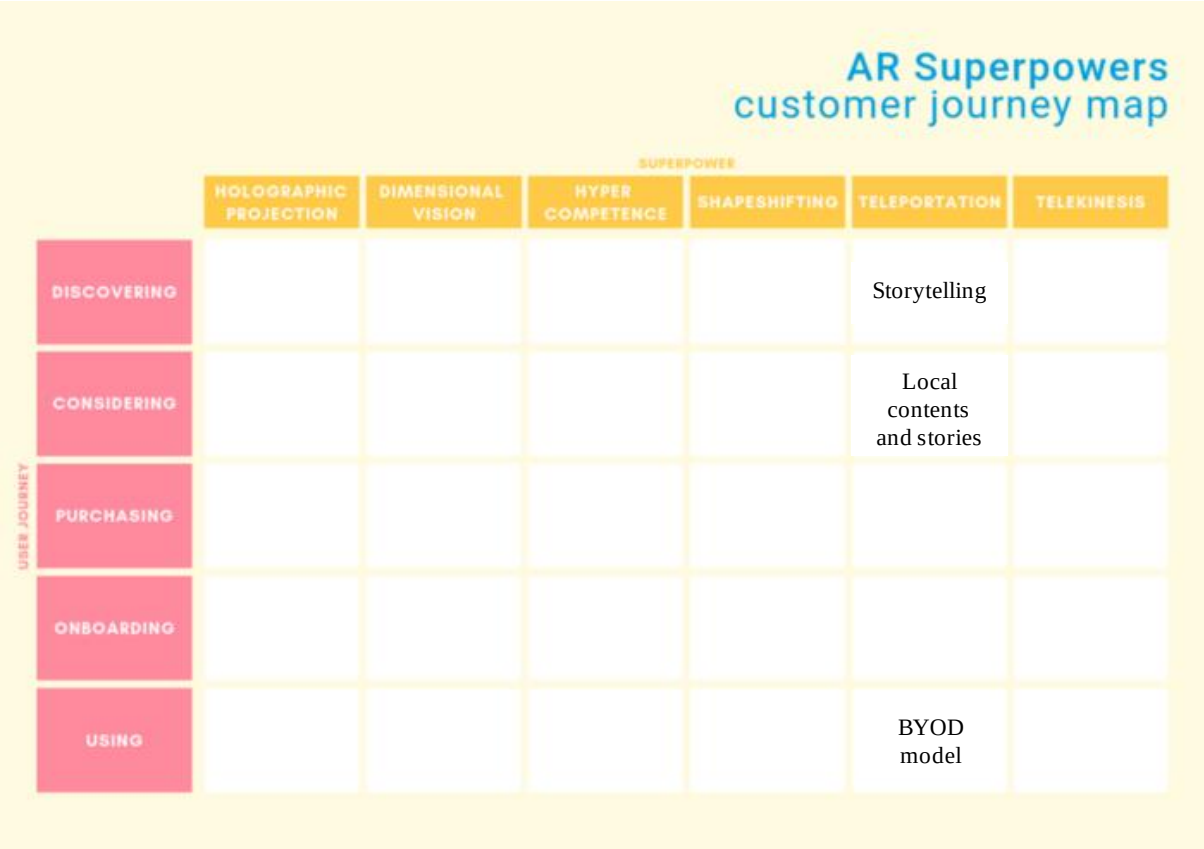

Figure 1. Conceptual framework of the proposed research study. Adapted from AR superpowers, by Alexander, J. (2019). Retrieved from https://uxdesign.cc/ar-superpowers-b03d1a026bef.

1.8 Significant of research

This research study aims to create a mobile augmented reality system via android platform for the Cat Museum based in Kuching, Sarawak, Malaysia. Different methods have been implemented from past studies to create a highly interactive system to attract more museum visitors. The proposed system can improve the interaction between the museum and visitors and enhance a better and deeper understanding of the information about cultural artefacts. In addition, the visitors can use their mobile devices, provided with appealing graphics, animations, and audio to better perceive, and discover the displayed objects. This will enhance greater attraction and further educate visitors in a highly effective method. The advanced application of augmented reality technology is beneficial to the museum as it leads to the greater interests of the crowds for more potential visitors, especially intentional or young visitors who are cat lovers. It is beneficial to reduce or avoid the immense cost of renovation and reconstruction thus, effectively reserving the existing building architecture.

1.9 Scope and Limitation of research

This research study aims to design and implement an augmented reality mobile system for the Cat Museum via storytelling strategies. However, it was built based on an android platform for users of any android operating system personal mobile devices.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discusses the traditional museums, modern museums with augmented reality, the technology of augmented reality, storytelling, and Bring Your Own Device (BYOD) model.

2.2 Traditional Museums

2.2.1 Concept of Traditional Museums

The traditional museums are commonly found of an institution that operates for evidential collection of diverse types of valuable objects (value systems, cultural memory, and scientific inquiry) while having to preserve, maintain, and display them at a given space (International Council of Museums, 2007; Pedersen, Gale, Mirza-Babaei & Reid, 2017). The museums exist in two forms, that is public and private institutions, and has a specific time for operation, regular or seasonal (Candlin & Larkin, 2020). Besides, the accessibility of the museums is based on the ticket, government, or non-government organization funding. Also, the museums may have both temporary and permanent exhibitions held according to different themes or seasons. The museum may also be formed in different fields such as arts, history, science, war, medical and so on. A museum is a prominent place for the provision of knowledge across the community and society (Panciroli, Macauda & Russo, 2018). Pedersen, Gale, Mirza-Babaei and Reid (2017) had mentioned that the preservation and maintenance of valuable objects are a form of knowledge articulation to the audience.

2.2.2 Implications of Traditional Museums

Nevertheless, some prominent issues arise after the transitions of technology. According to Hu and Tsai (2016), the conventional method of displaying information is via the usage of physical brochures, catalogues, pamphlets, or flyers that does not reduce paper consumption but also going against the eco-friendly concepts. The conventional display also includes static art with information boards that require ample reading, hence, there is no life-like virtual characters and

social presence (Dang, 2018; Park et al., 2019). Visitors are expected to read the exhibition information boards with small texts and long explanations. This potentially creates a gap between the younger generation (audiences with the existing technology) which provides greater mobility, network access, and interactivity. The lack of understanding for the visitors leads to inflexibility to choose based on their preferences from different series of collections, especially for new visitors. The reduction of visitors may cause lesser income of the museum for its operation and maintenance. Van den Akker (2016) had suggested that the museums should consider the importance of influence that should not be limited to whatever is inside of the museum but also to include the exterior of the museum.

2.3 Modern museums with Augmented Reality

2.3.1 Concept of Modern Museums with Augmented Reality

From a different standpoint, many museums had revolutionized and picked up modern technology to improvise and attract more visitors (Dang, 2018). The augment visuals can be used and adapt to different environment settings, such as indoors and outdoors (Panciroli, Macauda & Russo, 2018) but it requires proper implementation and testing. Panciroli, Macauda & Russo (2018) had also highlighted from all kinds of mobile devices, smartphones were most used in designing and transforming the assigned space for the exhibition of objects into digitalized augmented environments in museums.

2.3.2 Benefits of Augmented Museum Application

Such technology had shown promising results over the years that it provides greater accessibility and enhances the experience of art and heritage within the digital culture as it is more meaningful and interests the public (Van den Akker, 2016). The creative expression and museum fruition provide unique convergence for knowledge, creativity, and imagination according to immersive modalities to provide engaging interpretation, to present multiple viewpoints, to educate and challenge visitors (Panciroli, Macauda & Russo, 2018). The use of digital culture also brings such advancement for visitors, including both on-site and online approaches since it prolongs and improves the museum experience rather than becoming a substitution to replace any physical visitation (Roberts-Smith & Ruecker, 2017; Van den Akker,

2016). Not only that, it encourages the visitors to embrace a stylish and cultivated sense of aesthetic, historic, scientific, and cultural value during the visitation (Van den Akker, 2016). In fact, augmented reality technologies offer greater benefits especially for the youngsters to investigate a specific region and its city heritage that are capable of providing refined comprehension and open to new prospects that are memorable (Panciroli, Macauda & Russo, 2018; Roberts-Smith & Ruecker, 2017). Hence, the visitors need not to divide their attention between the surrounding and the aiding analogue or digital contents (Marques, 2017). The remodelling of virtual elements connects with real-world elements intensify the immersive experience to retrieve the impression of being present for a unique object of illustration regardless of its modes, for indoor or outdoor (Hu & Tsai, 2016; Panciroli, Macauda & Russo, 2018). Al Rabbaa, Morris and Somanath (2019) had also mentioned that it is practical for specifically directed wayfinding, to gain attraction and attention from the users, and to further encourage art engagement more vigorously. The developed system or application can be used in both settings, on-site and off-site depending on the needs (Hu & Tsai, 2016).

2.3.3 Research Studies and Examples

According to different experimentations of implementing augmented reality, it is a great technology that leads to positive feedbacks (Fenu & Pittarello, 2018; Ilhan & Celtek, 2016; Marques, 2017; Panciroli, Macauda & Russo, 2018) since it increases the satisfaction of visitors (Park et al., 2019) and had motivated visitors to obtain more information and experience with the system (Al Rabbaa, Morris & Somanath, 2019; Roongrungsi, Namahoot & Brückner, 2017). It also enhances imagination, emotional experience, and cognitive growth (Panciroli, Macauda & Russo, 2018), provide more continuity (Fenu & Pittarello, 2018) and repair gap between the visitor expectations and their experience in museum exhibition (Marques, 2017), increase and direct their attention by emphasizing and superimposing (Ghouaiel, Garbaya, Cieutat & Jessel, 2017).

There are a few applications and systems of Augmented Reality used in different museums as listed below: