



Design and Development of Interactive Media Installations, Experimental Prototype for U-Thong National Museum, Thailand*

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Abstract

This paper describes the design and the development process of interactive media installations at U-Thong National Museum in Thailand. This experimental prototype is attempted to design a model for revitalizing historical displays and to explore ancient objects, stories, and environment creating an interactive media installation in the original physical space of the historical museum. The experimental results are part of the researcher's PhD dissertation. This paper will describe the interactive installation through a tour of the entire design and development cycle of The Replay: U-Thong Sri Dvaravati exhibition. A key problem when working in the National Museum is the connection between two eras of old and new by experimenting the techniques to use on ancient objects. Finally, this paper will include increasing understanding of the historical objects in the Museum, using interactive media and examining its impact on the visitor's understanding and enjoyment of the museum experience, reviews the methodology employed, and provides a summary of concluding findings.

Key words: interactive technology, ancient objects, revitalizing experience, interactive design, physicality old space, Thai national museum

Introduction

Currently, interactive media technologies are widely used in museums in order to create content which is more interactive and garners more attention from the audience. Museums play a significant role as learning centers, especially when they provide interactive experiences, which may or not be technologically enhanced. The best learning in museums

occur when people are engaged cognitively, physically and emotionally (Ciszentmihalyi, M. et al., 1994). Primarily, interactive media technology has been widely used to modify or renovate existing museum space and to create new content. However, there are many permanent historical displays in museums and the museums lack funds to renovate. The museum visitors, especially the young, are not interested

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in the old presentation format. This study explores an alternative approach using interactive media to attract and garner more attention from the audience in order to solve the problems of display and presentation in historical museums of which there are hundreds in Thailand. The audience will enjoy learning ancient history and gain more knowledge.

Objectives

1. To study the design development of an interactive media for ancient collection museum.
2. To study the techniques and programming of designing interactive media for ancient collection museum.
3. To create the experimental prototype an interactive media installation in the original physical space of a design study of U-Thong National Museum.
4. To develop an alternative model for revitalizing the experience interactive media in historical collection museum.

Hypothesis

This concept of dissertation involved a range of content design and experimental techniques in a design case study at U-Thong National Museum (Figure 1), which is one of the most important historical museums in Thailand. The museum collects and displays artifacts of U-Thong, which was a historical



Figure 1 Ancient objects displayed physically on old space at U-Thong National Museum, Thailand.

period in early Thailand. Historians believe that the U-Thong Ancient City was the birthplace of Buddhism in the land of Suvarnabhumi and a major maritime trading center, as well as the center of Dvaravati culture (Proboot Chantachok, 2007). As mentioned above, several factors led researcher to believe that the U-Thong National Museum would be a perfect selection for this design case study and field experiment which shows the concept of revitalizing the experience of a historical museum's permanent collection using interactive media. The development of the experimental prototype is summarized in presentation.

Materials and Methods

Conceptual Model Framework Descriptions

The diagram (Figure 2) shows the concept for revitalizing an ancient object in museum using interactive media. The summarization of the preliminary model framework is as follows: First, an analytical overview of the museum's weaknesses, strengths, opportunities and threats and also the existing content, the atmosphere or environment, and the target audience. Second, analysis of the content objects in terms of location, history, value and atmosphere. Third, interactive media design should be analyzed from the perspectives of physical space, emotion and atmosphere, audience behavior, installation and maintenance. Fourth, analyze the audience's experiences regarding space, emotion, perception and recognition (Atitthep Chaetnalao, 2012).

Field Experiments of Content, Space and Interactive Technology

First Step, The research was performed utilizing a questionnaire, observations and interviews of visitors at the U-Thong Sri Dvaravati exhibition room. All the details of size and dimension were determined. Then the researcher created the layout plan for analysis of the content design using the following tech-

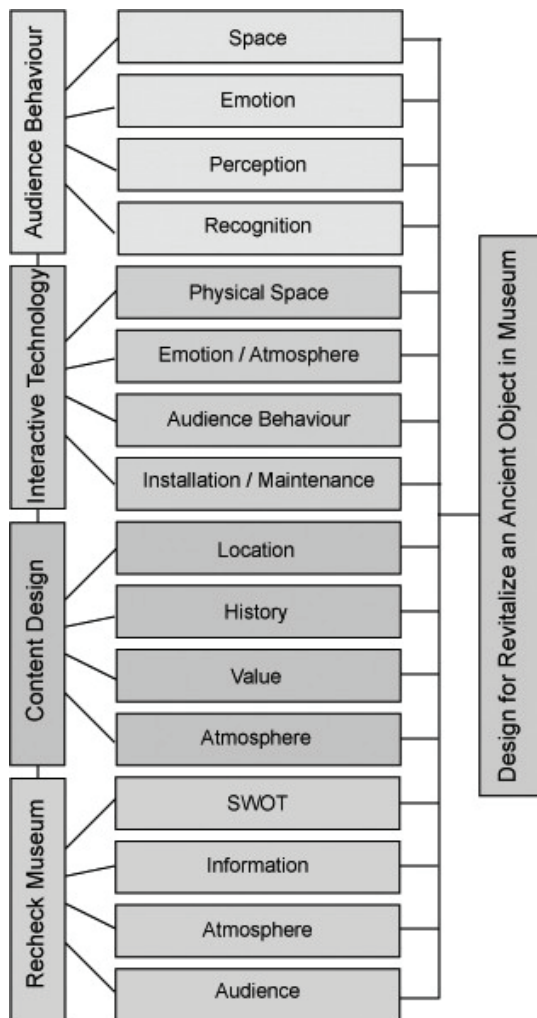


Figure 2 Conceptual framework for designed prototype model to revitalize historical displays and explore ancient objects, stories and environments.

niques.

Second Step, The content selection and interactive technology (Figure 3) were the first draft of the design solution. First, the entrance section presents the overall guide to the visitor by using the Kiosk Touch. Second, the introduction space section evokes the mood and tone of the exhibition using the story of the excavation of an ancient pagoda and using sensors to control the presentation by projecting motions on the floor and ceiling or mapping on to the Chedi model. Third, the Buddha image section tells the story of the Buddha and presents his first sermon in the

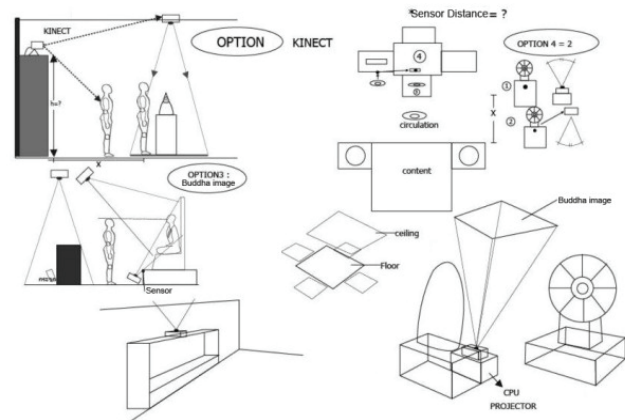


Figure 3 The placement sketch of content and Interactive technology for the experiment

Deer Park at Sarnath by using sensors and projector mapping motions on the Buddha or ceiling. Fourth, the Dharmachakra section presents the religious story using hologram techniques. Fifth, the stucco section projected by Kiosk control and motions on to the background wall. Sixth, the artifact section displays in the cabinets using the Mobile Device to give more information.

Third Step, Interactive technology testing was part of the field study which experimented with the techniques of interactive technology for each section (Figure 4). The first thing explored was the projector issues such as placement, short distance and long distance and brightness of the images and installation. The experimenter tried a variety of positions such as on the cabinet, the base of the Buddha image, on the Chedi model and on the stucco section. At the same



Figure 4 The field experiment content and projection in U-Thong Sri Dvaravati Exhibition Room at U-Thong National Museum

time, experimental techniques were used to control the content at each position. For instance, whether sensors worked with short or long distances, in darkness or light and in the normal light of the exhibition room. The results of the experiments in real space revealed significant limitations affecting the placement of the projector and the techniques used. In addition, the brightness of the lighting in the exhibition room and also the character of the surface of the floor, ceiling, walls and the object itself required consideration. The results revealed the need to adjust the image and motions to a high resolution clear enough to communicate with the audience.

Fourth Step, The ancient Chedi model field experiment (Figure 5) was selected as the first case study. The researchers began by measuring the dimension of the Chedi model. Then, they worked on a mock up paper model for testing projector motion before going to the real space. During the actual experiments, the researcher measured the proportion of the Chedi model again to determine the position of the motion in the computer files for perfect projection, fit and also to preview background images on the Chedi model to see how it worked. In addition, the experiments determined the distance and location of the projector. The first was located on top of the Chedi model and other was located in front of the Chedi model. Then they had to adjust the distance of the projection angle to 45 degrees to focus the mirrored image towards the Chedi model. The results will be used to guide further design development.

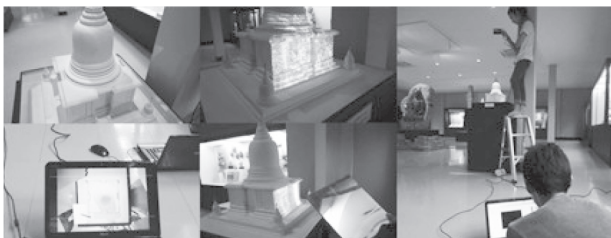


Figure 5 The field experiment content and techniques in U-Thong Sri Dvaravati Exhibition Room at U-Thong National Museum.

Results and Discussion

The Replay: U-Thong Sri Dvaravati Exhibition

The Replay: U-Thong Sri Dvaravati (Figure 6) (Atitthep Chaetnalao, 2012) is the exhibition presenting retrospective concepts to increase the ancient objects' liveliness by improvement of the old content, presentations and atmospheres to revitalize them and make them more interesting (Figure 7). To achieve that purpose, it was presented by combining modern presentation processes and focused on allowing visi-



Figure 6 Display of the Replay: U-Thong Sri Dvaravati Exhibition at U-Thong National Museum

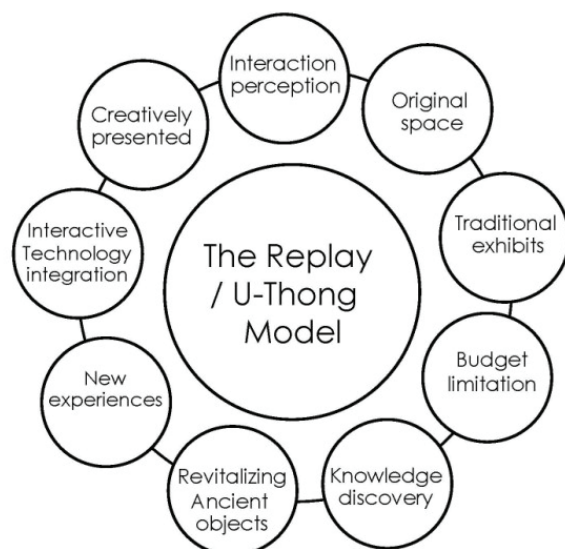


Figure 7 The Replay: Prototype Framework of the experimental prototype at U-Thong National Museum.



Figure 8 Display of the Discover for the Replay Zone at U-Thong Sri Dvaravati Exhibition Room

tors to have co-experiences with Dvaravati Era antiques found in the ancient U-Thong, thousands of years ago. The exuberances of cultures in that era, represented by the walking of lives going side by side as in the teaching of the Buddha, have great value as if gold is shining all over the ancient U-Thong display in U-Thong Sri Dvaravati room at U-Thong National Museum, Suphanburi, Thailand. The exhibition presents modern forms creating antiques' liveliness and more new experiences in visiting a museum. The technologies emphasize presenting content and ancient objects. Furthermore, the exhibition presents knowledge from research papers utilized in creation to develop and enlarge the exhibition and also mark the Flashback to Story as an archetype for other museums.

1. Prototype: Discover for the Replay

Discover for the Replay Zone (Figure 8) is the creation of atmosphere for welcoming visitors by letting them feel the golden light glittering throughout the ceiling and crossbar of the entrance to the U-Thong Sri Dvaravati room with "Sara" flowers falling. Visitors will recognize this when they are standing at the place abounded with faithfulness in religion because the "Sara" flowers are deemed religious flowers with respect to Birth, Enlightenment and Nirvana of Buddha. Moreover, visitors will take part in presentation when waving their hands on the falling "Sara" flowers which will then vanish gently which creates a tremendous sense of recognizing and enjoyment for visitors.

The Design Development and Installation:

Principles of the Discover for the Replay Zone will be controlled by Webcam's Motion with user's detection when they come to play. The development was divided into four parts. First, motion graphics content by thinking of storyboard prior to structuring content to be presented in the proper position. Then making the motion graphics content with the motion editing software and refining it after the trial in real space. Second, programming which must work between motion graphics and coding by preparing separate files for background, animation and objects. Then working on Flash software method called "Motion Detection" which works in conjunction with the Webcam and Sensors to capture the motion. Then play motion graphics with Flash from case study of Flash 8: Webcam Snowstorm from Grant Skinner (Skinner, 2005). Principles used and modified the wave to make the flowers fall and stick on the gate. Third, hardware which has been used includes Projector, Camera Webcam and Computer. Fourth, installation; (Figure 9) caution must be given on webcam position to determine the movements of visitor and setting of Projector must not be covered when it is playing and also the Projector Box's holder needs to have enough space for cooling so it does not overheat when playing the content. The audience will have to determine where to stand and wave in order to obtain the proper affect.

Media Techniques: Projector, Camera Webcam and Computer

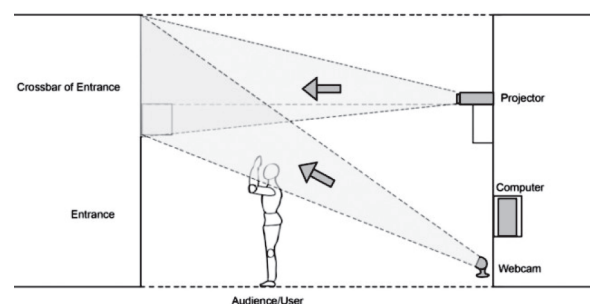


Figure 9 Installation Media Techniques Display at Entrance Area of the Discover for the Replay Zone.

2. Prototype: The Culture Odor

The Culture Odor Zone (Figure 10) creates atmosphere in U-Thong Sri Dvaravati exhibition room with motion graphics and odors. When visitors walk into the room, the atmosphere of golden light shedding down and leading to civilization will appear with “Moke” flowers continuously falling down. Concurrently, visitor will catch the scent of “Moke” flowers which have connotation about Thai culture in Buddhism with the meaning of innocence and Thai people also believe and relate to ancient objects which are exhibited in the room.



Figure 10 Display of the Culture Odor Zone at U-Thong Sri Dvaravati Room.

The Design Development and Installation:

Principles of the Culture Odor Zone will be controlled by the electronic device controller. Controller was made by a circuit FK 512 switch for catching visitor’s movement of walking into the room for a period of 3-5 seconds and then motion graphic will be played on the wall. Concurrently, visitor will get the scent of “Moke” flowers when entering the room which is scattered near the entrance. The development was divided into four parts. First, motion graphics content started by thinking of storyboard prior to structuring content to be presented in the proper position. Then, make the motion graphics with the editing software and refine the final size after trial in the real space. Second, programming which uses the VDO join coding by preparing a final VDO file and then

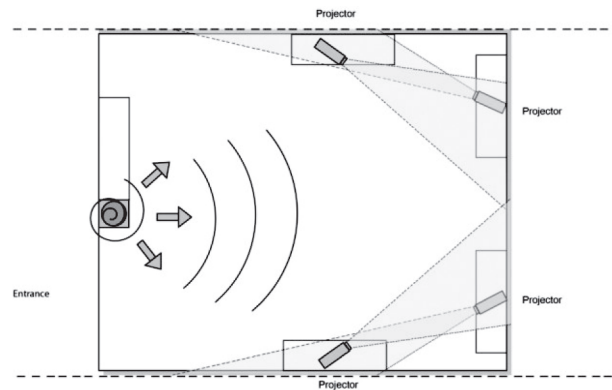


Figure 11 Installation Media Techniques Display (Top View Floor Plan) of the Culture Odor Zone at U-Thong Sri Dvaravati Exhibition Room.

crop split into four sections. Next, use the program Flash to write a script file. With that, playing time is flexible and easy to control by the motions. Third, the Hardware which has been used is Projector, Sensor and Computer. The principle of control hardware is a series of experimental Infrared Circuit FK 512 sensors. Fourth, installation (Figure 11) needs to calculate the distance access to all controls and consider the devices as well. The projectors have to be set in order to project the four motions and fit into the full area. The next issue is installing sensor to catch the visitor within a good walking distance and installation angle position.

Media Techniques: Projector, Sensor and Computer

3. Prototype: The Story of U-Thong

In the Story of U-Thong Zone, the pagoda models build by the National Museum U-Thong present contents of artifacts that were found around pagoda called Chedi and ancient remains presenting a civilization of culture in Dvaravati Era. The gorgeous building is decorated with stuccos showing religious items, art and other items of cultural value. Thus, it is narrated by motion context and sound using Hologram technique creating 3D motion picture which visitors can watch all around the Chedi model (Figure 12).

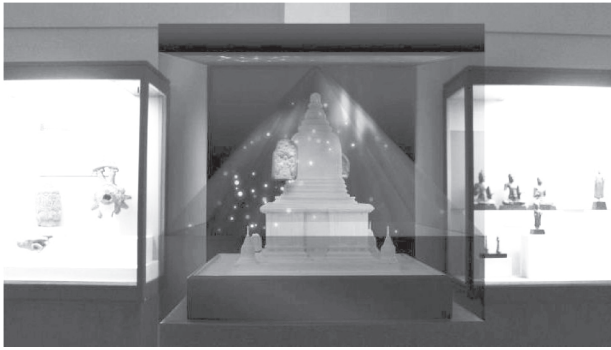


Figure 12 Display Hologram technique creating 3D motion of the Story of U-Thong Zone at U-Thong Sri Dvaravati Exhibition Room.

Moreover, visitor can get more information and feel like they are back in Dvaravati Era with the dimension enabled for them to see all around them.

The Design Development and Installation:

Principles of the Story of U-Thong Zone will be controlled by a circuit using a FK 512 sensor infrared switch control. When visitor approaches pagoda model, motions with light and sound will project the story about artifacts unearthed on pagoda. The development was divided into four parts. First, the presentations in this section will be 3D motion which uses Hologram techniques to apply from Future Kit (Future Kit: <http://www.futurekit.com>) The content started by thinking about storyboard to structure that presented on both input and output. The matter of

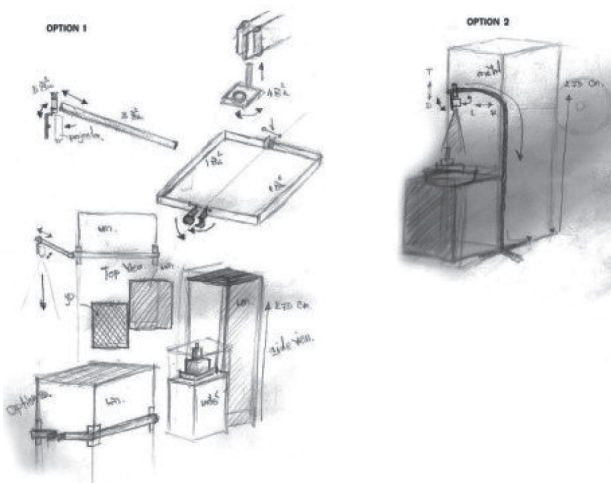


Figure 13 Media Techniques Installation of the Story of U-Thong Zone

proportion, which are width, length and height, need to be a concern for applications and motions and final file must fit in space. When finished with the overall content, then have to try projecting motions into actual location that where projector has been installed (Figure 13). Second, programming has used the VDO join coding by preparing a final motions file and then crop splitting into four sections. Then, use the program Flash to write an Action Script file which will be flexible and can easily use the VDO method that is known as the URL address of the motion. The motions have to be configured to receive the KEY by pressing the button which must be defined using the entire button. When both parts are available, the motion can be previewed by pressing the key. Then, motion graphic backgrounds have to play along with the 3D motions when visitor approaches near the Chedi model. Third, hardware that is used is projector, sensor, computer and light. The projector is used to project motion to Hologram monitor (Theory Hologram, <http://www.wikihow.com/Make-a-Hologram>). The Projector will be installed on a pole for projecting down on the Hologram which is made by Acrylic's Box. The control of this zone is activated as a switch working order when visitor walks into Chedi model. The hardware is switch command with trial circuit FK 512, which is set up by the infrared sensor and must work through the handle of the sensor and refitted Key box structure of the circuit. Fourth, installations (Figure 14) of this zone have to be concerned with interval between projectors and Hologram's box as to whether they can project motion into full area or not. Additionally, projector holder must be secured and have enough surrounding free space not get overheated. Next, speakers will be installed and set up soft sound background bringing the attention of visitor to the Hologram but being careful that sound does not disturb visitor. The Latter is installed on base of the equipment especially the Acrylic's Box of Hologram has to be durable and not on wobbly legs and projector must grip on pole well

and do not come off or move in scroll position. When installing the sensors, care must be given to intervals and phases when watched by the audience so that there is enough space to activate the story. The last thing

needed is to plan to have enough time to set up and keep it neat regarding wiring and cables.

Media Techniques: Projector, Sensor and Computer

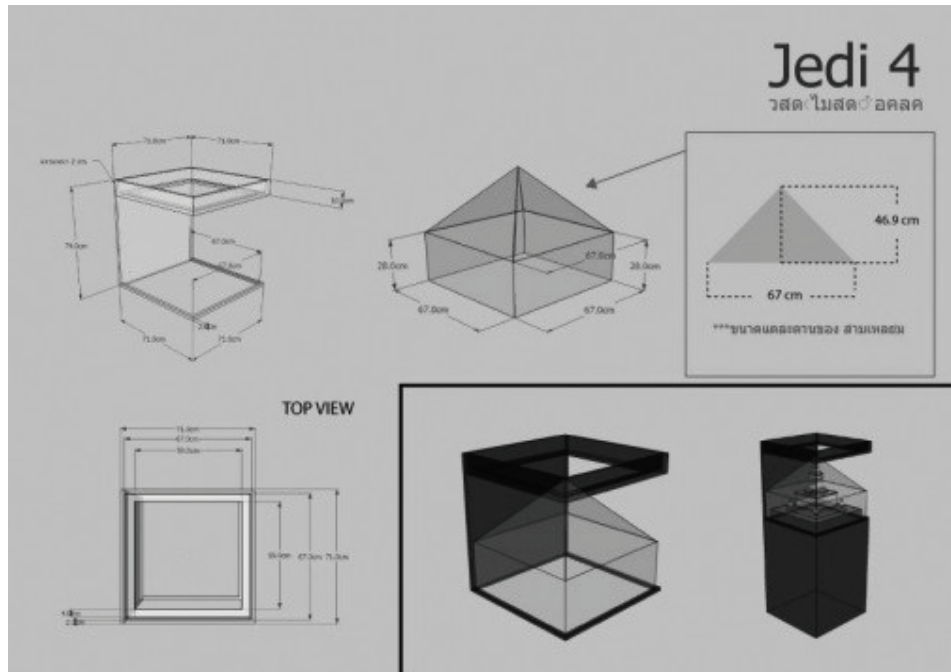


Figure 14 Media Techniques Installation of Hologram technique creating 3D motion Display of the Story of U-Thong Zone

4. Prototype: Buddha's Sermon

The attitude of giving the first Sermon Buddha image with right hand on left on the lap. The base is a crouching deer image indication the first preachment of the Buddha at Marukhathaiyawan forest. Thus, the Buddha's Sermon Zone (Figure 15) creates new atmosphere and experience setting for the carpets for practicing the Dharma at the front of Buddha image. The visitors will be introduced to this when they see the practicing carpet and know they should kneel down to pay respect to Buddha's image. Their respects will cause motion graphic of forest atmosphere to appear on the ceiling. There is a forest having a great high of "Ton Pho" with golden leaves falling down slowly when the breeze blows. Then, sound of birds and forest background is heard as if visitor is sitting and listening to the Buddha's preacher in

Marukhathaiyawa forest causing acknowledge in context. The feeling and imagination make objects livelier and have interactive harmony with visitors.



Figure 15 Display and Installation Media Techniques of the Buddha's Sermon Zone at U-Thong Sri Dvaravati Exhibition Room

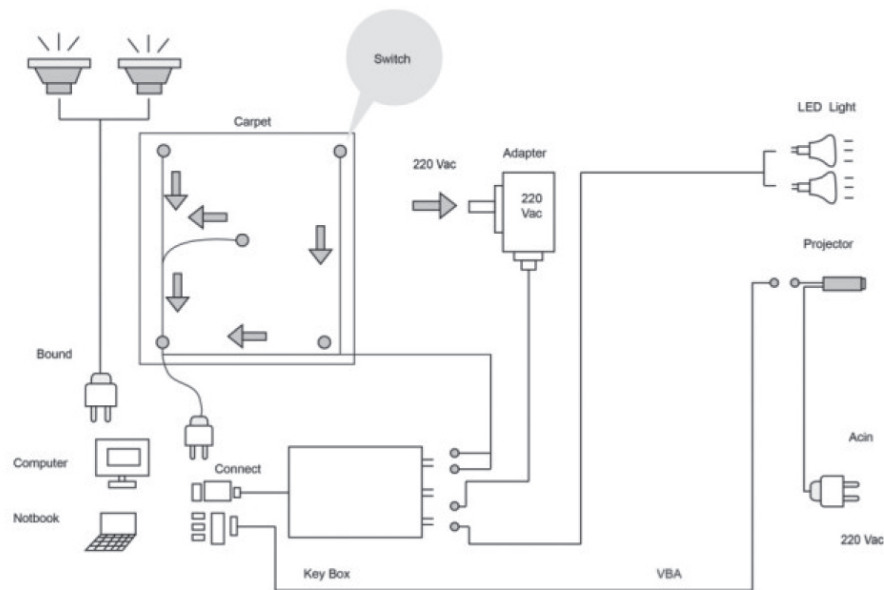


Figure 16 Diagram of the Hardware display of the Buddha's Sermon Zone.

The Design Development and Installation:

Principles of "Buddha's Sermon" Zone will be controlled by pressing and releasing a switch. The user will be instructed to sit down on the carpet and then the motion graphic will project up to the ceiling above the Buddha. The development was divided into four parts. First, Motion graphics content started by thinking of storyboard prior to structuring content to be presented in the proper position. Then, the motion graphic content was made with the motion editing software and the implementation work on size, width, space and the refining of final content needed for trial and fit on to ceiling. Second, Programming which had to work between motion graphics and coding by preparing a separate file for background, animation and objects. Next, working on Flash software called "Motion Detection" in conjunction with the sensors to capture the user. The next step was using an Action Script application which works flexibly and easily by the method referred as the URL address motion graphic. This section was coded so that it cannot be pressed repeatedly to play VDO until the motions have been finished playing then new visitor can participate. Third, the Hardware (Figure 16) which has been used is Projector, Controller and Computer.

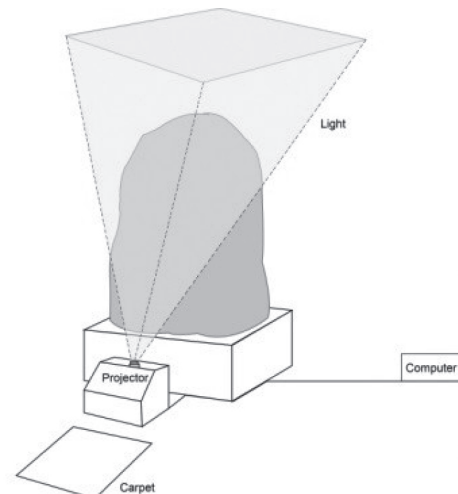


Figure 17 Display and Installation Media Techniques of the Buddha's Sermon Zone at U-Thong Sri Dvaravati Exhibition Room

Fourth, installation (Figure 17) which has to consider where to install equipment, especially projector which needs to be located at sufficient distance to project the motion in proper position to fit on to ceiling. The Projector Box's holder needs to have enough room for cooling and not overheat when playing the contents. Moreover, the carpets must be installed carefully because the cables and wires must remain safe and neat when the visitors sit on the carpets.

Media Techniques: Projector, Controller and Computer

Conclusion

The chosen methods of field experiments on contents and techniques allowed the researcher to build a satisfactory idea of the viewer interacting with the museum objects and make preliminary findings during the experiments in the Sri Dvaravati exhibition room, at the U-Thong National Museum. The researcher decided to discard the idea of using an interactive mapping which projected motion graphics onto the Buddha image. This was because the researcher observed that some of the audience wished to pay homage to the Buddha image (Figure 18) by bowing and touching the image. Therefore, the researcher must pay attention to the culture, beliefs and religion of the museum visitor from the point view of an archaeologist and a historian in the development of design solutions.



Figure 18 The audiences have come to pay homage to the Buddha image at the experiment of the Buddha's Sermon Zone.

Recommendations

The results of the experimental prototype in development and design solutions (Figure 19) found that the conceptual model is associated with knowledge and understanding of many aspects of the exhibit, such as history, content design, interactive media, digital content and exhibition design. All of this reveals that design development requires experts in the development of this conceptual model and also found that the physical space limitations of the traditional exhi-

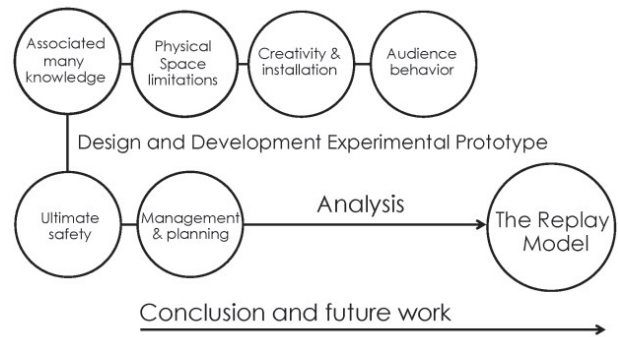


Figure 19 The conclusion and future work of the experimental prototype at U-Thong Sri Dvaravati Exhibition Room.

bition format must be used as part of the new technique to be compatible and fit in with the original style. Moreover, the researcher explored the following concepts of refreshing visitor experiences to a historical museum using interactive media: creativity and installation, physical space, atmosphere, lighting, diagram design of equipment, how to install an interactive design, audience behavior, techniques, technology, and making the aesthetics of interaction generally more user friendly. More than that, the feature of interactive technique or new media will draw attention from the audience, but as with any zone that has been constructed the survey found that the researcher must consider the behavior of the audience and variables related to the perception (Atitthep Chaetnalao, 2013). Besides that, the experimental prototype needs to be ultimate careful while working with ancient objects in the museum. Not only does installation have to be very safely done regarding electrical systems and heat, but also any demolition that needs to be done needs to be very careful not to damage the physical space. The value of ancient objects cannot be estimated and cannot be replaced if damaged or destroyed. In addition, a successful project requires good management and planning in the design process from start to finish. Finally, these prototype results relating to a model used to refresh visitor experiences at a historical museum will be a part of

this researcher's PhD dissertation. Regarding further research, this model study of "The Replay" will be used as an experiment for other cases in difference kinds of ancient objects, stories, and environments, for example a historical site in Thailand through future follow-ups (The Replay Exhibition: <https://www.facebook.com/TheReplayExhibition>).

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Notes

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