

Gathering Requirements and Designing Mobile Application Phra Mahathat Woramahawihan Temple for Thai Tourists

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Abstract

This research gathered requirements from 31 Thai tourists to design and evaluate a mobile application for visiting Phra Mahathat Woramahawihan (PMW) Temple as there was no such technology available. The advantages of using technology in cultural destinations include creating an interest and attracting more tourists. The mobile application was designed with content and user interface based on theories and related works. The Mobile Application Thai version was successfully designed and tested with 31 participants. The next step will be developing the Mobile Application and uploading it to the android and app stores. Then, the experiment with 30 participants will be run at the Temple. The results of the existing study show that the overall mean score for Thai tourists in all aspects is 4.29. Most visitors required the information about important points ($X = 4.67$), need text and pictures to describe the information ($X = 4.57$), and signs and maps to explain the important points ($X = 4.53$). The mean evaluation score of WebThai2Access was 4.23. Participants rated 3.0 in 2 aspects: can access to information from links and image layouts are appropriate. The 2 issues have been improved following the suggestions. An independent sample t-test showed that the mean rating was greater than 3.5 at the $p < 0.05$ significance level. The overall mean rating in user interface and design was 4.22. The independent sample t-test showed that the mean rating was better than 4.0 at the $p < 0.05$ significance level.

Keywords: Mobile Application, Phra Mahathat Woramahawihan Temple, User Interface Design, Requirement

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การเก็บรวบรวมความต้องการข้อมูลและการออกแบบโมบายแอปพลิเคชัน วัดพระมหาธาตุ วรมหาวิหาร สำหรับนักท่องเที่ยวชาวไทย

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บทคัดย่อ

งานวิจัยนี้เก็บรวบรวมข้อมูลจากกลุ่มตัวอย่าง 31 คน เพื่อออกแบบและพัฒนาโมบายแอปพลิเคชัน นำเที่ยววัดพระมหาธาตุวรมหาวิหาร จังหวัดนครศรีธรรมราช ซึ่งในขณะนี้ยังไม่มีเทคโนโลยีนำเที่ยวที่ดึงดูดความสนใจของนักท่องเที่ยวในการท่องเที่ยวเชิงวัฒนธรรม การออกแบบโมบายแอปพลิเคชัน มี 2 ส่วน ได้แก่ การออกแบบเนื้อหา และการออกแบบส่วนเชื่อมต่อกับผู้ใช้ โมบายแอปพลิเคชันที่ผู้วิจัยออกแบบได้รับการทดสอบการใช้งานกับกลุ่มตัวอย่าง 31 คน ขั้นตอนต่อไปจะอัปโหลดแอปพลิเคชันไว้ให้บริการบนระบบปฏิบัติการแอนดรอยด์และไอโอเอส และจะทดสอบกับกลุ่มตัวอย่างจำนวน 30 คน ณ วัดพระมหาธาตุวรมหาวิหาร ผลการวิจัย พบว่า คะแนนเฉลี่ยโดยรวมของนักท่องเที่ยวชาวไทยเกี่ยวกับเนื้อหาที่ต้องการมีค่าเฉลี่ยที่ 4.29 นักท่องเที่ยวส่วนใหญ่ต้องการทราบข้อมูลเกี่ยวกับความสำคัญของจุดสำคัญต่างๆ ภายในวัด ($\bar{X} = 4.67$) รองลงมาต้องการข้อมูลที่เป็นข้อความและรูปภาพ ($\bar{X} = 4.57$) และต้องการป้ายและแผนที่อธิบายจุดสำคัญ ($\bar{X} = 4.53$) การออกแบบตามเกณฑ์ WebThai2Access มีค่าเฉลี่ยโดยรวม 4.23 โดยมีคะแนน 3 ใน 2 ประเด็น ได้แก่ สามารถเข้าถึงข้อมูลด้วยลิงค์ และการจัดวางภาพมีความเหมาะสม และมีการปรับปรุงตามคำแนะนำ ผลการเปรียบเทียบสถิติ t-test พบว่า คะแนนเฉลี่ยสูงกว่า 3.5 ที่ระดับ $p < 0.05$ อย่างมีนัยสำคัญ การประเมินการออกแบบส่วนเชื่อมต่อกับผู้ใช้ พบว่า มีคะแนนเฉลี่ยรวมที่ 4.22 การเปรียบเทียบสถิติ t-test พบว่า ค่าเฉลี่ยสูงกว่า 4.0 ที่ระดับ $p < 0.05$ อย่างมีนัยสำคัญ

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1. Introduction

In 2015, the volume of tourists in Thailand increased by 9.5% compared to 2014 (Tourism Authority of Thailand, 2015). The average growth rate of tourism income in 2016 was not less than the growth rate of the GDP +1% of the proportion of tourism revenue to the GDP (Tourism Authority of Thailand, 2016). Including the mobile communication technology like smart phones has taken on a greater role in people's way of life in the era of boundless communication. Sixty-four percent of the Thai population owns a smart phone (Wearesocial.com, 2016) with the ability to communicate quickly, anywhere and anytime. The increasing mobile trend leads to growth of mobile application services which helps meet the needs of humans for access to a wide unlimited range of information including time and place. Most local cultural destinations are not funded by the government. Those attractions are managed personally and most revenue comes from the sale of commemorative products or from visiting fees. There is no technology used in such tourist services compared to large tourist attractions funded by the public and private sectors. The advantages of using technology in the arts and cultural destinations are creating an interest and attracting more visitors (Proctor, 2005, Sung, Chang, Hou, & Chen 2010, Rukzio, Gregor, Wetzstein, & Sergej 2008).

PMW Temple in Nakhon Si Thammarat province formerly known as Wat Phra borommathat is a first-class royal monastery. The Fine Arts Department announced the registration of PM Temple as an ancient site on September 27, 1936. PMW Temple is one of the most important places in the south of Thailand where the visitors must worship to pray for an auspicious life. The highlight is the large relics stupa at the top end of the gold and containing the relics (Tourism Authority of Thailand, 2015). An interview with tourists who visited PMW Temple has found that most tourists visiting PWM Temple are not sure which way to walk around the historic site and which areas are not to be missed. There is a signpost service on a pedestal before the entrance to the temple, but if a visitor does not notice it they will not know that it is there or any sign of the important spots of the temple as there is no map information. The temple provides a public relations services such as leaflets and signs of information of objects. However, the information is not complete such as no illustrations of the top of relics, so visitors need to imagine what it is. Because the pagoda is located high and unavailable to see visitors cannot learn and understand clearly the history, beliefs, faith and myths inside of the temple which corresponds to the study of PMW Temple.

Therefore, the researchers have come up with the idea to develop mobile applications of PMW Temple, Nakhon Si Thammarat in order to use as a technology for Thai tourists to freely visit the temple, reducing the difficulty of accessing such tourist information, and to attract more tourists to visit Thai art and culture. This directly affects PMW Temple to increase economic potential

and local culture for tourism sustainability in accordance with the Tourism Authority of Thailand's tourism promotion plan.

2. Research Objectives

1. To study Thai tourist's requirement in visiting PMW Temple, Nakhon Si Thammarat
2. To design the mobile application for Thai tourists at PMW Temple, Nakhon Si Thammarat

3. Literature Review

Technology Acceptance Model

The Technology Acceptance Model is a theory developed from the Theory of Reasoned Action, invented by Davis (1989), a popular concept used as a measure of success of use of technology to predict or describe the user's computer behavior by describing the relationship of two variables: perceived usefulness (PU) and perceived ease of use (PEOU). Perceived usefulness (PU) and perceived ease of use (PEOU) will affect attitudes toward System usage and can predict the user's demand for the system. In addition, perceived usefulness (PU) also affects the willingness to commit behavior that leads to real-life applications. Trakulmaykee & Hnuchek (2015) also applied TAM to predict users' intention to use Mobile Tourist Guide: perceived compatibility, perceived content quality, perceived interaction quality, and perceived appearance quality.

Perceived Usefulness

PU is the level of individual beliefs that perceive any system usage to help maximize performance and offer valuable alternatives in the workplace. Also, people using this new technology, get better quality work and finish work faster. PEOU reflects that unless technology is easy to use, it is unlikely to be acceptable to the user (Davis, 1989).

Perceptions of enjoyment and perceived benefits influence the perception of ease of use which results in the intention to use the application. Perception of enjoyment indicates the level of application awareness in its own right, beyond the system. Perceived benefits and perceived ease of use are reflected outside of the intent to use specific applications while the perception of enjoyment reflects a true inspiration for the intent to use a specific application (Davis, 1989; Chen, 2008).

The process of accepting innovation

The process of accepting innovation is divided into five stages (Rogers, 2003).

- 1) Awareness is the stage where the recipient receives information about the innovation.
- 2) Interest is the stage of interest and starting to find information.
- 3) Evaluation is the stage where the recipient will take the information into consideration.
- 4) Trial is the stage where the participants test a system.
- 5) Adoption is a stage where users agree to adopt permanently or until it is deemed

inefficient.

Various attributes of innovation affect acceptance. Relative Advantage is better perception. Compatibility is the level of relevance to the existing experience and needs. Complexity of innovation is the difficulty of understanding an application. Trial ability is the visible level that can see the experimental results and performance results, and the results of the use can be noticed. Observability is the level of ability to see the process in a tangible way.

User Interface Design

Shneiderman (2016) proposed principles of User Interface Designs which were derived from experience and applicable in interactive systems in order to improve a well-designed interface. Shneiderman's "Eight Golden Rules of Interface Design" are guides to improve good interaction design.

1. Strive for consistency: (e.g. sequences of actions; terminology; commands)
2. Enable frequent users to use shortcuts: (e.g. abbreviations, function keys, hidden commands, and macros).
3. Offer informative feedback: (e.g. modest for minor or frequent actions, more substantial for major and infrequent actions)
4. Design dialog to yield closure: (e.g. organize sequences of actions into groups)
5. Offer simple error handling: (e.g. system detects any error and offers mechanisms for handling it).
6. Permit easy reversal of actions: (e.g. relieving anxiety encourages exploration)
7. Support internal locus of control: (e.g. design system to make users initiators of actions)
8. Reduce short-term memory load: (e.g. keep displays simple, reduce window-motion frequency)

Universal Design

The seven principles of Universal Design are shown in Table 1 and consist of equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, and size and space for approach and use.

Table 1 Universal Design Principle

Principle	Meaning
1. Equitable use	An active design that everyone can equally utilize.
2. Flexibility in use	Flexible design to meet your needs, requirements, and individual ability.
3. Simple and intuitive use	The design is easy to use and understand. No matter how knowledgeable experience at any level or any language.
4. Perceptible information	Content design, information that can be perceived
5. Tolerance for error	Comprehensive design that covers errors.
6. Low physical effort	Design that physical capabilities can be used effectively with low effort.
7. Size and space for approach and use	There is an appropriate size and space to use. It covers people with tall bodies, disabled people with large wheelchairs that they can spin back and forth in the area.

Source: The Center for Universal Design (1997)

4. Research Methodology

There is no statistical record of tourists who have visited the temple. The sample number of 31 participants was chosen based on recommendations by Jakob (2008) in selecting at least 20 participants in the experiment. The data were collected by using questionnaires asking questions related to gathering requirements and designing the mobile application. All participants had been to PMW Temple before. There were two parts to the questionnaire: 1) gathering requirements in developing questions, and 2) designing the mobile application. The questions to gather requirements were developed based on the TEIF Framework of Angkananon, Wald, & Gilbert (2016) in gathering/evaluating requirements and also considering the TAM Framework in developing questions.

The three experts who had five years experiences in mobile application development validated and reviewed the questionnaire. The researchers improved the questions following the suggestions to be more clear, easy to understand, and concise. The researchers asked three participants to use the questionnaire and asked for the feedback and then improved it and tried it out with ten participants in order to reduce errors before using it in the experiment (Coombes, 2001).

Findings from Expert Validations and Reviews

In order to save time and money in developing the Mobile Application, the researchers designed the interactive prototype and showed it to the three experts who had five years' experiences in developing mobile application to validate and review the user interface in various aspects: buttons, menus, pictures, text font, text size, navigation, text color, and background color etc. The findings are shown in Table 2.

Table 2 Experts' reviews and validations

Item	Experts			Total	IOC
	1	2	3		
1. Buttons are easy to use and appear in appropriate positions.	1	1	1	3	1
2. Menus are easy to use and appear in appropriate positions.	1	1	1	3	1
3. Pictures are clear and interesting.	1	1	1	3	1
4. Navigation works well.	1	1	1	3	1
5. Text size is easy to read.	1	1	-1	1	0.33
6. Background color is contrast with text color.	1	1	1	3	3

The validation and review from the three experts about the user interface shows that all experts agree that: buttons are easy to use and appear in appropriate positions; menus are easy to use and appear in appropriate positions; pictures are clear and interesting; navigation works well, and background color contrasts with text color. Only one expert disagreed that text size is easy to read. Therefore, the researchers have changed the text size to be bigger and easy to read.

5. Results

1. Demographic data

Thirty-one participants who had been to the temple were asked to answer the questionnaire to get information needed for developing the mobile application. The demographic data of participants are shown in Table 3.

Table 3 Demographic data of participants

Item	Frequency	Percent
Gender		
Female	23	74.2%
Male	8	25.8%
Age		
15 - 20 years	2	6.5%
21 - 30 years	4	12.9%
31 - 40 years	20	64.5%
41 - 50 years	5	16.1%
Brand or model of phones' use		
iPhone	16	51.6%
Samsung	10	32.3%
Asus	2	6.5%
Oppo	1	3.2%
Ais	1	3.2%
IMobile	1	3.2%
Travel Time		
1 - 2 hour (s)	22	71.0%
2 - 3 hours	9	29.0%

Table 3 Demographic data of participants (continue)

Item	Frequency	Percent
Travel Day		
Weekday	3	9.7%
Weekend	17	54.8%
Holiday	3	9.7%
Festival	4	12.9%
Others	4	12.9%
Mobile Phone Experiences		
Use smart phone	31	100%
Mobile Application Experiences		
Used mobile application before	30	96.8%
Never used mobile application before	1	3.2%

Table 3 shows demographic data of 31 respondents. Most participants are female (74.2%). The modal age (64.5%) is between 31 - 40 years old. They all use their smartphone in their daily lives. Most of them use iPhone (51.6%), Samsung (32.3%), and Asus (6.5%) as well as others brands. Most tourists visit PMW Temple at the weekend (53.3%). They spent 1 - 2 hour (s) at the temple. All participants have used their smart phone in their daily life. 96.8% of participants have used a mobile application before and only 3.2 % have never used a mobile application.

2. Perceive information

A study on the perception of tourist information of PMW Temple found that most Thai tourists perceive information from friends or family the most, following by personal experience, and the least is publishing media.

Table 4 The perspective of tourists about travel information of PMW Temple, Nakhon Si Thammarat

Perceptive channel	Frequency	Percent
Personal experiences	18	58%
Friend/family	23	74.2%
Website	10	32.2%
Perceptive channel		
Billboard/public relations	3	9.7%
Print media	1	3.2%
Television	4	12.9%
Travel magazines	5	16.1%
Facebook	12	38.7%
Line application	6	19.4%

Table 4 shows travel information perception of PMW Temple of Thai tourists found that the majority of Thai tourists' perceived information (74.2%) from friends and families. The second channel was from personal experience (58%), Facebook (48.4%), and website (22.6%) respectively, and the least from print media (3.2%).

3. Decision in visiting PMW Temple

Table 5 shows information about the decision in visiting the temple of Thai tourists. The majority of Thai tourists' decision in visiting the temple (61.3%) was from friends and families followed by Facebook (48.4%), and website (22.6%) respectively, and the least from print media (3.2%).

Table 5 Decision in visiting PMW Temple

Decision in visiting the temple	Frequency	Percent
Personal experiences	19	61.3%
Friend/family	19	61.3%
Website	7	22.6%
Billboard/public relations	3	9.7%
Print media	1	3.2%
Television	3	9.7%
Travel magazines	6	19.36%
Facebook	15	48.4%
Line application	3	9.7%

4. Problems in visiting PMW Temple of Thai tourists as shown in Table 6.

Table 6 Problems in visiting PMW Temple of Thai tourists.

Problems	Frequency	Percent
Do not know where to go	16	51.6%
Do not know how important each point is	19	61.3%
Do not know what the rituals are	11	35.5%
Do not know where to go first	14	45.2%
Do not know the history or other information of each point	11	35.5%

Table 6 shows that most Thai tourists do not know how important each point of visit is (61.3%), where to go (51.6%), where is the starting point (45.2%), what the rituals are, and the history or other information of each point (35.5%).

5. Technology required

All Thai tourists are interested in using the mobile applications to help improve travel services of PMW Temple. The results are shown in Table 7.

Table 7 Demand for technology to assist in the provision of tourist information services

Technology format	Frequency	Percent
Technology with text description only	1	3.2%
Technology with text description and voice options for users to listen to when needed	4	16.1%
Technology with text and pictures description, and voice options for users to listen to when needed	25	80.6%

Table 7 shows that most Thai tourists (80.6%) prefer technology that is narrated by text, pictures, and voice options for users to listen to when needed. The second preference is technology with text description and voice options for users to listen to when needed, and the least preference is technology with text description only.

6. Information need

Thirty-one participants were asked to rate the information needed to help develop the Mobile Application. The results are shown in Table 8. The participants used 5 point Likert rating scales of 1 (very poor) to 5 (very good) in answering a questionnaire. Table 8 shows the overall average score for Thai tourists in all aspects is 4.29. Most of the visitors require information about important points at the temple that they should not miss ($\bar{X} = 4.67$). The second requirement is the visitors need text and pictures to describe the information about the temple ($\bar{X} = 4.57$), and signs and maps to explain the important points ($\bar{X} = 4.53$). An independent sample t-test showed that the overall mean rating was better than 4.0 ($t = 4.57$, $df = 30$, $p < 0.05$).

Table 8 The information needed for the mobile application in visiting the PMW Temple

Information need	X	SD
Text and pictures describe the information about the temple	4.57	0.63
Voice information to describe the information about the temple	4.43	0.63
Signs and maps to explain the important points	4.53	0.57
Information about how to dress at the temple	4.27	0.74
Information about how to get to the temple	4.23	0.77
Enough information about the temple	4.37	0.67
Information about the points they shouldn't miss	4.67	0.48
Overall	4.29	0.40

7. Evaluating Mobile Application

There are two main criteria in evaluating the Mobile Application: Accessibility Evaluation and User Interface Evaluation.

7.1 Accessibility Evaluation

Thirty-one participants rated the accessibility of the Mobile Application Design of PMW Temple as shown in Table 9.

Table 9 Evaluation Criteria of WebThai2Access

Evaluation Criteria of WebThai2Access	Mean	sd
1. There is image ALT Attributes and Text Alternative to explain the image to help understanding.	5.00	0.00
2. Can access to information from links provided	4.29	0.79
3. Content of presentation is easy to understand.	4.14	0.84
4. Text description is provided when the voice data is available.	4.14	0.89
5. Sound of recorder is clear.	4.14	0.97
6. Sound of recording is not boring.	4.00	0.96

Table 9 Evaluation Criteria of WebThai2Access (continue)

Evaluation Criteria of WebThai2Access	Mean	sd
7. Menu operations are accurate and easily return to the main menu.	3.14	1.01
8. Functional use such as save button can be done easily.	4.00	0.87
9. Colors of the text and background are contrast at the right level. It is readable.	3.86	0.99
10. Page Integrity when zooming	4.14	0.84
11. Size of the letter reads well	3.86	0.87
12. Text layout is appropriate.	4.43	0.91
13. Image layouts are appropriate.	4.14	0.92
14. Font type is easy to read.	4.29	0.84
15. A satisfaction's form is easy to use.	4.57	0.88
Average	4.23	0.88

Thirty-one participants rated the accessibility of the Mobile Application Design of PMW Temple referring to Angkananon, Wald, & Plodaksorn (2017) method of evaluating the Web Thai Accessibility design. The results are shown in Table 3. The overall mean score was 4.23. All participants agreed in four criteria ($\bar{X} = 5.00$): sound of recording is not boring, text layout is appropriate, font type is easy to read, and a satisfaction's form is easy to use. Participants only rated 3.0 in two aspects: can access to information from links provided and Image layouts are appropriate. The two issues have been improved following the suggestions. The independent sample t-test showed that the mean rating was greater than 3.5 ($t = 4.57$, $df = 30$, $p < 0.05$).

7.2 User Interface Evaluation

Table 10 User Interface Evaluation Criteria

User Interface and Design Evaluation Criteria	Mean	sd
1. Good design of navigation, user knows which part of the site, having title in every page	4.00	0.00
2. The name of menu can be understood.	3.58	0.51
3. Can go back to the previous page using the back button.	4.92	0.29
4. The menus are placed in the appropriate position and easy to use.	3.92	0.51
5. The color of the buttons and text on the menu is easy to read.	4.25	0.45
6. Menu button are the right size. It can be touched with the finger precisely.	4.75	0.45
7. You can clearly see which part of the screen can be selected or not.	4.42	0.51
8. The name of the navigation menus and links are understandable.	4.00	0.60
9. A clean and simple screen layout.	3.83	0.58
10. Use appropriate and clear illustrations.	5.00	0.00
11. If errors are detected. Does the application have contact options for help?	4.08	0.79
12. The FAQs menu answers questions you might want to know and the answer is useful to you.	4.58	0.51
Average	4.22	0.41

Thirty-one participants rated the prototype of Mobile Application of PMW Temple using the Likert 5 point scales of 1 (very poor) to 5 (very good). The results are shown in Table 10. The overall rating in user interface and design was 4.22. All participant agreed that the mobile application uses an appropriate and clear illustrations ($\bar{X} = 5.00$). The issues that need to be improved are name of menu could be understood ($\bar{X} = 3.58$), clean and simple screen layout ($\bar{X} = 3.83$), and menus were placed in the appropriate position and easy to use ($\bar{X} = 3.92$). The research improved the design following the suggestions. An independent sample t-test showed that the mean rating was better than 4.0 ($t = 4.57$, $df = 30$, $p < 0.05$).

6. Discussion and Conclusion

From the results the study concluded that without the mobile app most Thai tourists did not know how important each point of visit was, where to go, where was the starting point, what the rituals were, and the history or other information of each point. All Thai tourists were interested in using the mobile applications to help improve travel services of PMW Temple, especially technology with text and pictures description, and voice options for users to listen to when needed. Most visitors required information about important points so that they should not miss text and pictures to describe the temple and signs and maps to explain the important points.

1. Designing Mobile Application Phra Mahathat Woramahawihan Temple

The requirements from 31 participants informed content and user interface design. The content design was developed based on TAM framework (Davis, 1989) and the concept of Trakulmaykee & Hnuckek (2016). The example of content is shown in Table 11.

Table 11 example content of the Mobile Application

Menu	Thai content	English content
เกี่ยวกับวัด (About Phra Mahathat Woramahawihan Temple)	วัดพระมหาธาตุวรมหาวิหาร สร้างขึ้นครั้งแรกประมาณ ปี พ.ศ. 854 ด้วยศิลปะการก่อสร้างแบบศรีวิชัย ซึ่งภายในบรรจุด้วยฟันของพระพุทธเจ้า ต่อมาในปี พ.ศ. 1770 มีพระภิกษุจากลังกามาบูรณะองค์พระบรมธาตุให้เป็นแบบทรงลังกาอย่างที่เห็นจนถึงปัจจุบัน โดยมีความสูง 55.78 เมตร องค์ระฆังสูง 9.80 เมตร มีปล้องไฉน 52 ปล้อง ปลียอดหุ้มด้วยทองคำดงาม จนถูกเรียกว่า “พระธาตุทองคำ” แต่มีเรื่องแปลกคือ เวลาที่แสงอาทิตย์กระทบกับตัวบรมพระธาตุ เงากลับทอดไม่ถึงพื้น ทำให้ถูกเรียกอีกชื่อหนึ่งว่า พระธาตุไร้เงา	Phra Mahathat Woramahawihan Temple was originally built around B.C. 854 with the construction of Srivichai which contains the tooth of Buddha. Later in 1770, a monk from Ceylon renovated the relics to a glamorous Ceylon style as seen to date. It is a height of 55.78 meters. The bell is 9.80 meters high with 52 strap joints. The crown is covered with magnificent gold. It was called “Golden Buddha”. However, there is one strange thing when the sun hits the relics, the shadow does not reach the ground. It was also called “No shadow relics”.

The User Interface was developed based on the study of the "Eight Golden Rules of Interface Design" of Shneiderman's (2016), Ruzic, Lee, Liu, & Sanford's (2016) Universal Design Mobile Interface Guidelines (UDMIG), the Center for Universal Design (1997), and Angkananon, Wald, & Gilbert's (2015) Technology Enhanced Interaction Framework and Method. It was designed to make mobile interactions more accessible. Examples of the Mobile Application Design as shown in Figure 1.

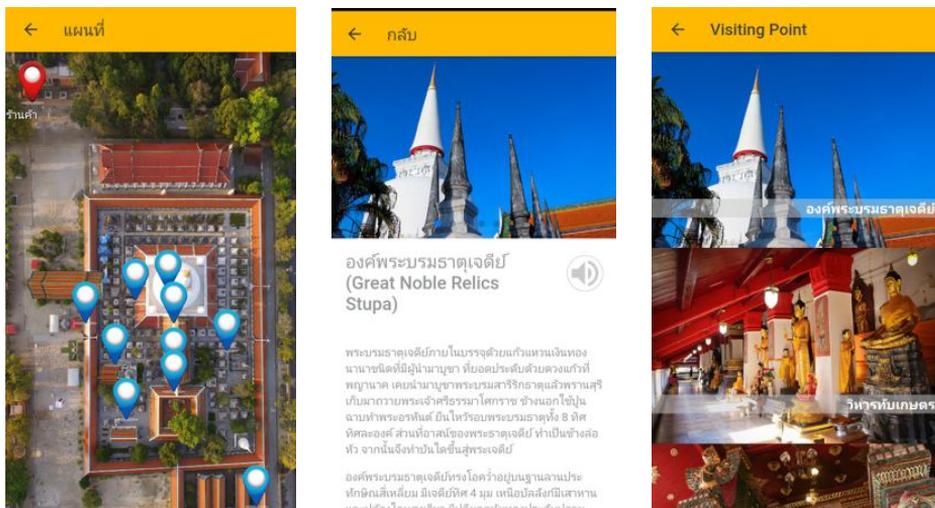


Figure 1 User Interface Design of Mobile Application PMW Temple

Future work

The Mobile Application Thai version has been successful designed and tested with 31 participants. The next step will be developing the Mobile Application and uploading it to the android and app stores. Then, the experiment with 30 participants will be run at PMW Temple. The participants will be asked to answer questions before and after using the Application and also answer the questions about their satisfaction in using the application. The English version of the Mobile Application will be designed and developed for foreigners. The experiment for the foreigner group will be run in a similar way to the Thai tourists group. Finally, the results of the two groups will be compared.

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8. References

- Angkananon, K., Wald, M., & Ploadaksorn, P. (2017). **Developing and Evaluating a Thai Website Accessibility Checker**. In: Stephanidis C. (eds) HCI International 2017 – Posters' Extended Abstracts. HCI 2017. Communications in Computer and Information Science, vol 713. Springer, Cham.
- Angkananon, K., Wald, M., & Gilbert, L. (2016). **Evaluation of Technology Enhanced Accessible Interaction Framework and Method for Local Thai Museums**. Journal of Management Science Suratthani Rajabhat University.
- Chen, L. (2008). **A model of consumer acceptance of mobile payment**. International Journal of Mobile Communications, vol. 6, no. 1, pp. 32 - 52, 2008.
- Coombes, H. (2001). **Research Using IT**. New York: PALGRAVE.
- Davis, F. (1989). **Perceived usefulness, perceived ease of use, and user acceptance of information technology**, MIS Quarterly, vol. 13, no. 3, pp. 319 - 340, 1989.
- Jacob, R. J., Girouard, A., Hirshfield, L. M., Horn, M. S., Shaer, O., Solovey, E. T., & Zigelbaum, J. (2008). **Reality-based interaction: a framework for post-WIMP interfaces**. Paper presented at the CHI-CONFERENCE-.
- Proctor, N. (2005). **Off Base or On Target? Pros and Cons of Wireless and Location**. Aware Applications in the Museum Paper presented at the ICHIM 05 - Digital Culture & Heritage, Paris, France. Retrieved from:<http://www.archimuse.com/publishing/ichim05/Proctor.pdf>
- Rogers, E.M. (2003). **Diffusion of innovations**. 5th ed. New York: The Free Press.
- Rukzio, E., Broll, G., Wetzstein, S. (2008). **The Physical Mobile Interaction Framework (PMIF)**. Technical Report LMU-MI-2008.
- Ruzic, L., Lee, S. T., Liu, Y. E., & Sanford, J. A. (2016). **Development of Universal Design Mobile Interface Guidelines (UDMIG) for Aging Population**. In International Conference on Universal Access in Human-Computer Interaction (pp. 98 - 108). Springer International Publishing.
- Shneiderman, B., Plaisant, C., Cohen, M., Jacobs, S., and Elmqvist, N. (2016). **Designing the User Interface: Strategies for Effective Human-Computer Interaction**: Sixth Edition, Pearson (May 2016) Retrieved from: <http://www.cs.umd.edu/hcil/DTUI6>
- Sung, Y. - T., Chang, K. - E., Hou, H. - T., & Chen, P. - F. (2010). **Designing an electronic guidebook for learning engagement in a museum of history**. Computers in Human Behavior, 26(1), 74 - 83. doi: 10.1016/j.chb.2009.08.004.

- The Center for Universal Design. (1997). **Principles of Universal Design. NC State University.**
Retrieved form:<http://www.ncsu.edu/project/design-projects/edi/center-for-Universal-design/the-principles-of-Universal-design/> (24.01.2012).
- Tourism Authority of Thailand. (2015). **Tourist Marketing Plan.** Retrieved on 7 August 2015. From: http://marketingdatabase.tat.or.th/download/file_upload/Untitled%20attachment%2000032.pdf
- Tourism Authority of Thailand. (2016). **Phramahathat Woramahawihan Temple.** Retrieved on 20 February 2016, from <https://thai.tourismthailand.org>
- Tourism Authority of Thailand. (2015). **TAT Annual Report.** Retrieved on 22 December 2016. From :<https://www.tourismthailand.org/fileadmin/>
- Trakulmaykee, N., & Hnuchek, H. (2016). **Examining the Model of Information Needs on Mobile Devices: Massage-Spa Therapy Context.** Journal of Management Sciences, Vol. 3 (2).
- Trakulmaykee, N., Trakulmaykee, Y., & Hnuchek, K. (2015). **Two Perceived Dimensions of Technology Acceptance Model in Mobile Tourist Guide Context.** International Journal of Trade, Economics and Finance, Vol. 6, No. 5, October 2015.
- Tussyadiah, L. (2014). **Toward a Theoretical Foundation for Experience Design in Tourism.** Journal of Travel Research 2014, Vol. 53(5) 543 – 564.[downloads/TAT_ANNUAL_REPORT/TAT-AR2015.pdf](https://www.tourismthailand.org/downloads/TAT_ANNUAL_REPORT/TAT-AR2015.pdf)
- WearSocail.com. (2017). **Digital in 2017Global Overview.** Retrieved on 8 May 2017. Form: <https://wearsocail.com/special-reports/digital-in-2017-gobal-overview>.

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