Walk Schofield: Walk. Learn. Play

Lindsey K. Davis
Learning Design and Technology, University of Hawai'i Graduate Student
United States
davislk@hawaii.edu
http://izi.travel/en/39184-walk-schofield?passcode=walkschofield

Abstract: Nearly 90,000 Soldiers, civilians and family members are stationed in Hawai'i. Schofield Barracks, an Army installation on Oahu, is home to approximately 16,370 Soldiers. A network of Army museums has been organized to expand public service and learning opportunities for these Soldiers and family members. Through this project a mobile application tour has been developed to facilitate the educational mission of the Tropic Lightning Museum on Schofield Barracks. Using location-based software, this app facilitates a historical walking tour of the installation. Accessing resources from archived collections, the tour provides the community with unique historical information, audio, and trivia questions to broaden knowledge and appreciation of the installation's cultures and history. The purpose of this usability study was to develop, evaluate and improve this mobile application to facilitate an interactive and participatory walking tour used by military personnel and their families. Using the FRAME Model, the app was evaluated based on three aspects: social, device, and learner. This study identified the key components of app-based tours and their relevancy in facilitating on-site educational lessons. Most importantly, this study contributed to the improvement of the apps' usability and accessibility for the members of the Schofield Barracks' community. Multiple factors contributed to the success of the app-based tour and the positive reception by community members. The progression of the app from a paper-based walking tour to an interactive and augmented reality experience will be discussed along with the growing pains of developing a mobile app.

Introduction

On Schofield Barracks, the Tropic Lightning Museum has been established to "collect, preserve, interpret and exhibit the artifacts and related memorabilia, which reflects the history of Schofield Barracks, the 25th Infantry Division, and Wheeler Army Airfield" (Welcome to the Tropic Lightning Museum). Standards have been set by a national organization, the American Association of Museums (AAM), to guide such institutions in achieving their mission of preservation, interpretation, and education.

The AAM has identified ten principles that govern museums' roles in public service and education. The top five principles employ museums to: assert the museums' place in education at the center of their public service role; establish and maintain a broad public dimension; expand and use the museum learning opportunities; enrich knowledge, understanding, and appreciation of collections, cultures, and ideas; and assure interpretation manifests a variety of perspectives

and an appreciation for diversity (Hirzy, 2008). In an effort to expand public service and learning opportunities, an analysis was performed to identify the needs of the Tropic Lightning Museum's audience. The majority of the Soldiers and family members in the Schofield Barracks' community are geographically separated from friends and family and are unfamiliar with the cultures and history of the installation. They have also experienced multiple deployments and constant relocations. Due to the demands to create familiarity with the installation and provide accessible information, a mobile application was identified as the best solution to guide the military community in their education of the history, culture, and locations of Schofield Barracks. The intent was that by using location-based software, this app would facilitate a historical walking tour of the installation while maintaining the attention of the user through interactive trivia and images for contextual awareness. Accessing resources from archived collections, it was anticipated that the app would provide the community with unique historical data, images, and audio to broaden their knowledge and appreciation of the cultures and ideas of Schofield Barracks.

Literature Review

Tasked with the principles of public service, learning, understanding, appreciation, and diversity; museums are faced with a myriad of complications in developing exhibitions to meet their goals and fit in their space. Nancy Proctor, author of Mobile Apps for Museums, asserts that mobile applications have the unique ability to offer "greater possibilities for extending outreach, improving the quality and accessibility of interpretation and education, and supporting other revenue initiatives and connecting platforms" (2011, p. 21). Statistics given from the J. Paul Getty Trust, the world's largest cultural organization dedicated to visual arts, shows that 25% of the Getty's web visits are via mobile phones or tablets (Ludden, 2014). These statistics emphasize the importance of mobile resources in museums and cultural organizations. With the benefits of mobile apps in museums, one question remains. Why aren't all museums using mobile technologies to foster community interest, engagement, and participation? The results of Mobile Strategy 2013, an annual survey of museums and mobile technologies, identified insufficient staff (57%) and cost (46%) as the key reasons for not incorporating mobile experiences in museums. By comparison, only 13% reported that mobile solutions were unsuitable for their institution (Tallon, 2013). However, in today's market there are growing opportunities for cost-effective mobile app development which can be leveraged to implement effective and participatory exhibition solutions. Prior to selecting one of these many mobile development platforms other considerations must be evaluated.

Considerations for mobile applications in museums should include purpose, content, context, engagement and testing. In assessing mobile applications for cultural walking tours and museums, Elycia Wallis, Manager for Collections Information Management Systems at Museum Victoria, has identified that successful mobile apps have a "clear purpose and provide a defined user experience extremely well" (Wallis, 2013, p. 283). She emphasizes the importance of showcasing research and collective knowledge through mobile applications. In a study conducted on the usability, design and content of mobile apps for cultural institutions, Boiano & Gaia

identified that content must contribute value, be easy to read, watch, listen to and understand, and make use of the device features (2012, p. 2-3). Aligning museum goals with the functionality of mobile apps requires the contextualization and personalization of information. T.Y. Lim of Multimedia University offers expertise in human computer interaction. Lim emphasizes the importance of designing for mobile tourism using situational awareness, and classifies awareness in three levels: perception, comprehension, and projection (2012). When developing mobile applications for museums, the identification of perception encourages the institution to connect the visitor's environment and experience with the goals and mission of the museum. The mobile device, as a context aware application, should also be a means of interaction between the visitor and the historical, social, or scientific data. In order for this interaction to be effective, the visitor and the device should be able to use implicit situational information (Raptis, Tselios & Avouris, 2005). This means that the process of using the mobile application must tie the visitor to the data and the location.

Visitor engagement and participation are other key elements in the successful implementation of mobile design. Nina Simon, author of "The Participatory Museum," has identified five visitor conceptions that participatory experiences alter. These conceptions insinuate that: 1) cultural institutions are irrelevant to real-life, 2) never change, 3) ignore individual views and context for understanding, 4) are not creative places of expression, and 5) are uncomfortable social places for sharing ideas (Simon, 2010). To transform these perceptions, an understanding of visitor motivations should be established in order to meet their needs. Forrester Research has released a "social technographics" profile tool to help businesses understand the ways different audiences engage with social media online. The researchers grouped participatory online audiences into six categories by activity: 1) creators, 2) critics, 3) collectors, 4) joiners, 5) spectators, and 6) inactives (Forrester Research, 2013). This research has identified that not all learners are creators and participation is guided not necessarily by the creators, but also by the spectators. Taking this into consideration, mobile design must include opportunities for exploration and self-discovery as well as passive learning experiences.

Testing must also be taken into design consideration. Proctor states that the success of a mobile application cannot be measured purely by downloads or money, but rather in how "the mobile program is able to engage audiences and support other museum programs, activities and revenue streams" (Proctor, 2014). Identifying testing techniques prior to development will help to identify user needs in advance and establish ways to include the visitor throughout the development process, maintaining an audience-centered design approach. A usability study on the MytileneCity guide included quantitative tasks to measure learnability, efficiency and effectiveness (Kenteris, 2009). Effectiveness was measured by the percentage of tasks completed and efficiency was measured by the time to solve the task. Learnability was the improvement of the task in the second trial. Determining measurement techniques prior to development will assist in maintaining a focus on the key benefits of implementing mobile technologies in museums throughout the development process.

Project Design and Development

At the onset of this project, it was determined that a solution would need to be developed that would expand the public service mission of the museum, provide fulfilling learning opportunities to the Schofield Barracks community and foster engagement, comfort and familiarity with the installation itself and the rich history it provides. After evaluating the materials at the museum, a walking tour brochure distributed by the museum was identified as a current method that was used to meet these missions and goals (Figure 1). A mobile application was recognized as the most appropriate solution platform to enhance the tour and improve visitor participation and engagement. A prototype was developed, using the program Live Code, to identify key functions to support the museum's mission and the project's goals, focusing on discovery learning and social engagement (Figure 2). To support discovery learning, the prototype offered audio, text, and recording functions as well as the ability to explore and share images. Social engagement was delivered through Global Positioning System (GPS) capabilities, links to videos, and favorites lists. These functionalities were evaluated and limited to images, audio, textual information, trivia questions, and GPS.

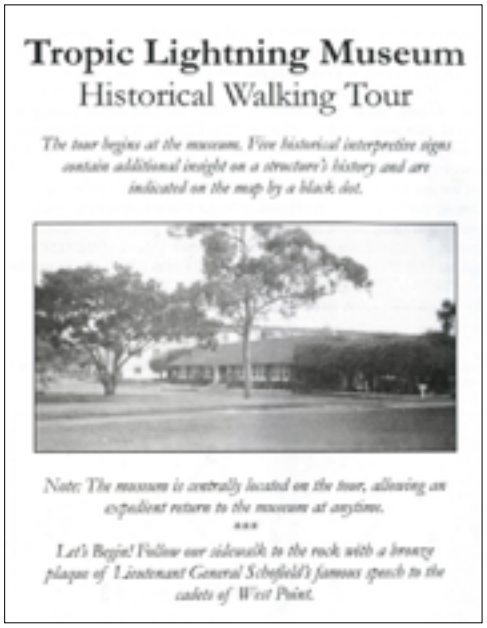

Figure 1. Walking Tour Brochure

Figure 2. Prototype

After identifying the purpose and the key mobile design components, the content and the context was evaluated. The content for the app was gathered, curated for presentation, and organized by geographic location on Schofield Barracks. Images were selected from hundreds of images archived at the museum. Each image was carefully scrutinized to determine the accuracy of the location and the visitor's ability to connect the image to how the location appears today. Audio from museum webcasts was trimmed down and limited to approximately two minutes. This feature was extremely important for auditory learners and to allow for users to walk and listen while using the app. Trivia questions were developed to engage users with the content and the

context of the app. The size of mobile devices and common museum labeling practices assisted in determining that text should be limited to fewer than 100 characters to ensure the most important and relevant information was being conveyed. Twenty locations were identified that had the best images, the most engaging audio and the greatest opportunity to familiarize the community with the installation.

After vetting the prototype design and curating the content, the development platform was analyzed. Though Live Code offered the ability to build unique functions and design an original product, this solution would require coding expertise and the museum staff would not have the ability to update and maintain the app in the future with their limited knowledge of technology design. Izi.TRAVEL was identified as the best solution due to the templates provided, the easy graphical interface, and the ability to load and manage navigation, text, audio, video and images with free and unlimited storage.

After selecting izi.TRAVEL as the development platform and loading the curated content, the Framework for the Rational Analysis of Mobile Education (FRAME) model was used to analyze the mobile learning aspects of the design. The FRAME model developed by Marguerite L. Koole (2009) identifies a set of guidelines to assess the quality, usability, and overall sustainability of applications. The FRAME model takes into consideration three aspects of mobile learning, device (D), learner (L), and social (S). These aspects intersect to create sub-aspects in device usability (DL), interaction learning (IL), and social technology (SL). Proper implementation of these aspects facilitates mobile learning (DLS). FRAME Model Evaluation Criteria was used to evaluate the necessary device characteristics and capabilities of the app to meet the criteria for a successful mobile learning device (Appendix A).

The elements of “The Device Aspect” were used to evaluate the necessary device characteristics and capabilities of the app to meet the criteria for a successful mobile learning device. Devices that can be used to access the Walk Schofield mobile tour include iPhone and Android smart phones and tablets. The use of mobile devices allows for GPS navigation and embedded maps so that the user can either organize a tour or open the app at any moment to explore the historical locations that are around them. The elements of “The Learner Aspect” were used to evaluate the learner’s involvement in the app and the criteria necessary to identify the needs of the user in relation to the capabilities of the app. Images, text, audio, and location based data maintain the attention of a variety of learners. The audio refers to places and things that users can see and touch as they explore. Trivia questions include location-based clues for contextual awareness and encourage applying knowledge from the environment as well as historic images and audio clips. The elements of “The Social Aspect” were used to evaluate how the app meets the social needs of the learner. Twenty locations are included in the tour to allow for a variety of information to be conveyed and unique interests to be met. Audio, text, images, and questions are incorporated so that users can discuss the history and unique facts about Schofield Barracks (Appendix B). Favorites' lists and the ability to share via social media, text, and email encourage users to walk, learn, and play both physically and virtually.

Standard usability procedures were conducted to analyze the functionality and content of the Walk Schofield tour. Three stages of testing were conducted. The first stage was conducted over a two-month period to evaluate the content of the app. The second stage was conducted during the following two-month period and included observation methods to evaluate the efficiency, learnability, and effectiveness of the app features. The final stage of testing was conducted in the final month prior to deployment using one-on-one interviews to identify final edits, receive stakeholder approval, and identify the requirements for marketing material.

Content evaluation was conducted on Version 1.0 of the app. During this testing stage, on-site evaluations were conducted to identify clear connections between visual and contextual cues. Trivia questions were analyzed for appropriateness and clarity. Improvements were made to update the trivia questions. The original questions focused mainly on the app's content, drawing the user's attention to the device. To incorporate elements of discovery learning, the revised questions focused on engaging the user with their environment as well as the app's data. Incorporating physical clues into the trivia questions helped to facilitate social engagement by encouraging group participation to find answers in the physical environment rather than in textual content. Images were also analyzed for relevancy. With a large archived collection of images, there was an opportunity to be specific about the direction that the user would be facing and the direction from which the image was taken. Images were analyzed based on the ability to face the desired location and explore it as it had looked in the past from that exact location and direction. Aerial images were also chosen to give users the perspective of location in relation to the whole landscape. Version 2.0 included these updates and changes.

The second round of improvements related to the esthetics of the app. Higher-quality images were produced for the introduction to encourage the user to continue using the app and demonstrate the professionalism and integrity of the content. More desirable colors were implemented for a sleek design and icons were added to provide easy access to app features. Figure 3 demonstrates the improvements from the original design to the improved design.

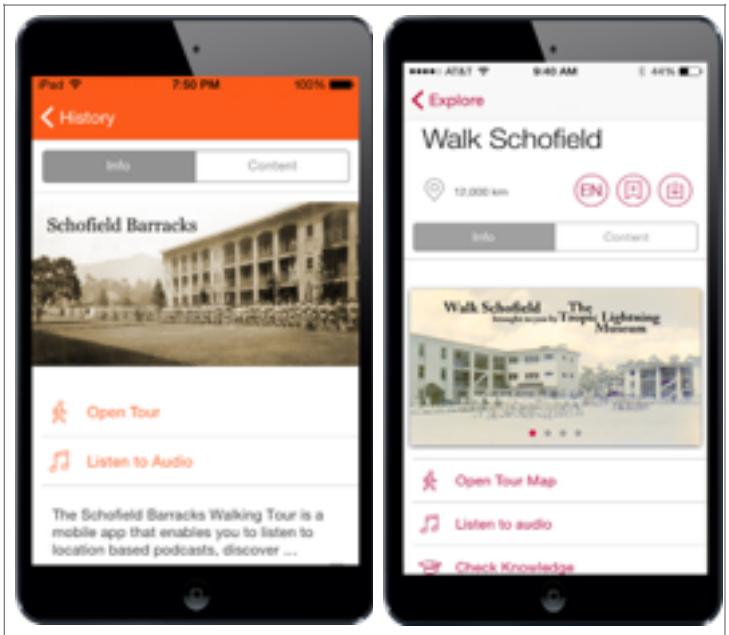

Figure 3. First Revisions

The final round of improvements implemented an introductory audio tutorial and instructional images. An audio tutorial approximately two minutes in length was written, recorded, and added to the welcome screen to provide basic information regarding app features. When the user selects the "listen to audio" link on the welcome screen, they will hear an introduction that describes the basic app icons and their functionality. Most importantly the audio describes how to begin the tour. Instructional images were also added to the welcome screen to introduce the app features and display examples of the functionality described in the audio tutorial. The most important features were chosen to demonstrate how to use the app. These features include: starting the tour, listening to audio, and accessing the trivia questions (Figure 4).

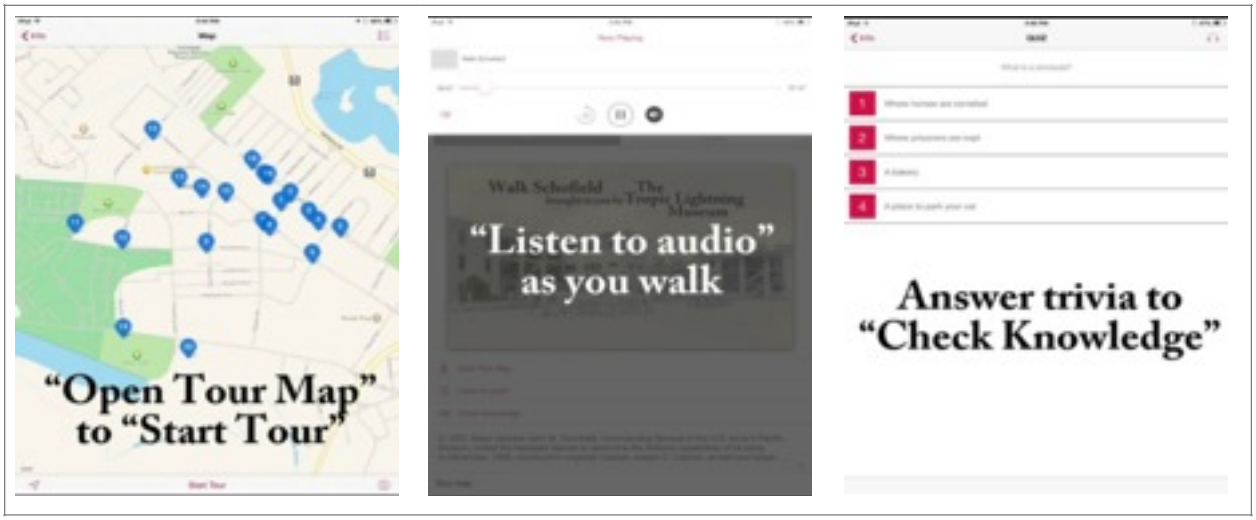

Figure 4. Instructional Images

Following final interviews, revisions were made to comply with Army public affairs regulations and ensure cultural and historical accuracy of content and locational data. A QR code was created for marketing. The code contains embedded information about the tour on the izi.TRAVEL site. If the izi.TRAVEL app is installed on the user's device and the QR code is scanned, the Walk Schofield tour will open in the izi.TRAVEL app. If the app is not loaded and the QR code is scanned the Walk Schofield tour will open in their internet browser on the izi.TRAVEL site which contains links and downloading instructions.

Conclusion

In conclusion, the Walk Schofield tour progressed from an idea to a useful and successful product. The final version reflects the mission of community awareness and education. Concessions were made from the initial prototype concerning the ability to record personal stories and upload images to the tour. However, these qualities were not essential to completing the mission. The implementation of archived images and pre-recorded webcasts provides the community with a connection to historical information that otherwise would be unavailable and supports the museum's mission to collect, preserve, interpret, and exhibit artifacts. The

functionalities of the app expand the public service mission of the museum and provide fulfilling learning opportunities to the Schofield Barrack's community and foster engagement, comfort and familiarity with the installation itself and the rich history it provides.

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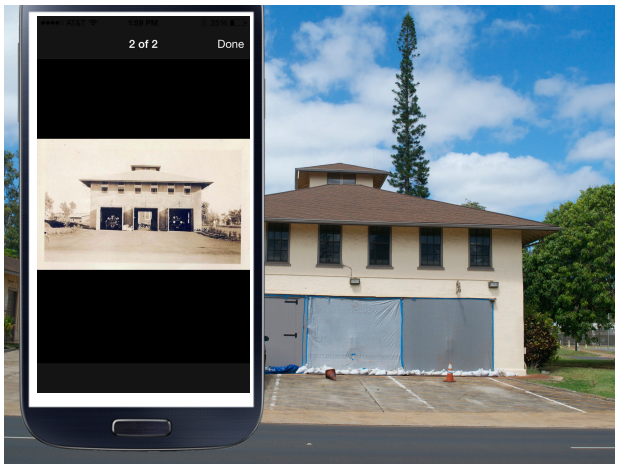
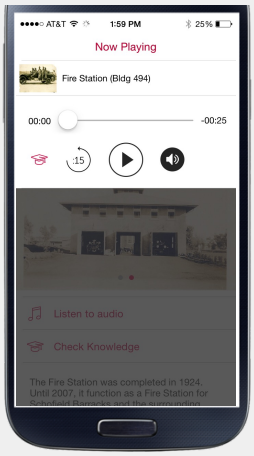
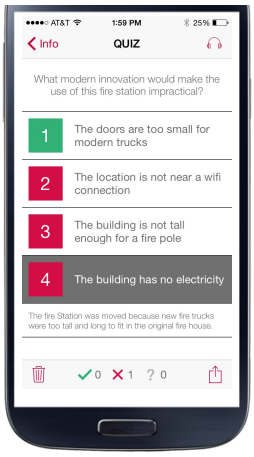
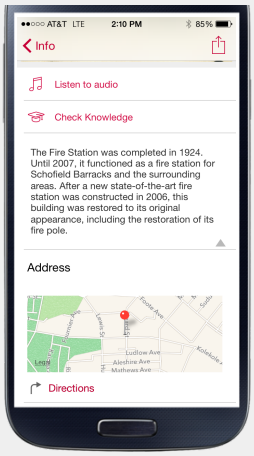
Appendix A
FRAME Model Evaluation Criteria

The Social Aspect	
	Walk Schofield Function
Conversation and Cooperation	Quantity: 20 locations are given to allow for a variety of information to be conveyed and unique interests to be met Quality: Audio, text, images, and questions are incorporated for a variety of learner-types Relation: Location-based and scavenger-hunt questions allow users to form a relationship to the locations in the tour Manner: Favorites and GPS navigation encourages the tour to be used individually or as a family group
Social Interaction	When military and cultural terms are used, they are used in the Knowledge Check questions to reinforce the context and definition.
The Device Aspect	
	Walk Schofield Function
Physical Characteristics	Using GPS navigation, Walk Schofield displays the user's location information on an embedded map. The app also alters the user when they are approaching the next location in the tour.
Input Capabilities	"Favorites" allows users to save locations and information prior to using the tour and while participating in the tour.
Output Capabilities	The GPS function shows the actual location of users as they move throughout the tour. "Check Knowledge" include location-based clues to engage contextual awareness throughout the tour.
File Storage and Retrieval	Each location contains "Listen to Audio", "Check Knowledge", text, and "Direction" consistently.
Processor Speed	The textual data has been limited to under 100 characters, the question feedback has been limited to under 23 characters, and the audio clips are under 4min to maintain attention.
Error Rates	The option to download the content prior to using the app will decrease the potential for error rates due to connectivity.
The Learner Aspect	
	Walk Schofield Function
Prior Knowledge	The video tutorial guides users through the basic functions of the app prior to use, decreasing the need for new concepts being introduces during the visit.
Memory	The use of images, text, audio, and location-based as well as "scavenger-hunt" questions are used to maintain attention and attract a variety of learner types.
Context and Transfer	Check Knowledge questions encourages users to apply the knowledge contained in the app and the locations.

The Learner Aspect	
Discovery Learning	Location-based and scavenger-hunt questions facilitate inquiry-based learning during the tour.
Emotions and Motivations	The tour allows fatigued users to return to complete the tour. The favorites list allows users to revisit places of interest as well as create lists to visit prior to participation. GPS location allows for users to access only those places that are in close proximity.

Appendix B
Walk Schofield App Features

Images	
Audio	

Trivia	
Text	
GPS