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Mobile Devices as Learning Aids for Museums

WM W. Stoerger

Southern Illinois University Carbondale, stoergerwm@gmail.com

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WHAT IS THE MOST EFFECTIVE WAY MOBILE DEVICES CAN BE INCORPORATED
INTO MUSEUM EXHIBITS, IN ORDER TO FACILITATE COMMUNICATION THAT, IN
TURN, PROMOTES AN ENJOYABLE AND EDUCATIONAL EXPERIENCE?

By

WM Weston Stoerger

B.A., Southern Illinois University, 2011

A Research Paper
Submitted in Partial Fulfillment of the Requirements for the
Masters of Public Administration degree

Department of Public Administration
In the Graduate School
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RESEARCH PAPER APPROVAL

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Approved by:

Dr. Dona Bachman, Chair

Dr. John Hamman

Dr. Randal Davis

Graduate School

Southern Illinois University Carbondale

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CHAPTER 1

INTRODUCTION

Museums serve as institutions that provide citizens with the ability to interact in a social environment while also engaging them in an educational or cultural experience. As society's level of connection with technology increases, museums must learn to adopt new forms of technology to establish lines of communication (Table 1). This means that museums should strive to navigate the increasing technologization of society, in order to effectively establish communication between the museum and its audience (Runnel, 2014). This communication manifests itself through the sharing of information and the participation between the visitor and the museum.

By incorporating new forms of technology into exhibits, museums hope to create interactions and experiences that are meaningful to their visitors. Individuals often cite the need for social interactions as a driving force behind their reason for visiting a museum (Simon, 2010). Creating an interactive technology to facilitate this need can take many forms, such as an interactive experience where individuals use their mobile devices to select their favorite work, so it can be displayed as part of an exhibition (Proctor, 2011).

Through the use of mobile devices, museums can help visitors establish a deeper connection to an exhibit. Using these mobile devices can allow museums to communicate with their audiences in very different ways. Many individuals in our society currently carry smart phones or other devices on them regularly. This close proximity to mobile devices has allowed an increasing portion of the population to become extremely familiar with their use (Table 2). Museums can harness this inherent comfort to their advantage. While not all citizens have access

to or are proficient in the use of mobile devices, these individuals are in an ever increasing minority (Table 1).

Mobile devices can be used to grant visitors access to a greater degree of information, and a deeper understanding of the content of an exhibit. They can also be used to facilitate active participation between the visitor and the exhibit. By creating activities or games that require more interaction than reading a text panel, museums allow visitors to establish a personal understanding of the concepts put forth in the exhibit.

Many museums around the world are already incorporating mobile devices into their exhibits, and they have been monitoring how the public has accepted and how they have interacted with them. These museums have taken a number or different approaches when attempting to integrate this new technology, in an attempt to facilitate communication across multiple contexts. By analyzing the strategies used by various museums, I hope to discover how mobile devices can be most effectively incorporated into museum exhibitions to facilitate communication which promotes an enjoyable and educational experience.

CHAPTER 2

STATEMENT OF THE PROBLEM

Museums identify themselves as intuitions of learning (Falk et al, 1992). As society

becomes ever increasingly connected to mobile devices, it is imperative that museums keep up to

date with these advances (Table 1). Staying up to date with advances in technology will allow

museums to effectively communicate with an audience that is becoming increasingly dependent

on digital technology.

Mobile devices are not the first automated tour aids to be used by museums. There have

been a number of devices used in the past, such as cassette players and informational videos.

Mobile devices offer museums opportunities that no other form of media can deliver. Without

proper information or understanding about how to incorporate these devices a number of issues

could arise. By adopting this technology early as it is moving toward universality, museums will

provide themselves with the time to learn about and explore the possibilities these devices allow

for.

PURPOSE OF THE STUDY

The purpose of this study is to create a set of recommendations for selecting effective

mobile technologies for museum exhibits. These recommendations will help determine mobile

technologies that are able to facilitate an educational and, above all, enjoyable experience.

Recommendations will be constructed from the work of multiple authors, placing importance on

the flow of dialogue across contexts.

With the growing power and capabilities of mobile devices, museums now have an array

of options for facilitating learning never before available. Including web based content, mobile

apps, and access to databases to name a few. Each possible use for mobile devices provides unique opportunities for museums, if they are properly designed.

Despite the possibilities afforded to museums through the use of these devices, their application and usefulness varies greatly from exhibit to exhibit (Samis, 2011). Since the educational goals and structure varies greatly between exhibits, it is difficult to create a "one size fits all" approach to using these devices. After analyzing studies done by various authors, there are some common themes among the findings. The authors find that mobile experiences should promote communication and an ongoing dialogue. As the goal of exhibits is to transfer ideas to a larger audience, it is crucial that the mobile experiences accompanying the exhibit merge seamlessly together.

These authors also found that mobile experiences should possess the ability to evaluate and learn from their past experiences. By not establishing effective evaluation criteria it makes it very difficult to understand if you have created a truly successful mobile experience. Like all effective evaluation measures, this should be a continuous process.

CHAPTER 3

SYNTHESIS OF RESEARCH

The following research by various authors is meant to emphasize the importance and power of mobile devices as learning aids. This discussion ranges from gaining an understanding about the various types of mobile apps, to discussing the growing societal trends that are driving their use. While all these works look at mobile learning in slightly different ways they are all centered on the idea that the dissemination of information through mobile devices is something museums must be ready and willing to adopt.

A) Mobile Apps for Museums

The museum world has always tried to find creative ways to reach out to new generations. Museums are social institutions that also serve as centers for learning. If they are to maintain this standing they must be flexible enough to adapt new technologies into their operations. This process can be a difficult one for museums, as many do not have the resources available to invest in a new technology.

In her book *Mobile apps for Museums*, from the American Association of Museums (AAM), Nancy Proctor provides a guide for museums that wish to incorporate this new form of technology into their exhibits. This work looks at a number of museums that have begun to incorporate mobile devices into their exhibits. As mobile devices emerged onto the marketplace museums needed to make quick decisions about whether to integrate them or not. The Dallas Museum of Art faced this situation when they had to decide whether to install repeaters to boost cell phone reception, or to install an in house Wi-Fi network (Forbes, 2011).

Her work discusses two primary methods for the incorporation of mobile devices. These methods are referred to as native apps, and web based content, which allow for augmented

reality experiences. While the concept of incorporating mobile devices may seem modern, museums have actually been looking towards incorporating mobile tour elements into exhibits since the early 1950's (Proctor, 2011). With the growing use of smart phones, museums have been presented with a new tool that opens up an untold number of possibilities.

Beginning in 2008 the museum world has seen an explosion of various apps that can be downloaded onto mobile devices (Forbes, 2011). By creating apps that are intended for specific operating systems, museums are able to gain quick access to a large audience. As these apps are able to be downloaded through various online stores, audiences can be reached even before they set foot in the museum. Native apps give museums a medium to present more information than they could otherwise hope to deliver. These native based apps also allow museums to keep in contact with visitors before and after they visit the museum.

As their name implies native apps are unique to certain platforms, such as Apple and Android. These apps are relatively easy to access by visitors, as they live in online stores users are already familiar with. With multiple platforms on the market, museums are required to create three versions of the same app to insure that visitors can access the content (Proctor, 2011). Despite their advantages, there is one key feature that keeps these from mainstream use. This feature is the price to create them. To combat the cost and time involved with creating native apps, museums have started creating web based apps.

Web based apps provide museums with a low cost alternative to native based apps. These apps tend to be much simpler; they are accessed through a cellular phone's browser, and they are not specific to any one carrier (Forbes, 2011). Web based apps also allow museums to easily update content without requiring a new version or update. Because these apps live on the Internet, they are easy for museums to update and easy for visitors to locate. Despite the

advantages of living on the Internet, the very nature of these apps is their downfall. If there is no internet connectivity in the gallery, then visitors will not be able to access the desired content. This is a key factor for museums to consider when deciding which type of app they will create.

The goal of both of these methods is to create an augmented reality (AR) experience. Proctor defines AR as the "real world" overlaid with digital content to create a truly unique experience (Forbes, 2011). AR tours have always been a very common method museums have used to enhance exhibits. With the introduction of smart phones, museums have been able to take this to an entirely new level. They have given museums the ability to layer extreme amounts of information about exhibits, which has allowed museum staff to present a much deeper level of content to visitors (Rodley, 2011).

This work provides a great deal of useful information to the reader about some of the best practices for creating museum apps. They accomplish this by analyzing successful programs from various museums around the world, and discussing what those museums did and how they created their app. There is one aspect of this work that raises some questions, which is that the various programs the authors look at do not discuss actual figures.

The authors present various cases, which have been deemed as successful, for the reader to draw lessons from. But despite this reported "success" the various authors do not present hard figures to the reader. This can cause some difficulties for the readers, as they are forced to imagine what "successful" means to the various institutions. This is a loaded term, in that it can represent either a slight increase in participation or a significant one, which gives the term a subjective meaning. Despite this gap in the findings, the research presented is extremely sound, and it successfully accomplishes its stated objective.

This work by Proctor has presented some interesting ideas about the use of mobile devices in museums. At the start of this work Proctor states that the objective is to "help museums grasp some of the mobile skills and opportunities most available to them" (Proctor, 2011). To accomplish this goal, Proctor needed to look at the use of mobile devices holistically, not focusing at one specific use. The results of the research presented in this work, is that there is not one best mobile app for all museums.

All museums are different, and their resources dictate what they will be capable of accomplishing. With this in mind Proctor has compiled what amounts to recommendations for the most effective implementation of mobile apps. Throughout the work Proctor discusses the various pros and cons of native and web based apps, along with examples of how various museums have integrated them. These recommendations are not meant to make one form more important or significant than the other; they are simply an analysis of successful uses of this new technology.

B) Mobile Learning in Museums

The work *Mobile Learning in Museums* offers a number of studies that address the issue of using mobile devices in museums. These studies take a deeper look into how museums can create truly meaningful mobile learning opportunities that are more than just a gimmick. In examining the use of mobile learning exhibits, many of the writers in this work suggest that the issue of how to best use mobile devices is the real challenge.

To come to a deeper understanding of how to best use mobile devices in the museum setting, the authors address three themes, what is mobile learning, designing mobile learning, and evaluating mobile learning (Sharples, Arnedillo-Sanchez, Mirad, Vavoula, 2009). They also look

at how mobile learning has been incorporated into learning projects as a means to understand the difficulties associated with using these devices for education (Sharples et al, 2009).

The theoretical framework that the authors use as the basis for their understanding of mobile learning places the object and context at the center of the analysis, and examines how learning flows across locations, time, topics and technologies (Sharples et al, 2009). This refers to the individual meaning each visitor makes, allowing for lasting impressions to be made along the personal context. Context is central to this understanding; context is constantly created when individuals interact with each other and their environments. Mobile technology allows for the exploration of new ideas and helps to promote a collaborative learning environment (Sharples et al, 2009).

The first of the themes the authors look at is, "what is mobile learning." The authors' interpretation of "mobile" learning goes beyond mobile devices. To decipher the idea of "mobile" learning the authors look at mobility in physical space, mobility of technology, mobility in conceptual space, mobility in social space, and learning dispersed over time. This means that museums must be able to design technologies and interactions that create meaningful channels for learning across contexts (Sharples et al, 2009). This learning should not be limited to the on-sight visit, but should begin before and last long after visitors leave.

To help museums navigate this process the authors have identified four things museums need to do. The first is to create quick and simple interactions. The second is to prepare flexible materials that can be accessed across contexts. The third is to consider the special affordances of mobile devices that might add to the learner experience, and the fourth is to use mobile technology not only to "deliver" learning but also to facilitate it (Sharples et al, 2009). These

four concepts allow designers to create mobile technologies that facilitate learning, and allow for additional experiences that would otherwise not be available.

This means that a successful design for mobile technology allows learners to reach personal understandings, supports collaboration, uses technology to enrich collaborative knowledge building, and supports the learners' transitions across learning contexts (Sharples et al, 2009). These boil down to five key success factors, according to Sharples and the other authors they are Access to Technology, Ownership, Connectivity, Integration, and Institutional Support (Sharples et al, 2009).

The final topic looked at by the authors is "evaluating mobile learning." The evaluation process is a key stage in the lifecycle of any system. By not understanding what is needed to properly evaluate mobile learning designs, museums run the risk of not learning from their mistakes. There are four key challenges that museums must consider when evaluating their programs. They are unpredictability of the context of use, unpredictability of the learning process, unpredictability of the mode of use, and looking beyond the 'wow' effect (Sharples et al, 2009).

These issues are inherent in the data collection process, and are important when assessing and analyzing learning outcomes in mobile learning. It is important that these evaluations be a continuous process throughout all stages of the design process, from implementation and beyond. This evaluation revolves around the goals for assessing usability, educational effectiveness, and overall impact. All of which are conducted at the micro, meso, and macro level (Sharples et al, 2009).

There is no question that mobile devices can provide museums with any number of possibilities. The piece by Sharples and colleagues attempts to take a deeper look into how

museums can create truly beneficial mobile learning opportunities. They accomplish this by addressing mobile learning in three stages: defining mobile learning, designing mobile learning, and evaluating mobile learning.

Breaking mobile learning down into these categories allows museums to look at mobile learning as a process. This gives museums the ability to analyze their actions throughout the process. This holistic approach allows museums to address if mobile learning is appropriate for their exhibit, and how it can be best incorporated. To design truly effective mobile learning opportunities the authors suggest short simple interactions that can travel across contexts. Interactions like posting on discussion boards about an exhibit or participating is a simple game are effective ways museums can create these simple interactions.

Possibly the most crucial piece of advice these authors present is that all mobile learning programs should be able to be reviewed. Without the ability to review what has been done it can be very difficult to determine if something is effective or not. By evaluating the success and failures of mobile learning attempts museums can learn what best suites their organization, allowing for the creation of truly beneficial mobile experiences.

C) Democratising the Museum.

The work *Democratising the Museum*, presents a collection of essays addressing the importance of participatory technologies in the museum world. These essays can help museums navigate the increasing technologization of society as museums seek to facilitate information sharing, communication, and networking through modern technology (Runnel/Pruulmann-Vengerfeldt, 2014). These various essays draw on a five year study by the Estonian National Museum (ENM) (Runnel/Pruulmann-Vengerfeldt, 2014).

As this work is based on findings of a museum located outside of the United States, certain concerns come to mind about the adaptability of their argument. The Estonian people have had to face a number of major political upheavals, which has caused them as a nation to seek out democratic values. As this book is a discussion of the importance of democratizing museum collections, the question of whether this is an exclusively Estonian sentiment or if it is truly a worldwide concern is raised.

As technologization and democratic values have spread globally this is an argument that can be easily debunked. Technology provides individuals with access to unlimited amounts of information, via smart phones and the internet. Because of this it can be assumed that individuals expect more information than can be provided by physical object labels. By providing visitors with this greater level of access to information, museums, regardless of their locations, can help to foster future research and lasting connections.

The idea of democratization initially may seem out of place within the museum world, but throughout their work Runnel and Pruulmann-Vengerfeldt argue that this is an ideal that has grown larger than the political arena. Stemming from the idea of a democratic government and the creation of a process that involves all the citizens through technology, the authors assert that similar expectations are being placed on museums (Runnel/Pruulmann-Vengerfeldt, 2014).

The goal of "democratizing" museums is to increase the level of connectedness a visitor feels to an exhibit. This feeling of connectedness is established through the use of various participatory technologies. The use of participatory technology is not a one size fits all practice, but it is best envisioned as a matrix (Pruulmann-Vengerfeldt, 2014) with possibilities such as contribution, collaboration, co-creativity, and hosting opportunities.

As hand-held devices become more powerful, and as societies move toward a more open and inclusive process, museums must be ready to incorporate this technology. Through the various articles presented in this work, the authors make a compelling argument for museums to create participatory environments using technology to create exhibits that visitors will find both educational and enjoyable (Runnel/Pruulmann-Vengerfeldt, 2014).

These authors look at the deeper meaning behind the use of technology. They are not so much focused on the initial flash or novelty of using mobile devices, but rather they look at the deeper meanings and connections that mobile devices can bring to museums. They posit that museums should adopt technologies that are first and foremost communicative, especially those that create multi-vocal environments where discussions between multiple parties are emphasized (Runnel/Pruulmann-Vengerfeldt, 2014).

Along with the ongoing theme that museums must strive to keep up with the growing technologization of society, the various authors of this work emphasize the importance of democratizing collections. The authors in the work look at this issue from inside the museum, meaning the curator's point of view. They explore the various challenges that museum staff can face when trying to incorporate modern technology into their exhibits. These problems range from familiarity with technology, to selecting an ideal form of participation and who should control the process (Pruulmann-Vengerfeldt et al, 2014).

Using technology that facilitates dialogue and participation museums can ensure that the experiences visitors take away will foster long lasting connections and promote an enjoyable and educational experience. By looking toward mobile devices as a platform to facilitate this dialogue, museums can access an extremely powerful tool that a large percentage of the population is familiar with (Table 2). Through the use of mobile applications such as web based

and native technology museums can create powerful tools for disseminating information and establishing dialogues.

Drawing on the examples presented by the various authors cited in this paper, I note that museums have been presented with a theoretical framework for creating beneficial exhibits that use participatory technologies. This framework is comprised of information gathered from various activities hosted by the ENM, and involves the incorporation of various forms of technology.

It is the goal of these authors to add validation for the use of participatory technologies in exhibits. They accomplish this by highlighting a number of factors, the most prominent being the growing use of technology within society. As technology becomes more pervasive throughout society, museums must begin to look towards these new advances to maintain their relevance. This requires that museums be mindful of the participatory needs and expectations of their visitors. Without proper planning it is likely that the use of participatory technologies may do little more than add some "flash" to an exhibit, or in the worst case distract visitors from what is intended. From the five year study by the ENM, the authors have found that visitors want technology that allows them to feel connected to the exhibit that also provides a deeper level of information. When combined these factors foster an educational environment that can keep visitors interested while not distracting from the actual exhibit.

CHAPTER 4

CASE STUDIES

Museums have a long history of incorporating technological learning aids into their exhibits. These have ranged from audio tours to educational videos. Today's technology centers on mobile devices which provide museums with a wide variety of possibilities (Proctor et al, 2011).

 The most powerful advantage mobile devices provide a museum is their ability to rapidly and effectively disseminate information. This dissemination of information can take many forms; it can be as simple as an announcement from the museum about exhibits or activities. Most importantly it allows museums to provide visitors with a deeper connection to the content of exhibits. Mobile devices can provide museums with the ability to open up their collections allowing for more enriching and educational experiences.

Mobile devices are an emerging platform for information sharing that museums have begun to experiment with. The use of these devices is still in the very early stages of use, with a limited number of museums experimenting with them. These devices offer museums a number of opportunities that other forms of communication either are not able to or struggle to accomplish (Falk et al, 2008). Without proper consideration during the design of a mobile experience, there is a risk that they can interfere with the intended communications.

To ensure that they do not waste their time museums should adopt a contextual model for learning. A contextual model focuses on successful communication across three main contexts, the personal, physical and sociocultural contexts. This model is most applicable because it does not make clear predictions or assumptions about learning (Falk et al, 2009). The contextual model states that learning is complex and that individuals make meaning out of information

gathered across these contexts. As museums serve as social institutions it is important that they consider multiple forms of learning across multiple contexts, and not rely on one sided interactions, such as when a visitor reads an object label to learn about a piece.

Along with context building another key feature of mobile technologies is the ease at which they facilitate participatory experiences. There are a number of museums that have begun to use mobile devices to create this participatory communication. This does not mean that museums have a complete understanding of this new technology.

In this section I will be presenting a number of case studies from within the museum world. These cases have been selected for their strengths in two key areas. They look at mobile experiences that emphasize the use of contextual learning, and facilitate effective participatory learning. In the case studies that do not specifically use smart phones, they feature some form of mobile technology whose functions can easily be replicated onto mobile devices.

Case Study 1

Metropolitan Museum of Art: New York, NY discussed in *Digital Technologies and the Museum Experience* by: Smith et all, 2008

Description

The first case study I will be looking at was conducted by the Metropolitan Museum of Art. This study dealt with the usefulness of audio tours in an art museum setting. To test this, the Metropolitan Museum offered audio tours to 272 visitors (Smith et al, 2008). The purpose of the study was not to measure the acceptance or willingness of visitors to use audio tour devices, but was to gauge the usefulness of audio tours in art museum settings**.**

This was a self-guided tour where only select works in the galleries had an audio component. Individuals were given a personal audio device and were able to freely move

throughout the exhibits, activating which ever audio experience they wished. After returning the equipment the individuals who had participated were asked to take a survey about their experience.

While this experience did not take place explicitly on a mobile device, this discrepancy does not affect its relevance to this study. As mobile devices can easily be used as a platform for audio tours, the positive findings about the acceptance is highly relevant to the usefulness of mobile devices. The findings from the study are shown in Table 4.

[Insert Table 4]

Based on these findings visitors at the Metropolitan Museum had a favorable opinion of the use of mobile devices as learning aids. Among individuals who had used an audio device before the acceptance was around 80%, and it was at an equally high 77% from people who had never used one. This high favorability accompanied by an extremely low number of people who felt the audio tour interfered with group communications makes for a technology that has a strong educational impact (Smith et al, 2008).

Audio tours such as this one are strong learning aids that create meaningful learning opportunities at the personal context level. This tour allowed individuals to select which works they wanted to learn more about, along with giving them the freedom to move at their own pace through the tour. This allowed them to create deeper more personal connections between visitors and artifacts.

While the strength of this tour may be its emphasis on learning across the personal context, it does not ignore the other two. Since this tour takes place in a physical space and requires the visitor to physically move from object to object visitors are still able to take the

exhibit in as a whole. Allowing visitors the opportunity to engage with the exhibit and not just a few items, this allows them to establish learning connections through a physical context.

The audio tour also allows for sociocultural learning by allowing individuals time to talk between objects. By forcing visitors to manually select when they want to learn about an object the audio tour allows for discussion about a given piece before moving onto the next. This is a very important feature of this application, as social interaction can help reinforce the understanding of certain ideas.

Case Study 2

George Square: Glasgow, UK discussed in *Digital Technology and the Museum Experience* by: Rudman et al, 2008

Description

The case study about George Square discusses the use of mobile technology to establish a connection between two groups of people who are not sharing the same physical space. This study highlights the power of mobile apps in on-sight and off-sight experiences. In this study participants were divided into two groups. The groups consisted of those who would explore the physical space of George Square, and those who be exploring the same space digitally from a remote location (Rudman et al, 2008).

The purpose of this study was to test how differently these two groups would behave while "interacting" with the space. In this study the participants were provided with the mobile devices they would be using. The group moving through the space was given tablets and digital cameras. The second group was given laptop computers. While these groups may have been physically separated the application being used allowed for active conversation. Both groups also

maintained audio communication, as well as uploaded pictures of locations in the Square (Rudman et al, 2008).

During this study the group with tablets would be able to move around the physical space and visit the shops in the square, all the while the tablet would make a map of where they had gone. This would create an image of a path moving around a digital map, creating a real time image of what they had been doing (Rudman et al, 2008). The off-site visitor would be able to see the path of the on-site visitor and would search the web for pages related to locations near the on-site visitor providing insight into what near them in the square (Rudman et al, 2008

This study found that instead of working separately and exploring the space via their devices, these two groups worked together. The audio component of this experiment was the primary form of communication between the two groups (Rudman, 2008). Promoting discussion of the various images the two groups had posted during their time exploring the Square in their respective manners. This use of technology promoted multiple forms of communication, creating a space where individuals can easily and rapidly share information and ideas.

At the personal context level this mobile experience creates multiple opportunities for individuals to make quick, lasting, and significant interactions. Whether in the actual space or interacting remotely visitors were able to upload and share what they found most interesting, which allows for communication and learning before setting foot in the space. Allowing multiple visitors to post on the same place creates a dynamic conversation about what is the most exciting or interesting, helping to establish lasting personal connections to the experience.

While it may not seem like it at first this experience allows for significant connections to the physical space, visitors on site are able to select the aspects of the space that they find the most significant and share them with a larger community. This allows individuals to feel that

their voice is important and what they say is of interest, helping to create lasting memories. The posted images and information also provide a deeper level of insight into the visitor's surroundings, fostering a greater level of learning.

The physical context of this exhibit is not exclusive to those on-site. Posting things such as images and information, as well as the paths visitors took through the Square, can help potential visitors prioritize parts of the exhibit before they arrive. Prioritizing their visit in this way will allow visitors to spend more time on the parts of the exhibit they find the most interesting or beneficial. This allows visitors to establish more personal and meaningful connections with the space itself.

At the sociocultural level this experience excels. As a central part of this mobile experience is the communication between those on-site and off-site, group discussion and learning is central to its effectiveness. This is accomplished in two ways, the first being the posting of images and information. As individuals are able to post things in response to and for others to see this activity encourages group interaction; this can even be extended to the maps being made of people's movements.

The second way the Sociocultural Context is addressed is through the actual dialogue of the individuals. Providing visitors with a way of communicating directly between those on and off-site places group learning as a central concept of this activity. Fostering learning between individuals through active dialogue is an effective way for museums to help establish ongoing learning and deeper understanding of concepts.

Case Study 3

Context Aware Gallery Exploration: Birmingham, UK discussed in *Digital Technology and the Museum experience* by: Rudman et al, 2008

Description:

  The Context Aware Gallery Exploration (CAGE) study was conducted at the University of Birmingham and was a study using ultrasound to chart visitor movements through a gallery. To carry out this test the researchers placed a number of boxes that projected ultrasonic noise throughout a gallery. Individuals were then given hand held devices that acted as receivers, allowing the researchers to determine the location of individuals to within one meter (Rudman et al, 2008).

  The purpose of this study was not to test if this technology could work, but was to measure which works were the most popular and chart how visitors moved through the space. When visitors holding a handheld device moved within a certain distance of an artifact, they were presented with additional information about the work. The amount of information provided on the hand held device was relative to the visitor's location to the work (Rudman et al, 2008). To compare this to a regular visitors experience a select group of visitors were given pamphlets and told to explore the same gallery. These pamphlets held all of the information that was available on the hand held devices, to ensure a comparable experience.

  From these devices the researchers were able to gather three main types of information; the path they took through the gallery, the length of time at a work, and times previously at the piece. This information allowed the individuals conducting this study to do two very interesting things.

First this information allowed for the creation of a map of how visitors moved through the space (Rudman et al, 2008). Access to this information allows museum workers to see what images are the most popular, and how visitors moved between them. This tracking data is extremely beneficial; it can help museum staff understand traffic flow. Learning the traffic flow can help exhibit designers create a more enriching experience by strategically hanging works causing visitors to move through the space in the intended manner.

The second thing that charting visitor interest in this manner allowed museum workers to determine was the amount of additional information each work should be given. As a large part of the content delivery system was based on time spent near a work, visitors who spent more time examining a work were rewarded with information they may have missed. In the case study the researchers noted that this occurred around a specific painting, where visitors gathered and discussed various details of the work as they were brought to their attention through the handheld devices (Rudman et al, 2008). Paying attention to visitors interests in this manner can also act as a form of evaluation, helping to ensure that time is budgeted in ways that will be of the most benefit.

This activity allows for meaningful learning at the personal and the physical contexts. By design the CAGE program rewards visitors for longer and more intimate interactions with different works. As individuals are provided more information the longer and closer they are to a piece, they are likely to spend more time engaging with individual works. This can also help visitors make sense of the physical space of an exhibit. Allowing for personal meaning to be made as visitors are able to navigate the exhibit in the way they find the most appropriate; creating their own flow for a gallery.

Unlike the other contexts the sociocultural is not as well developed in this activity. In its current state there are only limited ways that individuals are encouraged to interact via the activity. As the activity is only designed to provide a previously established set of information, there is little to no reward for group interaction and learning. It can be argued that the maps being made allow for a degree of group meaning making, as they help visitors understand the parts of the exhibit others found the most meaningful and informative.

Case Study 4

MyArtSpace: UK discussed in *Digital Technology and the Museum Experience* by: Rudman et al, 2008

Description

The MyArtSpace application is an extremely powerful use of mobile devices that helps museums do what they do best, serve as centers for education. MyArtSpace is a digital storage service that allows users to upload various forms of information about an exhibit they find relevant or interesting. Once a user has uploaded a piece of information MyArtSpace notifies them of other users interested in the same information (Rudman et al, 2008).

As museums serve as centers for learning they are often the subject of school field trips. MyArtSpace allows museums and schools to work together to create educative experiences that start before students arrive at the museums, and continue once they are back in school. The goal of MyArtSpace was to create a way for museums and schools to provide a more educational and enjoyable experience for the students. This is done to take the students away from activities such as worksheets and guided tours, and allow them to explore an exhibit and create personal connections to what they are learning (Rudman et al, 2008).

This study was carried out extremely thoroughly; it was tested by 4,000 some students in three museums in the UK (Rudman et al, 2008). The goal of this project was to create a way to better establish an educational link between what was happening in classrooms before and after a field trip. To carry this out the three museums were provided with mobile phones that had the MyArtSpace application on them. These would be used by students to select individual works to upload that they felt were relevant to a question posed by their teacher.

When the students enter one of the codes assigned to an artifact, information, images and sound would be uploaded onto a web page assigned to each student by the application. The MyArtSpace application would then tell the students if any of their classmates selected the same work, encouraging communication between individuals (Rudman et al, 2008). Once the information has been uploaded onto the webpage the students have the ability to access it at any time. Giving them the freedom to engage with the exhibit, spending more time examining the meaning behind what they were seeing, and less time worrying about filling in worksheet.

MyArtSpace is an extremely strong example of learning flowing across contexts. This is not surprising as this application was designed to facilitate education and establish lasting connections. It was noted that in one of the museums conducting this study that the average time spend interacting with the exhibit expanded from 20 minutes to an hour and half (Rudman et al, 2008). This means that the children were taking advantage of all the application offered establishing a strong personal context with the exhibit.

At the personal level this application excels at allowing individuals to quickly develop a unique understanding of the gallery. By allowing visitors to select which work they think is the most important or meaningful, they are able to express which aspects of the exhibit they feel

express the intended goal of the exhibit. This allows visitors to engage with the material in a more meaningful way, creating more memorable connections with the material in the exhibit.

By having visitors post images and voice recordings of parts of the exhibit they found the most helpful, MyArtSpace is able to establish a strong physical connection between the visitor and the exhibit. Directing visitors who are participating in the program towards others who have uploaded the same things allows the people using MyArtSpace to spend more time interacting with the actual exhibit materials. This helps to create lasting memories of the various aspects of an exhibit that could easily be overlooked.

Directing the visitors towards interacting with one another is an ideal way to stimulate learning in the sociocultural context. As individuals may find aspects of an exhibit overwhelming or confusing, a group discussion about the presented topics can help to alleviate these pressures. Discussing topics in this manner can help to reinforce ideas and understanding, allowing visitors to more easily grasp the concepts presented to them. This can help to create a positive memory about the experience, helping to ensure that visitors will continue to learn and interact with the information gathered during their visit.

CHAPTER 5

RECOMMENDATIONS

As stated earlier in this work, there is likely no "one size fits all" approach to creating mobile learning aids for museums. But this does not mean that there are not some common trends among successful uses of them. It is crucial that museums take advantage of these devices while they are still a growing technology, as it is likely that an ever increasing portion of the population will possess one (Table 1).

Through the work already done by those inside the museum world, there are a number of lessons museums can learn from when it comes to investing in mobile devices. The following recommendations have been gathered from literature related to learning as well as technology in museums, and has been bolstered with examples of successful applications as discussed in the case studies. It is the goal of these recommendations to provide museums with some clues as to what creates a truly effective mobile experience.

- **Base the design on the Contextual Model of Learning**

The first recommendation is that any mobile experience should be rooted in the Contextual Model of learning. This learning model does not try to make strict recommendations or predictions about how learning will take place, but instead it states that learning is something that flows across contexts, and is constantly created as individuals interact with other people and their surroundings (Falk et al, 2008).

The model states that learning flows across three contexts, the personal, physical, and sociocultural. These create an all-encompassing understanding of how individuals create meanings and learn. The personal context deals with individual learning and internal dialogue, it is all about the personal meaning created when an individual interacts with a concept or idea.

The physical context is how an individual interacts with their environment, and what sort of meaning he or she can make from the physical objects around them. This can be as simple as the layout or design of a gallery, to more complex interactions with various exhibit items. The sociocultural similar to the personal context, but it takes it one step further. It deals with the communication between individuals or groups, and the meaning they can make by interacting with one another (Falk et al, 2008).

Mobile devices are an extremely powerful tool that museums can easily take advantage of. As they have naturally evolved mobile devices have become a platform that can easily establish learning across all three contexts. They are able to provide museums with an almost endless number of possibilities. The case studies present a number of ways museums have begun to address this issue, a feature that they all share is the ability for visitors to gain additional knowledge through prolonged use. Creating a mobile experience that visitors are able to access and find beneficial before and after an exhibit is just as crucial as ensuring it fits in with the exhibit.

A mobile experience that has no substance is not very likely to be successful. By basing the design in the Contextual Model museums can create learning experiences that go well beyond an initial visit. Developing mobile experiences around a model that basis learning on development over time and contexts museums can create experiences that allow visitors to make lasting and meaningful connections to the ideas and information in an exhibit. As the primary goal of museums is to serve as centers of learning, the ability to encourage this before, during and after a visit seems ideal.

- **Create ways for visitors to participate**

Working alongside the use of the Contextual Model is the need for museums to create experiences that allow for active participation. Participation can mean any number of things, and can range from posting questions on a message board to selecting works to be displayed. Despite the endless possibilities mobile devices allow for participation, there are three key features of all successful uses in the museum setting.

First these interactions need to be simple and quick; any individual regardless of prior knowledge of the device should be able to easily understand what they are expected to do. If this becomes overly complex there is a risk that it can turn people away, damaging the effectiveness of the mobile device as a learning aid. The second trait is to create experiences that cause individuals to feel that their participation is beneficial and appreciated. Rewarding individuals can be a simple of a ways as recognizing creativity which can be an effective method to ensuring future participation. Third is to ensure that both the interactions and feedback are highly visible

Mobile devices are an ideal platform for encouraging participation. As a large portion of the population already owns a smart phone, they are rapidly becoming a pervasive part of society (Table 1). Because of this it can be inferred that as this percentage increases, individuals will become more comfortable using mobile phones as more than direct communication devices. This means that mobile devices such as smartphones can serve as a highly effective method to encourage acting and lasting participation with museums.

- **Always design a way to evaluate the outcome**

Any program that lacks proper evaluation measures creates a situation that makes it extremely difficult to determine success. Without data to back assertions such as the "success" of

exhibits or applications, any definition becomes subjective and difficult to rely on. Like the other aspects there is no "one size fits all" approach to this either.

Different evaluation measures such as surveys and interviews can attract different demographics of people, which is why only using one survey instrument can produce possibly inaccurate or skewed results, as each measures a different audience. Mobile devices are an ideal way to administer multiple survey instruments about an activity to a wide audience; on a platform they are likely to be comfortable with (Table 4). As museums exist as social institutions, when individuals visit the museum they often expect to spend that time interacting with their families. It is crucial that the survey instruments being administered be as unobtrusive as possible.

To figure out which survey instruments would be most appropriate, it is important that the type of information the museum is looking for be identified. There are many survey instruments that museums can use that provide a great deal of information, such as interviews, observations, surveys and focus groups (Nelson et al, 2015). All of which are able to provide highly accurate information about how visitors felt about an exhibit.

Mobile devices can allow museums to collect certain forms of data that are more difficult to manually track. Types of data collection such as recorded conversations, web analytics, and participation data all of which can all be easily integrated into the functionality of a mobile device. These survey measures are not the only possibilities for mobile devices; with the increasing connectedness of mobile devices to our lives it has become easier to administer things like surveys through this platform.

Depending on the activity the desired survey instruments could easily be designed into activity itself. Factors such as number of users, frequency of logins and number of interactions

are easy measures to track and can provide a great deal of information. Even though measures such as those can provide a good deal of information, they do not always effectively express individual's opinions and how effectively the activity accomplished its learning objectives, which is why it is crucial to use multiple survey instruments.

CONCLUSION

From the works presented by Proctor, Tallon et al, and Sharple et al, it is clear that mobile devices can clearly benefit museums, it also apparent that there is no "one size fits all" option available to museums to harness this technology. Because of this museums must carefully consider the use of these devices with each individual exhibit. To best accomplish this there are three common themes museums should adhere to.
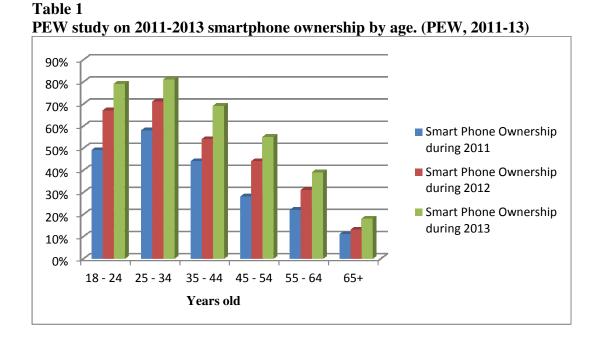
They are the use of the Contextual Model of learning in the design of the experience. This model will help museums ensure that the mobile experience they are developing will create strong personal connections between the visitor and the exhibit. The second is the use of participatory learning activities. Strong participatory activities allow visitors to engage in a dialogue about the exhibit, helping to strengthen their personal understanding of the exhibit. The third trait of successful mobile experiences is the ability to evaluate their success. Without the ability to evaluate how a mobile experience is perceived by visitors, museums put themselves in a very difficult place when it comes to measuring its success.
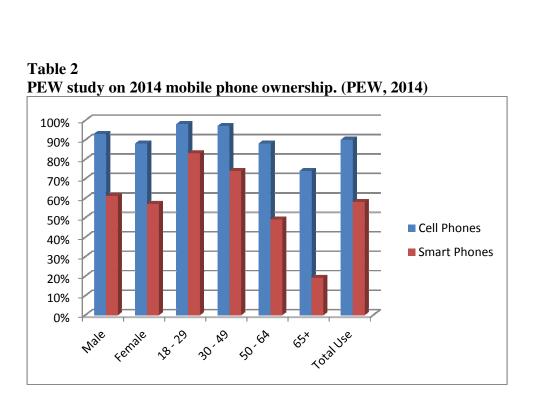
LIMITATIONS

There are a number of limitations inherent in this study, the most significant deals with the very nature of the qualitative analysis that the study is based around. As qualitative analyses do not rely on hard data to reach their conclusions, their accuracy and validity as evaluation measures comes into question. Another issue with this lack of data is the "successful" nature of

the cases being analyzed. As they have been presented throughout the various readings as successful incorporations of digital technology into exhibits, the reader is forced to trust the authors despite the lack of quantifiable data.

Another potential issue with this paper is the lack of a test of the recommendations. The recommendations presented in this paper are based on conclusions drawn from outside studies, not expressly testing the strength of the Contextual Model of learning. Despite this the studies selected are strong examples of how this model can be successfully used to increase visitor enjoyment and learning. All of these studies test a mobile experience that attempts to establish deeper connections between visitors and an exhibit, managing to establish learning across multiple contexts simultaneously.
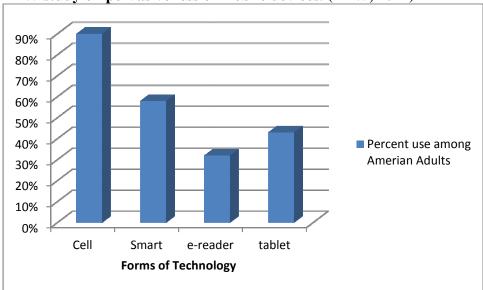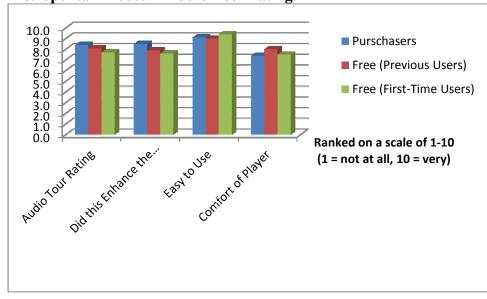
TABLES

Table 1
PEW study on 2011-2013 smartphone ownership by age. (PEW, 2011-13)

Table 2
PEW study on 2014 mobile phone ownership. (PEW, 2014)

Table 3
PEW study on pervasiveness of mobile devices. (PEW, 2014)

Table 4
Metropolitan Museum Audio Tour rating.

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APPENDICIES

APPENDIX A: KEY TERMS:

The following are terms that appear throughout this paper. To clarify any misunderstandings about how they will be used I am providing some operational definitions.

Mobile Device: For the purpose of this paper when the term "mobile devices" is used it is in reference to smart phones.

Contextual Learning: The Contextual model of learning does not make predictions about learning; it states that learning is a continuous process that takes place over multiple contexts. These contexts are the personal, physical and sociocultural. Learning on any of these levels can extend past the initial visit.

Personal Context: Personal Context refers to individual meaning and significance established between an individual and an artifact or idea. This also includes their motivations and expectations, stemming from prior knowledge and interests.

Physical Context: Learning in the Physical Context refers to how visitors learn and interact with the physical aspects of an exhibit. This includes navigating through the space; understanding the intended or unintended flow of the exhibit, to interacting with various components of an exhibit.

Sociocultural Context: The Sociocultural Context as mentioned in this paper refers to communication between those in a group or larger community. This operates under the assumption that communication between members of a group can help clarify and strengthen the understanding of ideas and concepts.

VITA

Graduate School
Southern Illinois University

WM Weston Stoerger

stoergerwm@gmail.com

Southern Illinois University Carbondale
Bachelor of Arts, History, May 2011

Research Paper Title:
WHAT IS THE MOST EFFECTIVE WAY MOBILE DEVICES CAN BE INCORPORATED
INTO MUSEUM EXHIBITS, IN ORDER TO FACILITATE COMMUNICATION THAT, IN
TURN, PROMOTES AN ENJOYABLE AND EDUCATIONAL EXPERIENCE?

Advisor:
Layla Murphy