

**Location Aware: Museum Mobile Applications as an Interpretive Tool**

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**Abstract**

The goal of this research was to describe the ways that the specific technologies available to smartphones, such as location awareness, afford new opportunities and strategies for interpretation of exhibit content and audience engagement. On-site analysis guided by principles of interpretation and design, and interviews with museum app developers, suggest that museum apps are considered effective as interpretive tools when the smartphone technology is used in a way that serves the content being presented. All of the institutions surveyed were interested in creating mobile apps that focused on augmenting the experience that visitors might have through traditional interpretation or exhibit content, rather than imitating it. A survey of professionals indicates that a more complete understanding of the audience of museums apps is still required within the field for there to be certainty about their effectiveness and impact as interpretive tools.

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## Chapter One: Introduction

In 2013, the NMC New Horizon Report named location-based services as a technology whose adoption by museums would become a trend in next two to three years, allowing for more precise in-gallery mobile interpretation, as well as for more outside-of-gallery mobile interpretation linked to a particular location or site (“NMC Horizon Report,” 2013). As recently as 2011, both the MUSE awards and Museums on the Web’s Best of the Web awards added awards categories for mobile applications. The American Alliance of Museums published a guide to mobile strategy for museums, called *Mobile Apps for Museums: The AAM Guide to Planning and Strategy*, in 2011. Museums are beginning to consider ways that mobile technology can be, and has been, used to further the goals of institutions and enhance visitors’ engagement and learning.

Despite the emphasis on its increasing importance, the museum field is only beginning to assess what characterizes successful use of this technology by museums, and, particularly, the ways that museums are creatively using the technological architecture of smartphones, in interpretation. The use of mobile apps as an interpretive strategy is still new within museums, and is constantly changing as the technology platforms evolve and new programs are tried. There are a lack of established best practices for the use of technology by museums and museum programs, and museums are struggling to find ways to maintain content as technological platforms are changing rapidly (“NMC Horizon Report,” 2012). The field has begun to track the use of mobile technology by visitors in museums, as well as by the institutions, in efforts such as the 2011 AAM mobile technology survey, the annual survey conducted by Museums and Mobile, AAM’s TrendsWatch, and the annual NMC Horizon report, all of which describe trends, practices, and innovations within the field regarding the use of technology by, and in, museums.

The inclusion of a mobile app award category in the MUSE awards and Museums and the Web's Best of the Web Awards reflects a growing trend within the field to consider and recognize what makes a successful and innovative museum application.

Mobile technology possesses unique capacities as an interpretive tool to bridge and connect museum space and non-museum space, connecting exhibit content with the wider day-to-day experience of the visitor. Because of the ubiquity of smart phones, and their capacity to be carried from place to place with a person, they need not only serve museums within the exhibit space. They can extend visitor engagement beyond the initial visit, and reach audiences that may not be able to visit the physical museum space. Smartphone apps are highly interactive, creating opportunities for crowdsourcing, social networking, and annotation, as well as providing access to information tailored to specific needs. They have location service capabilities, allowing developers to link content to space in new and interesting ways. Museums applications are incredibly varied and diverse, just as museums and their audiences are incredibly varied and diverse, and this technology provides different opportunities as a tool than more traditional interpretive methods might. Smith (2009) described a shift in museums from the use of traditional audio guides to the adoption of content for multimedia devices, as well as the apparent slowness of museums to change their interpretive content to suit the challenges and opportunities presented by this new platform, rather than simply duplicating the old material and format of the traditional audio guide tour. Smith (2009) goes on to suggest that museums should take into account their audience and its needs and desires, and incorporate interpretation and content that utilizes the unique capabilities of mobile technologies such as the search function, the ability to record sound and video, wayfinding, the ability to generate recommendations for users tailored to location and preference, the ability to collect and curate, the ability to contextualize objects

with additional content upon visitor request, user-generated content and social media, and the ability to tailor a tour or path to an individual. Mobile app projects such as Art Maps are allowing visitors to engage with history and art by taking digital collections content out into the outdoor environment, allowing them to contextualize it and engage in participatory activities that can't be achieved within the confines of the museum gallery, itself (Beaven, et al., 2013). By selecting a few specific examples of museum apps that all utilize smartphone technologies, such as image recognition, geolocation, social media connectivity, camera capability, etc. to present and interpret museum content, that represent a variety of application formats, institution types and sizes, and analyzing them in detail, I will attempt to describe the ways they have successfully exploited the opportunities of their technological framework, and fulfilled visitor and institution needs.

By developing a better understanding of trends within the field as they are still developing, and the ways that the unique capacities of this technology are being used as a tool for museums to connect content to space and community, museums will be better able to develop their own mobile applications to meet their needs, and the needs of visitors, in the future.

The goal of this research is to describe the ways that the combination of technological capabilities available in smartphones, such as location awareness, image recognition, and access to social media, afford new opportunities and strategies for interpretation of exhibit content and audience engagement.

## **Chapter Two: Literature Review**

This research strives to examine the museum fields' use of mobile applications both in terms of the way the smart phone's technology informs and shapes what they can do for institutions and visitors and in terms of the interpretive principles that make them, at their core, a valuable interpretive tool for museums to deploy, both inside and outside of their spaces. Mobile technology possesses unique capacities as an interpretive tool to bridge and connect museum space and non-museum space, connecting exhibit content with the wider day-to-day experience of the visitor. The goal of this research is to describe the ways that the technological capabilities of smartphones, such as location awareness, image recognition, and access to social media, afford new opportunities and strategies for interpretation of exhibit content and audience engagement.

The literature that informed this research was diverse, both in format, context, and subject. The literature drawn upon encompasses literature from within the museum field critically reflecting upon the use of technology, surveys of technology use, case studies of applications that have previously been developed, best practices, and projections about the future use of technology in museums. This literature appears in anthologies of essays, web publications, and conference papers. It also encompasses literature from outside of the field, such as essays about mobile applications and education or informal learning, best practices in information design, and best practices in interpretation. The literature is meant to inform my study through examination of relevant theory within the field. Literature drawn upon addresses ways technology has been deployed in museums, as well as the development of thought and opinion about it over time. Specific examples of applications developed by and for museums have been included to contextualize the applications selected as cases in this study within broader trends

and strategies over time. The principles of interpretation and information design form the basis of the framework used to analyze the four applications selected as cases. The majority of these publications are recent, especially those dealing with museum mobile applications, something made inevitable by the relative newness of smartphone apps, in general. The best practices and theory included are both new and old, and remain relevant to museum professionals reflecting upon mobile applications as an interpretive strategy.

### **A History of Research about Technology and Museums**

Handheld mobile technology as an interpretive tool is not a new addition to museums. In early 1952, the Stedelijk Museum introduced the first audio tour, in the form of identical lectures recorded in multiple languages onto magnetic tapes and received by a portable radio receiver with headphones as visitors passed through the gallery (Tallon, 2008). Museums have been using mobile tools as an evolving strategy for interpretation since the development of the audio-guide. The definition of “mobile” when used to describe an interpretive tool has changed considerably over time, and now can encompass a variety of technologies, such as tablet computers, smartphones, cell phones, media players, and media players (Nancy Proctor, 2011).

The Pew Research Center found that, in 2015, 64% of adults, nearly two thirds of the adult population, in the United States own a smartphone (Pew Research Center, 2015). A smartphone possesses Internet connectivity, allowing it to provide access to applications, websites, and other content (Bicknell, Forbes, and Proctor, 2011, 109). In the Tate Museum’s recent evaluation of visitors’ use of its smartphone applications, one of the primary reasons for people utilizing their smartphones in the museum was to take pictures and share them on social media (Fildes and Villaespesa, 2015). As more visitors use their smartphones in museums,

museums have taken notice, and begun to consider ways this visitor behavior can be taken into account. Over the past several years, museums have begun utilizing mobile application programs, or apps, to accompany, supplement, interpret, and augment exhibit content. An app is “any body of code that performs a task or tasks when installed on a given operating system” (Bicknell, et al., 2011, p. 103). 43% of the 551 institutions that responded to the Museums and Mobile annual survey for 2013 indicated that they currently provide mobile content of some kind to their visitors, and another 23% indicated that they currently have plans to launch mobile content (“Mobile Strategy in 2013,” 2013).

Within the museum field, publications such as the NMC Horizon Report, which focuses on emerging technology tools used in museum education and interpretation, have noted museum mobile applications as a new and developing interpretive tool (“NMC Horizon Report,” 2012, and “NMC Horizon Report,” 2013). The American Alliance of Museums’ *Mobile in Museums Study* (2012) reported that the number of US museums to offer mobile services increased by over one third from 2011 to 2012, with smartphone app offerings increasing by 151% (American Alliance of Museums, 2012). Despite the recent trend towards museums developing mobile applications for the use of visitors with devices, the field is only really beginning to address what an application has the potential to be, as an interpretive tool. The first iPhone was launched in 2007, and the first smartphone using the Android operating system was launched in 2008. An online conference entirely focused on the topic, Museums and Mobile, was founded in 2009. It was as recently as 2011 that mobile applications were added to the award categories for the MUSE awards, and the Museums and the Web awards. The American Association of Museums also published their *Mobile Apps for Museums: The AAM Guide to Planning and Strategy*, a

series of essays edited by Nancy Proctor, in 2011. The museum field had begun to discuss what constituted best practices in museum mobile applications.

Despite this growing attention, Tallon (2008) remarks that, despite the potential of mobile devices as an increasingly ubiquitous medium for engaging museum visitors, there is a lack of thorough and easily accessible research within the field itself. Tallon (2008) hopes that this is changing, pointing out an increase in disseminated research by museums and universities focusing on functionality, content style, and visitor experience. Kate Goldman (2011) envisions that types of potential future research about museum mobile apps might include visitor-based research, case studies, and stratified and/or longitudinal studies. Goldman (2011) points out that visitor-based research currently poses challenges due to the difficulty of identifying visitors using museum apps and the consequent small sample size, but stratified and longitudinal studies, with their institutional focus, would provide a much larger field-wide sample, able to chart changes in barriers over time.

There has been a great deal of enthusiasm and optimism about the deployment of smartphone technology within the museum. However, there has also been trepidation expressed by museum professionals, as well. Burch and Gammon (2008) point out common myths about the deployment of digital technology in museums—that it is unpopular with visitors, and that it detracts attention from the actual museum content—but find in their research that when the design of the technology incorporates the needs, behaviors, and desires of visitors, the opposite is generally true—it enhances their engagement and enjoyment.

### **Significant Cases**

Artlens is the Cleveland Museum of art's mobile app. It launched in 2013, though Gallery

One, the in-museum interactive technology installation launched slightly earlier (Alexander, Barton, and Goesser, 2013). It has been written about more extensively than many museum apps, and has also been the subject of evaluation studies, as well as having been the winner of a 2014 Best of the Web award in the mobile category. It is significant to consider because of the amount and variety of content it includes, as well as its integration with the exhibit, and the digital Gallery One elements in CMA. It uses geolocation services to provides information about works within proximity to the visitor that have media content, such as digital stories, attached to them, scanning and image recognition can be used to activate augmented reality content tied to specific artworks, or sections of artworks, hotspots that provide more information about specific aspects of a work, tours created by curators, or by other visitors, as well as allowing visitors to create and share a tour of their own, and connectivity to social media allows visitors to post and share their favorite artworks from their visit (Alexander, et al., 2013). The augmented reality content refers to text and audio material that can be seen digitally layered over the physical artwork by looking at it through the camera of the smartphone while within the app. This is a significant case, not only because it is held up as representing a high standard within the museum field, but also because it has been discussed more than most. It is similar, in many respects to MAGart 2.0, one of the apps selected for this research, which also has a great deal of rich content, providing visitors with tours, further information, associated media, and hotspots, which focus in on certain aspects of works in the collection, allowing visitors to look more closely. MAGart 2.0 seems to strive to offer something for every visitor, as does ArtLens. ArtLens was intentionally designed to be appealing to visitors who browse the galleries—something that CMA found was a common visitor behavior when they did visitor studies (Alexander, et al., 2013).

Scapes was an app created as part of a sculpture installation in the deCordova Sculpture

Park and Museum by Halsey Burgund, and was on view from July 13, 2010 through Dec 31, 2010 (deCordova Sculpture Park and Museum, n.d.). Scapes tied a virtual soundscape to the physical landscape of the garden. Not only did it utilize location services to link musical scores to the landscape and the art on display, it also allowed visitors to add their own recorded discussion and comments about the art to the virtual soundscape (deCordova Sculpture Park and Museum, n.d.). The Fine Arts Museums of San Francisco's app, Voices:FAMSF, builds on the concepts pioneered by Scapes. Voices: FAMSF is also an app that layers sound over the landscape using location services, in order to interpret outdoor sculptures and architectural features, and is customizable, allowing visitors to choose the type of sound that they hear, and participatory, allowing for the visitor to record responses to prompts (Girardeau, Beaman, Pressley, and Reinier, 2015). That the app resembles Scapes in content and style to such a high degree is likely due in part to the fact that the museum's partners in the project were Earprint Productions and Halsey Burgund, who created Scapes using his open source software, Roundware, which was also utilized for Voices:FAMSF (Girardeau, et al., 2015). These projects are important to consider when examining the creation of an app that uses AR, or augmented reality, to allow visitors to explore a physical landscape in a more nuanced way. The Texas 1836 app does this by augmenting a landscape with digitally animated elements from its historical past, such as a town general store or a ferry boat, layering the simulated past over the physical reality of the present, and allowing visitors to explore both at once.

MORITZ (Mobile Tours in European Textile-Industry Centers) was a very early mobile project that was begun in 2006 using PDAs as its platform, rather than smartphones (Klüttsch, Koplín, and Eirund, 2007). It was intended to extend the museum experience onto historical industrial sites, allowing users to receive informational and multimedia interpretation content

that connects the past of the site to its present as they explored and interacted with the physical locations (Klüttsch, et al., 2007). The project involved collaboration between textile museums and academic institutions across Europe (Klüttsch, et al., 2007). PhilaPlace, another digital project, also strove to connect the historical past to physical locations, and went further by allowing the public to collaborate in content creation. PhilaPlace, which was a collaborative website that launched in 2010, focused on community, place, and history by using open source solutions to allow people to collaborate by digitally attaching their own ethnographic stories to physical locations in Philadelphia's neighborhoods (Borun, Fisher, Mann, and Sajet, 2011). Borun, et al. (2011) explain that, "The central interpretive idea underlying PhilaPlace...is that place is an important touchstone for memory, history, and culture, and that by exploring the memories and records of place, we educate the public about the past to promote and protect neighborhood spaces, sites, and stories that hold meaning in the present." These are projects to look to when studying the TXTilecity application. TXTilecity is also a project focused on interpreting historical textile industry sites and extending museum experience beyond the museum walls. As well as being an app, it is also a website, which, like PhilaPlace, takes advantage of easy-to-use web-based software in order to allow the public to upload their own multimedia content and stories about the places that were central to the history of Toronto's textile industry.

When Kew Gardens was working to develop an app, they commissioned a study of visitors' motivations and needs while on site, involving visitor-tracking, mini-interviews, fulfillment maps, and detailed exit interviews (Saunders and Waterson, 2012). They found that visitors had emotional, social, and spiritual motivations for visiting the Gardens, rather than intellectual ones; they did not come to Kew Gardens to find out information, and didn't need, or want, detailed wayfinding information (Saunders and Waterson, 2012). Instead, visitors enjoyed

exploring spontaneously, without guidance, and being allowed to make discoveries (Saunders and Waterson, 2012). Based on this, Kew Gardens determined a number of principles that would guide their app design: orientation shouldn't be prescriptive and navigation should be responsive (Saunders and Waterson, 2012). The app should be a tool allowing people to lose themselves, responding to visitor need in the moment, rather than determining the structure of the visit (Saunders and Waterson, 2012). The Kew Gardens' visitor study and its results shed light on the design of the Haiku Hunt app, which is also intended to provide wayfinding and information to the visitor, but in a playful, visitor-led manner. Balboa Park has little wayfinding signage, so the Haiku Hunt app provides information about a particular location to the visitor when she or he arrives at that particular location, and does so in a whimsical, rather than didactic, fashion.

### **Smartphone Applications and M-Learning**

George Hein (1998) discussed different theories and approaches about learning that can occur in museums. These range from the heuristic, wherein one learns through a process of experimentation and problem-solving, to the constructivist, wherein meaning is constructed by the participant through connecting it with their own past experiences and social and cultural framework, to the didactic, wherein knowledge is imparted by an authority, and to the behaviorist, in which the learner is passive in the learning process, responding to external stimuli. Dierking and Falk (2008) suggest, in their contextual learning framework, that the factors that influence meaning-making, or learning in a museum, a free-choice learning environment, are those that fall within the categories of personal context (such as personal motivation and prior knowledge and interests), sociocultural context (cultural background), and physical context (architecture and exhibit/program/technology design). The fact that personal

context and sociocultural context are just as important in meaning-making as physical context means that visitor learning will only be enhanced if the technology allows for visitors to customize and personalize their experience, relating it to themselves and their past experiences (Dierking and Falk, 2008). Bressler (2013) comments on the way that mobile devices can help to bridge contexts, supporting learning, serving as a scaffold, able to offer context-aware experiences to every learner, in any time or place.

As well as the literature of learning theory, and learning within the contexts of museums, the literature of the relatively new field of m-learning is also valuable when trying to analyze museum apps. M-Learning is learning that uses personal devices and occurs across multiple contexts, through interactions with social groups and content (Crompton, 2013). Crompton (2013) describes it as a field that is evolving rapidly. Some of the characteristics of m-learning, as defined by Helen Crompton (2013), are: lack of time-constraints, due to the fact that a handheld device can be carried and used just about anywhere; allowance for personalization through applications and modifications; privacy; spontaneity; that learning can take place in many physical and social settings; the possibility for both informal and formal learning; and allowance for social connections to those nearby and those distant. Kukulska-Hulme (2013) identifies common target audiences for m-learning: schoolchildren and their caregivers, students in higher education, young adults not in education or work, audiences described as underserved, professionals, communities, and learners with special needs. However, Kukulska-Hulme (2013) goes on to point out the following missing target audiences who could benefit from m-learning programs: older, retired population, young adults who are in work or education, those with disabilities who are not receiving proper support, and local underserved audiences that might be overlooked in favor of those located in other geographic areas.

Learning Theory should also inform the design process. Visocky & Visocky (2008) comment that cognitive science and education theory inform aesthetic choices that are made in the information design process, because users generally prefer a particular type of sensory interaction with new information. Three most common of these sensory modes are visual, auditory/verbal, and kinesthetic/tactile (Visocky and Visocky, 2008). Visual modes of imparting information might take the form of images, maps, or films. Auditory/verbal modes could be text or spoken word. Kinesthetic/tactile modes might include hands-on experimentation or play. A museum mobile app can utilize all of these modes of imparting information. Smartphones are inherently tactile and often haptic, featuring touch screens and allowing the user to move through spaces freely while utilizing them. An app can provide multimedia content that could include films, recorded voices, text, and images.

Visocky & Visocky (2008) point out that, “It is important to remember that most people learn through a combination of styles. By incorporating supporting layers of information in the form of type, images, and, when possible, tactile and aural experiences, the designer is able to engage multiple stimuli, creating a more memorable and meaningful experience” (p. 56). Smartphone technology, as used by museum apps, affords experiences that can engage multiple learning styles at once, very easily.

## **Design**

C. G. Screven (1999) addressed the importance of information design in informal learning environments, such as museums, pointing out the importance of making design choices calculated to both fulfill visitor needs, and also to catch and hold attention. Unlike students in a classroom, museum visitors are free to make choices about what content they engage with, and

how they engage.

Screven (1999) suggest that communication of an exhibit's message to visitors is not a passive one-way exchange. Rather, "exchange between viewer attention and observation and an exhibit's content form a loop... Visitors identify, encode, organize, reorganize, interpret, and perhaps act on exhibit information through their attention, perception, memory, and cognitive processes" (p. 138). The role of the interpretive planner, or designer, is to organize information in a way that will focus the visitor's attention upon the message that the exhibit is meant to convey to the visitor. Screven (1999) tells us that organization, clarity, relevance, aesthetic appeal, and the visitors' perception of the content's value will all play a role in attracting and holding the visitor's attention, allowing for learning to occur.

Museums face the tension between trying to reach the widest audience that they can and trying to make interpretation that connects visitors to content on a personal and individual level. Bringing technology into this equation only increases this tension, by adding the need to make content to audiences with varying technical proficiencies and comfort levels. Human-centered design, or user-centered design, can be a useful approach to take in addressing the potential problems of a user's unfamiliarity with the use of mobile applications. Visocky and Visocky (2008) describe human-centered design as a process involving cycles of research, testing, analysis, and refinement in order "to create artifacts that enhance the way people work, learn, and play—rather than forcing them to conform to new or unfamiliar skill sets and learning methods" (p. 25). The focus is placed on the needs of the user.

Robert Horn (1999) defines information design as "the art and science of preparing information so that it can be used by human beings with efficiency and effectiveness" (p. 15). Horn (1999) stresses the importance of comprehensibility, of ease of retrieval and application,

and of comfort. Designers of museum applications should strive to attain these factors. Visocky and Visocky (2008) have summed up some of the ways that a designer might approach doing so.

Contrasts of color draw notice, and large, simple fonts help readers to see and process textual information (Visocky and Visocky, 2008). The composition of content is important to understanding it. For example, objects adjacent to one another may invite comparisons and associations in viewers, and those that are similar may be understood as a group (Visocky and Visocky, 2008). Richard Wurman (1989) created five ways of grouping information. Wurman (1989) called this LATCH, meaning Location, Alphabet, Time, Category, and Hierarchy, each of his five schemes for grouping. All of these five can easily be applied to sets of information. Visocky and Visocky (2008), also suggest emphasizing the most important information most prominently, and then the rest of the details. Think of a newspaper headline and subtitle that tells you the basics of who, what, when, and where, while the article supplies further supplementary information.

Alvin Toffler (1970) coined the term ‘future shock,’ meaning the inability to process and understand information due to being overwhelmed by the volume of it that is available. Information overload, an overwhelming density of information, and visual shock, the equivalent pertaining to maps, pictures, and charts, is something design should prevent (Visocky and Visocky, 2008). It is for this reason that interpretation should be designed in a responsive fashion, tailored to the needs of the user, providing the content that the museum visitor is most likely to want, with the choice to receive more or less information.

It is also important to keep in mind that the information that you are trying to convey will not reach as many people if they have to struggle to get it. If your design is difficult to navigate through, or makes it hard to locate the information that the user wants, they will be more likely to

give up and do something else. Thomas Mann (1993) refers to the Principle of Least Effort, meaning that users will be more likely to use a tool that seems familiar and easy-to-use than to try to master something new if it appears that it might take more time and effort. A mobile app designed to conform to behaviors smartphone users already most commonly engage in with the technology will be more familiar, and involve less effort on the part of the user.

Wayfinding also requires thoughtful design to convey information successfully. According to Visocky and Visocky (2008), “‘wayfinding’ describes how an individual orients him- or herself within a new environment, and the cognitive processes used to determine and follow a route, traversing from one point to the next” (p. 72). This term is generally used to refer to a physical space, but it might also be used to refer to navigating a digital space, such as a database, a website, or an app. Wayfinding relies on route-based knowledge, which is cues within the physical environment, such as landmarks, and survey knowledge, which is a representation of a space, such as map (Visocky and Visocky, 2008). How easily one can use wayfinding is determined by the clarity and legibility of design.

## **Interpretation**

The aim of this research is to consider the way that the technological affordances of smartphones can shape and inform museum apps in their function as an interpretive tool. In 1957, Freeman Tilden wrote *“Interpreting our heritage: Principles and Practices For Visitor Services in Parks, Museums, and Historic Places,”* a book which defined the principles of interpretation, establishing best practices that remain relevant to interpretive planning today. Tilden defined interpretation in a couple of different ways. He gave a “dictionary-style definition” of the term: “An educational activity which aims to reveal meanings and relationships

through the use of original objects, by firsthand experience, and by illustrative media, rather than simply to communicate factual information” (Tilden 1957, p. 8). Tilden goes on to define it additionally as “the work of revealing, to such visitors as desire the service, something of the beauty and wonder, the inspiration and spiritual meaning that lie behind what the visitor can with his sense perceive” (Tilden 1957, p. 3-4). The reason that Tilden defines interpretation in multiple ways is that interpretation is something that is difficult to define in a neat and encompassing fashion. Beck and Cable (2002) who updated Tilden’s six interpretive principles for the 21st century, and added an additional nine principles, suggest that this confusion about the definition of interpretation may stem from the broad range of activities and spaces that it encompasses.

Tilden’s (1957) six principles are:

- I. Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile.
- II. Information, as such, is not Interpretation. Interpretation is revelation based upon information. But they are entirely different things. However, all interpretation includes information.
- III. Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is to some degree teachable.
- IV. The chief aim of Interpretation is not instruction, but provocation.
- V. Interpretation should aim to present a whole rather than a part, and must address itself to the whole man, rather than any phase.
- VI. Interpretation addressed to children (say, up to the age of twelve) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best, it will require a separate program. (p. 9).

Beck and Cable’s additional nine principles add suggestions about the thoughtful integration of technology, communication style and tone, planning and sustainability, and the

connection of the past with the present (Beck and Cable, 2002).

- VII. Every place has a history. Interpreters can bring the past alive to make the present more enjoyable and the future more meaningful.
- VIII. Technology can reveal the world in exciting new ways. However incorporating this technology into the interpretive program must be done with foresight and thoughtful care.
- IX. Interpreters must concern themselves with the quantity and quality (selection and accuracy) of information presented. Focused, well-researched interpretation will be more powerful than a longer discourse.
- X. Before applying the arts in interpretation, the interpreter must be familiar with basic communication techniques. Quality interpretation depends on the interpreter's knowledge and skills, which must be continually developed over time.
- XI. Interpretive writing should address what readers would like to know, with the authority of wisdom and its accompanying humility and care.
- XII. The overall interpretive program must be capable of attracting support—financial, volunteer, political, administrative—whatever support is needed for the program to flourish.
- XIII. Interpretation should instill in people the ability, and the desire, to sense the beauty in their surroundings—to provide spiritual uplift and to encourage resource preservation.
- XIV. Interpreters can promote optimal experiences through intentional and thoughtful program and facility design.
- XV. Passion is the essential ingredient for powerful and effective interpretation—passion for the resource and for those people who come to be inspired by it. (p. 8).

When designing a mobile application, it is important to keep these principles in mind.

Both sets of principles of interpretation were initially conceived before the introduction of museum mobile apps. In fact, Tilden's principles precede even the first handheld audio guide. Nonetheless, they express guidelines that are useful in the development of all interpretive strategies, regardless of medium. As discussed earlier, experiences in the museum are often thought to be imparted with meaning by context. Tilden's first principle expresses the importance that interpretation makes it possible for the visitor to relate information to their own

life, their personal context. The second and third principles relate to the importance of imparting information thoughtfully and creatively, as one might by using the principles of design, avoiding information overload, and drawing the visitor's attention and interest. The fourth principle recalls the idea that learning experiences in museums are exchanges. By provoking a visitor to respond, to ask questions, to contribute, rather than simply imparting information, an interpretive tool facilitates that exchange. Tatter (2008) also points out that this exchange can have a quality he refers to as "transactivity," which not only involves the potential to change the visitor, but also their environment, social relationships, and the material tools involved—in this case, the smartphone app (Tatter, 2008). The fifth principle deals with the audience, serving as a reminder that an effective interpretive tool must balance between being able to address a broad audience, and still creating a personal and individual experience. The sixth principle also addresses audience, emphasizing the importance of not talking down to a younger audience, but rather designing interpretation specifically with their needs in mind.

Beck and Cable (2002) state that interpretation can express itself in many forms, such as talks, demonstrations, living history, storytelling, tours, signs, exhibits, and interactive computers. However, museum apps present many new possibilities to developers in regards to how they present content to users, and facilitate engagement. Keeping focus on what constitutes best principles in interpretation for the field allows museums to utilize the opportunities of the technology, while not losing sight of what makes an interpretive strategy effective.

### **Technology and Affordance**

The aim of this research is to describe the ways that the specific technologies available to smartphones afford new opportunities and strategies for interpretation of exhibit content and

audience engagement. According to Carmean, Frankfort, and Salim (2013), “affordance lies at the intersection of the user’s perceived capability of the device (mobile mass storage), plus the software (unique to the needs of the user), available wherever the user needs to be at any time” (p. 188). Affordance describes the possibilities for experience created by the smartphone as a tool, and the ways we interact with it, and perceive it. All of the specific technological features of a smartphone create new affordances for learning experiences and engagement.

Touch screens supply new affordance by reducing the stop and go nature of navigating menus and buttons, creating fewer steps to achieve a task, but this is dependent upon realization in design (Carmean, et al., 2013). Touch screens are also more intuitive, since we are used to manipulating the world around us with our hands. They require less effort to learn to navigate. Internet access also comes with a new set affordances, supplying immediate answers, allowing for shared knowledge, and providing access to resources of all kinds (Carmean, et al., 2013). Mobile apps themselves create another set of affordances, when added to mobile devices. Carmean, et al. (2013) describe the mobile app as “software designed for a small job or a singular purpose, to be run on a mobile device.” (p. 190). This focus of purpose and of content of the mobile app means that the design is specific enough that “the user never struggles with where in the menu to find an option, never wonders what the App was fully intended to do, never worries whether we are fully utilizing functionality” (Carmean, et al., 2013, p. 190). While this is likely only the case if the app is well designed, it does give an indication of how suitable an interpretive tool an app can be, in such cases. Apps can be incredibly personalized. A user chooses what to install and use on their smartphone, and further customizes their experience within the app, itself. Rather than a one-size-fits-all traditional audio guide, an app fosters visitor choices, helping them to personalize their experiences, and make meaning from them. As

Carmean, et al. (2013), phrase it, “We now begin to see m-learning as actionable possibility built on the learner’s context, actions, choices, and needs in the moment. This combination of features creates a learner-centered connection to the world and the individualization of knowledge yet to be understood in learning design” (p. 191). In the context of the learning process as it is described by Carmean, et al. (2013), or by similar constructivist approaches, museum apps may be understood as facilitating learning by enabling the visitor to make a greater array of choices, allowing them to contextualize and personalize information, making meaning from it. As an interpretive tool, it must be attuned to the needs of visitors.

Carmean, et al. (2013) ask, “Mobile, connected to the Internet and its web of individualized choices, built for access in small chunks, and customizable to individual’s needs and experience—does this not change m-learning from learning that is mobile, to something more and not yet experienced or understood?” This research is intended to explore this question. The affordances of smartphone technology and museum apps are more than just portability, location awareness, and Internet connectivity. Affordances of smartphone technology can help museum visitors shape and personalize experiences when they are utilized as part of a holistic and visitor-centered strategy of interpretation.

### **Changing Technology and Interpretive Strategies Now and in the Future**

Despite the emphasis on its increasing importance, the museum field is only beginning to assess what characterizes successful use of this technology by museums, and, particularly, the ways that museums are creatively using the unique features of mobile applications in interpretation. Much has been written in very specific forums within the field about the deployment of technology by museums, including museum mobile applications. Museum mobile

apps have also featured heavily in publications that deal with current trends in the field, or speculate about future ones. When reading these pieces, it must be remarked upon, that they can often be tied to a specific technology platform that may soon enough fall out of use. After all, smartphones came into common use very recently. Pew Research Center (2015) reported in its trend analysis “Device Ownership Over Time,” that in 2011, 35% of American adults owned a smartphone; by October of 2014, that number had nearly doubled. For this reason, it is important to focus on what is unique about the experience provided to museum visitors by a mobile device’s technology, as well as upon what defines an exemplary interpretive strategy, regardless of its medium. By conducting descriptive research composed of case studies of four quite different museum apps that were developed by four very different institutions, I hope to be able to focus on the way guiding principles of information design and interpretation can be applied across this spectrum, in ways that intelligently and creatively utilize the affordances of smartphone technology.

Nancy Proctor (2011) emphasizes that, “Understanding that the new mobile devices today are also geo-spatially aware computers capable of supporting research, communication and collaboration challenges us to ‘think beyond the audio tour’ and our silo-like approaches to digital initiatives” (p. 9). However, it is not the smartphones, themselves, that are notable as an interpretive strategy. It is the way we utilize the affordances provided by this tool to provide engaging, meaningful, well-designed content to museum visitors in a personal manner. What makes museum applications so exciting is the potential for experiences afforded by the interaction of all these components in combination. When a museum application is developed, the way that the affordances of the technology are utilized, in combination with the guiding principles of interpretation and design, to shape the visitor’s experience, can help those designing

interpretive strategies that utilize technological tools do so in a more thoughtful and holistic way, regardless of whether they are creating content for a smartphone app, a website, wearable technology, or even standard signage in an exhibit.

## **Chapter Three: Methods**

### **Methods For Collecting and Analyzing Data**

This research is organized as a series of case studies that describe a range of innovative ways in which mobile apps created for museums use their technological platform's capacities in order to create new interpretive experiences and connect audiences to museum content.

MuseumMobile, an online conference and a website designed to allow museum professionals to share ideas and strategies about the use of mobile technology, proposed a set of guidelines for general case studies of museum mobile applications, focusing on seven categories of information: background on the planning and development process of the application, the content of the application, feedback and evaluation, the way the application is marketed, general reflections on the application's success and development, and resources and technical details related to the project (MuseumMobile, n.d.). My research dealt primarily with the content of the application, and the development process and professionals' reflections upon it. However, in the process of doing my research I found that my on site analysis, and the responses I got during interviews addressed all seven of the MuseumMobile categories, to at least some extent. I was interested in exploring how the app was intended to facilitate the audience experience, as well as on the choices made during development, and the way design and interpretive principles can guide the ways the utilization of affordances of technology. Materials that were considered and analyzed included the content and design of the application itself, its functionality during use on-site, and the responses by museum professionals and developers about the choices that they had made in the process of developing and using the museum apps. By examining the content as it is presented within the application, as well as its integration with material within the museum, I was able to compare the interpretive strategies of the four museum applications, and how the

technology of the smart phone applications was used. This also allowed me to look at ways in which the app experience and the in-museum experience compliment and change one another when both are accessed in concert.

To experience the way these applications utilize the opportunities afforded to them by their technological platform, I utilized their content on location, within the context visitors were intended to use them. By doing this, I hoped to be able to present an idea of the visitor experience they create. I examined why, and how, the application was developed, how it serves institutional and audience needs, and how it allows museum staff and developers to cultivate new interpretive strategies. I gathered qualitative data during my research. “Qualitative techniques are extremely useful when a subject is too complex be answered by a simple yes or no hypothesis” (Shuttleworth, 2008). The qualitative data allows me to begin to create a larger understanding of museum apps as an interpretive tool, as well as how professionals within the field conceptualize them.

### **Instrument**

To describe the ways that the technological capabilities of smartphones afford new opportunities and strategies for interpretation of exhibit content and audience engagement, I conducted interviews with the museum staff, as well as outside professional or non-museum developers, who were involved in the conception and realization of the museum mobile applications selected as cases. These interviews were conducted by phone or email, according to what was most convenient for the interviewee. I made digital audio recordings of the interviews, using a program called Audacity, and then transcribed the interviews. The interviews were semi-structured. My full interview guide can be seen in Appendix A. The interview guide, included

questions such as “How does the mobile application change, or add to, the way audiences interact with exhibit content?” or “What sort of things did the technology enable you to do, that you couldn’t have otherwise?” I found that not all of the questions were as easily addressed as I had initially hoped, particularly those relating to the ways that audiences used and responded to the applications. However, the questions helped draw out responses that illuminated why mobile applications might be considered an appropriate tool for particular content, such as outdoor site-specific information. I was also able to determine some of the ways that developers and museum staff conceptualized the way an app might enable new types of visitor experiences. Responses also addressed the limitations of apps, which included both the technology’s lack of capacity to achieve a desired result, and the fact that some of those interviewed felt that there were some types of visitor experiences that the app might not be able to allow, whereas a traditional interpretive strategy might. I also received responses pertaining to the interviewees’ uncertainties about the apps, including, for example, lack of certainty about how app content might be retained if current smartphone technology became obsolete. I gained insight into the interviewees’ ideas about the ways that the apps and similar interpretive tools might be developed or altered in the future. I was able to ask contextual questions, such as, “Is the application a native application, or a web app? Why did you make this choice?” This question drew out responses about the ways that technology limited or shaped choices during development, as well as responses about the platforms of the apps. Interviews were approximately 30 minutes in duration, or, in the case of interviews conducted by email, 2-3 pages long. I also used probing questions, for the purpose of clarifying a question, or producing elaboration upon many, if not most of, the responses.

### **On-Site Visits**

I visited the institutions that hosted the apps between April 23 and May 1. Visits generally lasted one to two days. During this time, I was able to utilize the museum apps within the context they were created for, whether that was within a museum, throughout a city, or on the grounds of a park. I was able to analyze the experience the apps created for a visitor, how technology enabled or limited that, and how information design and interpretive principles were deployed to design a more effective tool. The tables featuring my analysis based on principles of design are included in Appendix B. The aspects of the design that I focused on analyzing were:

- Text
- Color
- Composition
- Incorporation of learning styles
- Grouping and structure of information
- Wayfinding
- Information density
- Ease of use

I wanted to study how these aspects of design helped to make the app a more effective interpretive tool, and how they allowed the technology to be more easily utilized.

I also analyzed the app using a framework that drew on the interpretive principles as defined by Tilden (1957) and by Beck and Cable (2002). The tables featuring my analysis based on principles of interpretation are included in Appendix C. Looking at how the app adhered to these principles helped me to articulate what makes a museum app distinct, or typical, as an interpretive tool, and how the technology of smartphones comes into that equation.

## **Subjects and Sampling Procedures**

The cases selected for this study all utilize features of the architecture of the mobile technological platform, such as GPS and location awareness, to enable new and innovative interpretive techniques and ways of facilitating visitor engagement with exhibit content. They represent a variety of museums of different types and sizes across North America, allowing for detailed examination of varying examples representing innovations within the field. They were selected for this variety in function and content of application, institution size, type, and location, and for their presence within the field-wide conversation about museum mobile applications. This presence in the field's conversation was how I found the four applications. I went through nominations for the mobile category of Best of the Web and MUSE awards for 2013 and 2014. I selected the applications based on their presence among those nominated, because it spoke to the applications' noteworthiness and the awareness that professionals within the field had of them. JFG Haiku Hunt and MAGart 2.0 were both Best of the Web nominees for 2014, and Texas 1836 and TXTilecity were nominees for 2014. Additionally, JFG Haiku Hunt was the recipient of the 2014 Honeysett & Din Award.

Shuttleworth (2008) states that, "qualitative research methods are not as dependent upon sample sizes as quantitative methods; a case study, for example, can generate meaningful results with a small sample group." In this case, the sample group was four museum apps. The cases selected focus on the use of multimedia content (MAGart 2.0), crowdsourcing and a map interface (TXTileCity), location services (JFG Haiku Hunt), and augmented reality (Texas 1836), among other features.

Interview subjects were selected on basis of their involvement with the development of the applications selected as cases, and include both museum staff and developers. I conducted six interviews, four with museum staff, and two with software developers. I selected these individuals by searching the museum websites for those most likely to have been involved with the application, scanning press releases for the names of those involved, or through a word of mouth referral. Due to the specificity of the cases and their roles, they are identified by name, as well as their involvement with their application project. Interview subjects were given consent forms to sign, detailing the nature of my research, its publication, and the extent to which they will be identified, as well as their right to choose not participate at any time. My raw interview data was kept on a password-protected personal computer, and in a password-locked folder in an external hard drive. It was shared only with my committee.

### **Data Analysis Plan**

Once data was collected, it was coded using NVIVO software. One of the coding categories was uncertainty, which dealt with things that the interviewees weren't able to answer definitely, as well as things that they felt trepidation or uncertainty about. Some of the codes within it were "uncertainty about visitor use" and "uncertainty about technology." Coded phrases included, for example, "I don't know that we have a clear sense of which would be better," and "You know, we haven't done a full evaluation, and we certainly haven't done any sort of formal observation of people using the app, so I'm not sure how to answer that question." Other examples of coding categories included "what does the technology enable you to do," which included coded phrases such as "showing parts of an object that are hard to see because the object is three dimensional and you can't walk around all the sides," and "that's kind of why we

made the app location aware—so that you could just open it, and as you pass by you know you’ll get notifications about the place you’re standing on.” Further examples of broad coding categories included “audience (intended),” which was used to code instances where interviewees described the audience that they hoped might use the app, even if they weren’t certain that they represented the actual audience, and “content,” used to code the actual content and structure of the application, which many interviewees discussed in the process of describing what sort of experience they intended to create for visitors. This experience was often described in a way that allowed me to use the code, “what do you feel distinguishes the application from other interpretive methods.” I looked for commonalities and trends between interviews, as well as outliers that seemed significant. I found that there was a great deal of discussion of content, so I made certain to try to identify motivations, uncertainties, ideas about the future of museum apps, and what was significant about what the app was able to do, as an interpretive tool, within the context of that particular institution. I did descriptive analysis of the data collected during my on-site visits, which took the form of detailed notes, and screenshots. The range of collected data to analyze included:

- Application content and design
- Associated exhibit content
- Advertising and signage for the app
- Interview content

I identified trends and strategies present in my cases with regards to tailoring content and interpretation to the mobile technologies.

## **Chapter Four: Findings and Discussion**

### **Phenomenological On-Site Analysis**

One of the major limitations of my research is the lack of concrete data about the experience of visitors using the museum apps. When visiting the sites in order to use the applications, I adopted a phenomenological approach to my analysis. Trochim (2006) describes phenomenology as “a school of thought that emphasizes a focus on people's subjective experiences and interpretations of the world. That is, the phenomenologist wants to understand how the world appears to others.” For this analysis, I acted as a participant observer, using the applications in order to gain a perspective on what a visitor might experience using them. This approach means that my analysis is based upon my own perceptions and experiences, and so will not be subjective, and not representative of all experiences, just as would be the case for an individual visitor.

### **JFG Haiku Hunt**

The Haiku Hunt application had the most simple and straightforward design of the four museum mobile apps that I examined for this study. It was created for use at the Japanese Friendship Garden, in Balboa Park. The Japanese Friendship Garden is in the style of a traditional Japanese garden, and features a koi pond, two small bridges, a rock garden, several potted bonsai trees, a variety of plants and trees, a small waterfall, and a couple of buildings featuring small permanent and temporary exhibits. The app uses a scavenger hunt game to highlight certain areas of the park and to encourage visitors to engage in wayfinding by providing environment-based clues that they have to use to navigate. I was able to borrow an Android device from the administrative offices in the Park, in order to use the app. The app

itself, and the fact that devices were available to borrow, was not advertised within the park. I found out about the possibility of borrowing a device from an old press release that I found online about the app. The first screen provides simple, easy-to-understand instructions, which are accompanied by illustrative images. The text is large and readable, and the color contrast adds to the legibility, since it is largely black text on a white background. This color scheme is further echoed in the use of images, which are also black and white, seeming to echo the style of Japanese sumi-e ink paintings. See Appendix D for an image of the application in use. The user is invited to solve a series of clues, given in haiku form, accompanied by the visual clue of the painting and, usually, an auditory clue of an associated sound, both of which are associated with a location within the park. As the user solves the clues he or she goes to each place within the park. Doing so allows the interaction of the mobile app and a Wi-Fi chip, called a PlaceSticker, hidden within that location in the park, which unlocks that part of the scavenger hunt challenge. The partial painted image of the location is replaced with a complete one, and the name of the place is revealed. As well, a screen pops up with a photo and a much larger section of white text on a black background that gives detailed information about that part of the garden, revealing more information to the visitor about the place — interpretation as a reward for solving a puzzle. When the visitor has solved all of the haiku puzzles, and completed the scavenger hunt, having travelled through most, or all, of the Japanese Friendship Garden, they “win” a coupon that can be redeemed for a discount on a membership to the JFG.

On the surface, the Haiku Hunt app seems ideal in many ways. It has a very simple design, its straightforward and uncluttered composition making it easy to use and navigate through. Even though I am less familiar with the use of an Android device, I found it easy to use. It has a high readability due to the use of a mostly black and white color scheme, and large text

in a legible and easy to read font. It uses a puzzle game as an invitation to the visitors to explore the Garden, providing more detailed textual interpretation as a reward when a part of the puzzle is solved. It addresses visual, kinesthetic/tactile, and auditory/verbal learning styles, presenting a small part of a painted image, which is suggestive of the place, a textual clue in the form of a haiku, and an auditory clue, in the form of a sound that might be heard in the place the visitor is being invited to find (for example, the sound of feet on a wooden bridge), as well as encouraging a visitor to interact with and explore a physical space. It takes a whimsical, rather than didactic approach to wayfinding, allowing a visitor to discover the garden in the moment, rather than giving them detailed information before they arrive at a location. When I spoke to the software developer who created the application, he mentioned that the wayfinding function of the app was a major motivation for its creation. The Japanese Friendship Garden has rather strict rules about the presence of signage, so the app was able to offer wayfinding that did not interrupt the beauty of the garden, or the experience of exploring it independently. When I was using the app, I found that the PlaceStickers, which are planted discreetly in the ground at the locations that the visitor is trying to discover, do not provide a reliable signal for the application to locate in a specific fashion. On the day that I visited the site to use the app, it had been a fairly cloudy morning for San Diego, and, even though the sky cleared by the time I began to use the application, the PlaceStickers, which are solar powered, did not consistently register my presence, even when I paced over the location. Most visitors would not know why this problem was occurring, and could not mitigate through any action on their part. Even though the puzzles should be easy to unlock, the uncertainty of the technology's ability to locate them means that the visitor may need to go to great effort to unlock the interpretation text, and move on to the next clue. I imagine that some might get frustrated, and give up. The software developer confirmed that the uncertainty of

determining specific locations with the technology is the most common problem, saying, “Those PlaceStickers I mentioned, they use Wi-Fi, and because of that...the app wasn’t very accurate in positioning. So, sometimes, the app will not pick up where you’re at.”

The coupon gained from solving all of the puzzles provides a discount on membership, which would be an incentive for future visits, but once the puzzle has been solved there is no new challenge presented for the repeat visitor. The developer, Jesus Rios, had mentioned that he thought repeat visitors would be more likely to use the app, in order to be able to have a new sort of experience at the garden. In this way, the app might encourage a visitor to return, in order to have a new sort of experience.

The app also does not provide any opportunity for the visitor to contribute to the Haiku Hunt, though the haiku clues were crowdsourced during its development. One might expect the winning visitors to be able to leave some sort of record of their win, or even share their win on social media. There were some missed opportunities for interactivity with this app, however they are looking into further development of interactive components of the app in the future.

Haiku Hunt takes a whimsical approach to wayfinding as a process of discovery, in which interpretive text appears only when you have discovered a place through the imaginative, sensory and physical experience of it: Matching the visual image of a place to the stylized partial image clue, listening to an auditory sound and trying to decipher what it is, and how it fits into the auditory landscape of the Garden, and reading the poetic rendering of the geography, and trying to translate it back into the physical geography of the place that you are discovering by traveling through it.

Tilden’s (1957) second principle of interpretation is, “Information, as such, is not Interpretation. Interpretation is revelation based upon information. But they are entirely different

things. However, all interpretation includes information” (p. 9). Haiku Hunt exemplifies this principle by using the location aware technology to create this moment of revelation. The visitor, instead of being given didactic information, is given poetic and artistic information, and goes through a process of discovering and understanding the landscape in relation to that poetic and artistic rendering. Upon discovery, more detailed and traditional interpretive information is given to the visitor, so that they now understand the landscape in that form, as well. Tilden’s (1957) third principle, “Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural,” (p. 9) also seems to be realized in Haiku Hunt, as well as Beck and Cable’s (2002) thirteenth principle, “Interpretation should instill in people the ability, and the desire, to sense the beauty in their surroundings” (p. 8). See Appendix C for a complete table of the analysis based on principles of interpretation.

The Haiku Hunt is also notable for the fact that it was successfully crowdfunded through a campaign on Kickstarter. Beck and Cable’s (2002) twelfth principle is that an interpretive program should be able to draw support, including financial support. Haiku Hunt relied on the support of the public for funding, and drew enough to see realization.

### **Texas 1836**

The Texas 1836 app was developed through collaboration between Eduweb, the Washington-on-the-Brazos historical park, and the Star of the Republic Museum. David Schaller from EduWeb, and Adam Arnold, an Interpreter at the park, both described how the app was meant to recreate the town that had been on the site in 1836, of which there were few remaining physical structures or traces. The use of augmented reality allowed animated images of the past to be layered over the physical landscape as it currently exists in the present. “The app is

basically a modern version of those books with transparent overlays, showing then and now scenes. The app goes one step further, of course, by making the “then” overlay a fully-realized 3D environment, rather than static images from a few vantage points,” Schaller stated. See Appendix D for a screenshot of the app.

The application was integrated into the museum content of the park’s Visitor Center. There were three consoles allowing visitors to explore content that was part of the app as a virtual tour, and the other interactive elements in the exhibit had also been developed in collaboration with Eduweb, so they matched the style of the application. The application was also prominently advertised on both the park’s website, and in the Visitor Center. There were fliers posted about it, as well as mentions of it within exhibit text.

Texas 1836’s design featured yellow text boxes with brown text. Some of the menu screens also featured bold red and blue. The font of the headings and the color scheme appeared to convey a sense of the time and place that the app strove to recreate virtually for users. Overall, it is a very visual application, full of 3D digital animation, in the style of a video game, and minimal text. See Appendix B for a table featuring design analysis.

The application has options allowing it to be used both on and off site. Offsite, it would function as a virtual tour. Onsite, the location services component of the app allowed visitors to view the virtual 1836 elements, such as buildings and people that no longer exist on the site, as part of the real current day landscape of the park. The two versions allow it to reach a wider audience, as well as to serve slightly different functions, though in both cases the focus of the app remains the history and landscape of the site itself. The user is able to engage kinesthetically with history elements that normally might be presented in text panels—indeed, in many cases, text panels presenting similar information were present on the site. Instead, the visitor is invited

to step into a virtual home, which no longer exists physically on the site, and interact with a historical character. As an interpretive strategy, it functions as a sort of virtual living history, wherein a visitor might move through the park, encountering the residents of Washington-on-the-Brazos, and engaging with them to learn a little about their daily lives.

The application features an option to take photos of the landscape with the 3D augments transposed on top of it within the app. Unfortunately, when I tried this, it did not seem to take viable photos, giving me empty, black screenshots, instead. I am uncertain whether this is a problem specific to my phone, in particular, or if it is more widespread. When I moved around the historical site, I found that the digital augments were engaging, and entertaining. I stepped into the virtual buildings, visible only on the screen of my camera, and explored them. Some elements featured sound, such as the animated ferry blowing its whistle as it moved along the river.

There is also a version of the app specifically for use by teachers, as well. A staff member at the Visitor Center told me that, rather than being solely a virtual tour of Washington-on-the-Brazos, as it existed in 1836, it also develops the game-like elements of the app further.

Beck and Cable's (2002) seventh interpretive principle suggests that, "Every place has a history. Interpreters can bring the past alive to make the present more enjoyable and the future more meaningful" (p. 8). The Texas 1836 app illustrates the intention of this principle. The virtual augments creates the possibility of tying the past to the present, allowing the potential for visitors to perceive and interact with the two simultaneously, and to understand the landscape of Washington-on-the-Brazos through the ways that it has changed over time. See Appendix C for a complete analysis based on interpretive principles.

Tilden's (1957) first interpretive principle is "Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile" (p. 9). The Washington-on-the-Brazos park staff saw the risk of sterility and disconnect between relying on interpretive texts in the Visitor Center, alone, to try to connect the history of the events to the landscape of the park itself. Instead, they brought the interpretation beyond the walls of the museum, expressing it through relatable characters, and connecting it to real space.

### **TXTilecity**

TXTilecity is different from the other applications in that it exists both as a website and as a mobile application. In some ways, it is arguably more effective as a website. According to Shauna McCabe, the Textile Museum of Canada's Director, TXTilecity was developed as a project highlighting the role the textile industry has played in shaping the landscape of Toronto, because that was in line with the museum's mission, but the building's limited space made it difficult to realize. An app allowed the TMC to extend the content into the urban landscape, connecting stories and events to the places where they actually happened. It came out of a partnership between the Textile Museum of Canada, Year Zero One, [murmur], and the Toronto District School Board.

The content for the smartphone application and website is not linked to exhibit content, for the most part. It is presenting and interpreting its own content, outside of the context of the museum, though in line with its mission.

The application's primary screen appears as a map with pinned locations, the pins are in different colors (red, green, or blue) to indicate what type of media is associated with them. See

Appendix B for a complete design analysis. It is also possible to view the locations as a list. By selecting a pin, you are given further information about the site. See Appendix D for a screenshot of TXTilecity. Text is in a simple font, and is black in a white box, to make it easily read. The address is displayed on a text box meant to imitate a pinned piece of fabric. The media is linked, so that it can be accessed with a tap.

Of all of the three applications studied, TXTilecity was the most interactive in terms of allowing users to contribute content. The website allows visitors to upload their own stories about the city of Toronto and its textile industry past. Content has been created for over sixty locations. This variety also meant that there were a variety of types of stories, as well as different media. There were audio recordings, Youtube videos, and historic photos. However, I found it difficult to use the application on city streets. Site locations were not indicated through signage at street level, or, at least, I could not find any of the signage. This was problematic because, the application deals with historical sites which are no longer preserved as the same buildings, it can be very hard to identify them from the street, even with the help of the application's map. One of the interview responses I received indicated that the information was meant to be pushed to my smartphone as I navigated the city. This may mean that the app was meant to use location awareness to send notifications when a user arrived at a location, which would have worked well in the place of street-level signage. However, it doesn't seem to have worked when I used the app.

TXTilecity is illustrative of Beck and Cable's (2002) seventh principle in action. The app brings the past of Toronto alive through ethnographic stories and media content, connecting them to vanished and changes places that a visitor might pass everyday without being aware of their history. See Appendix C for a complete analysis based on interpretive principles.

## **MAGart 2.0**

The MAGart 2.0 app first began to take shape in 2005, as a cell phone tour, well before the first iPhone was launched in 2007. It involved collaboration between institutions, as well as technology partners. Further components have been added to it since, including outdoor interpretation, and a couple of interactive tours. Because of the accumulation of content over time, and the partnerships that have gone into this application, it is very content-rich, to the point where it verges on overwhelming. Rather than fulfilling one or two visitor needs, this application strives to address many.

The application does not feature the use of location services, though it provides maps for wayfinding. Due to the lack of location services, they are static images, rather than something like a Google maps interface, however they allowed users to pull up more detailed sectional maps while using them. According to Susan Dodge-Peters Daiss, the former head of the Education department at the Memorial Art Gallery, this is because the historical nature of the building does not allow for comprehensive use of Wi-Fi within the space. She stated that, “because of the nature of our building—it’s a building that is now, at least in part, over a hundred years old, we do not have Wi-Fi throughout. So, there is not lifetime GPS location um facility for our app. We do have maps, and we have tried with our maps to help people locate visually where you might be when you are interested in this work of art or that.” Instead, the visitor is cued to use the app at certain places by the use of signage, or information within the app. The app also features an excellent search function that allows the user to search for works, artists, exhibits, and even general words or phrases. Search is, by far, the easiest way of navigating the app. The app contains informative text that supplements the often-minimal signage in the exhibits. In

addition, it also features video clips, photographs, audio recordings, tour options, and activities that visitors can engage in. It features two tours that focus on the edges of the MAG grounds, where the paving stones in the sidewalk contain fragments of poems, or words that express the theme of a story. There is a greater possibility for location services to be used outside of the building. Using the app, a visitor can search for those keywords and find an audio clip of the poet reading their poem, or a community member telling a story that expresses a part of the history of Rochester, and their lives there. The app features white text on black backgrounds, and the high contrast provides clarity and legibility. Menu bars are in red. Information is grouped in several ways, such as by exhibition, by culture, by highlights, and by tours. See Appendix B for complete table of design analysis. The informational text given is broken up into sections, but still often requires some scrolling on a phone screen. MAGart 2.0 compiles a lot of existing information in one place, from past audio tours, to AR projects that past Rochester Institute of Technology students have done for them. This does have some considerable downsides. Viewing the augments created by RIT students required the download of an external app, also developed by RIT, which is no longer available, for example. The volume of content is kept from being frustratingly dense to navigate through by the ease and sophistication of the search function.

Though location services are not used to link content to place directly, the app still has the potential to give visitors more of a sense of place. It features some content with a focus on the history of the building, and its collections, over time. Rather than just learning about the content of a painting, one might also learn about when and how it came to the museum, and its history as part of the collection since then. The application also provides a lot of information about the grounds and the sculptures located there, also elaborating upon the history of the building's architecture.

MAGart 2.0 is well advertised within the museum space, with notations on placards beside works, as well as a poster near the gift shop. See Appendix D for a photograph of signage about the app. I also found that when I visited the Renaissance Remix exhibit, the interactive elements were very much matched to the app content for the exhibit. Both offered a game component, which involved trying to determine what the Renaissance-era equivalent of a modern object might have been, and were narrated by a character from one of the paintings in the exhibit.

MAGart 2.0 is the only app that I observed visitors using while onsite. This, of course, does not mean that it is possible to conclude that it is used more often than the other apps, but it does provide one example of what visitor use might be like, an element that is unfortunately largely missing in the information available to me in my research. While I was in the gallery, a group of visitors were viewing an artwork. One of the children was taking notes, and, from their conversation, was doing a report on either the painting or its artist. The adult female visitor noticed the MAGart 2.0 app placard by the work, and suggested that the child taking notes should download the app. He did not, but the adult male pulled out his iPhone and did so, looking up the painting in the app. He handed the phone to the adult female, who read some of the additional text information about the work and the artist to the other group members. The child took further notes. The adult female remarked that some of the text seemed familiar to her, and wondered if she had read about the artist in an exhibit catalogue. The adult male took the phone from her, and continued to read, remarking that he hadn't realized that the painter had been part of the Ashcan school.

Susan Dodge-Peters Daiss emphasized that the app was intended to provoke people to look at the art more closely, through the use of hotspots, text, and informational prompts. Hotspots are what the Memorial Art Gallery call a particular feature of the app, that lets you

view a high-resolution photograph of an artwork, and select certain spots on it to get a closer view and more detail about a specific element of the work. See Appendix D for a screenshot. Daiss explained that the tone of the app was meant to be conversational and engaging, not to imitate the experience of a docent-led tour, but to invite a similar sort of engagement and Socratic learning. This desire to provoke a closer examination of the artwork speaks to Tilden's (1957) fourth principle. The focus on tone is also evocative of Beck and Cable's (2002) eleventh principle, "Interpretive writing should address what readers would like to know, with the authority of wisdom and its accompanying humility and care" (p. 8). The app strives to encourage active learning and participation, rather than just imparting information in a didactic manner. The way the app is thoughtfully integrated with other interpretive content, whether that is audio recordings from the past, or the current text labels accompanying works within the gallery also speaks of Beck and Cable's (2002) eighth principle, "Technology can reveal the world in exciting new ways. However incorporating this technology into the interpretive program must be done with foresight and thoughtful care." (p. 8). MAG seems to have tried to integrate the app as part of an overall holistic strategy of interpretation, as can be seen by the inclusion of notices about the app on label text, and its connection to the interactive kiosks in the Renaissance Remix exhibit.

## **Interviews**

### **Technology Enables**

All of the interviewees responded with things that the app enabled them to do, that they hadn't been able to do before, or that defined the app's interpretive function. In the case of the Memorial Art Gallery, both interviewees responded that MAGart 2.0 was intended to allow

visitors to “look deeper,” or to engage in “active looking.” This was enabled by the hotspots, which focused in on particular aspects of a work of art, using high-resolution photographs and text and media content. This looking deeper was also invited through photos in the app offered views of art that were not normally possible, due to obstructions, or difficulty with viewing pieces in the round. Lucy Harper, from the Memorial Art Gallery, also mentioned that the app allows both “a multiplicity of voices,” as well as “a multiplicity of ways of seeing.”

Shauna McCabe, Executive Director of the Textile Museum of Canada, reflected that the app allowed a focus on content that the museum didn’t have space to display as fully as they wanted within the building, itself. The app provided an ideal means of interpreting that content because of its ability to extend experiences beyond the museum itself, and into the streets and daily lives of the local community of Toronto. The technology afforded the opportunity to better fulfill the museum’s mission to be “anchored in the local community,” and “reflect the evolving richness and diversity of cultural experiences through the materials of everyday lives.” (Textile Museum of Canada, 2013).

All of the institutions surveyed were interested in creating mobile apps that focused on augmenting the experience that visitors might have through traditional interpretation or exhibit content, rather than imitating it. The form that the augmentation of reality took differed from app to app, based on institutional need and content. The Textile Museum wanted to augment the cityscape with ethnographic content that told the story of Toronto’s textile industry. The Japanese Friendship Garden wanted to create wayfinding and interpretation that did not intrude on the experience and image of the garden itself, and did so by creating an interpretive tool that could do it virtually. Washington-on-the-Brazos historic site wanted to augment the experience of visitors on the site itself. The town of Washington-on-the-Brazos is now mostly gone, so the

desire was to augment the park with a virtual image of the past. David Schaller describes it this way: “The app is basically a modern version of those books with transparent overlays, showing then and now scenes. The app goes one step further, of course, by making the “then” overlay a fully-realized 3D environment, rather than static images from a few vantage points. I think that this can make a site visit more appealing to many audiences, since it adds a “you are there” sense of immersion while walking around the site, and encourages visitors to explore more widely in order to see more of the 3D environment.” The Memorial Art Gallery wanted to create an interactive experience, similar to what a visitor might get from a guided tour, but independent and customizable, that would draw visitors to look closer at the art. As Susan Dodge-Peters Daiss put it, “from the very beginning, the hope was that it would never replace and not imitate, but augment. We already have text labels that offer information—historical information—about the objects themselves, but we were really hoping it’s an interactive tool, to engage visitors in active looking, and so, in that case, it really is an augmented experience, not a replacement, or an imitation.”

All of the interviewees defined the role of apps as interpretive tools by the opportunities to try to create new visitor experiences afforded by the smartphone technology. They viewed the experiences being created by the museum app as unique from what a visitor might experience in the museum normally, or with a different interpretive method.

### **Technology as a Limiting Factor**

The interviewees defined the apps role as an interpretive tool by the sort of experiences smartphone technology afforded. However, they also often described its limits as an interpretive tool in terms of technology’s affordances. Both Lucy Harper and Susan Dodge-Peters Daiss

mentioned that the sort of experience the app was able to create was limited by the fact that the over a century old museum building could not have Wi-Fi throughout. Location services could not be utilized effectively for wayfinding, or AR based on location, rather than image recognition. Jesus Rios, who developed the JFG Haiku Hunt app, lamented the fact that the PlaceSticker Wi-Fi chips were not as precise at determining locations as he had hoped initially. Reflecting on how his perspective on museum apps had changed through his involvement with creating one, he said, “My perspective changed, that it’s not so easy or it’s not such a fluid experience...the root of that problem was more with technology that I was using. I think Bluetooth beacons that museums are using now, those are a lot better than Wi-Fi.”

David Schaller, of Eduweb, who developed the Texas 1836 app, also remarked that the technology might limit which visitors choose to use the app. He reports that, during his involvement in past projects, visitors sometimes showed reluctance to try an app, because they worried that it might intrude upon, rather than augment, their experience of a site.

### **Motivations for Choosing an App as an Interpretive Strategy**

Interviewees identified a range of motivations for developing apps, including, but not limited to, ways the app could provide interpretive experiences. Not all of the interviewees brought up their motivations for creating an app as an interpretive tool, rather than something else, such as a living history project, or an exhibit. Among those that did, the decision seemed to be driven by a desire to expand the sorts of experiences available to visitors, as well as to fulfill an institutional need. As mentioned, the Textile Museum was striving to address the fact that local garment industry history is underrepresented in their museum, and wanted to do this in a way that would be more dynamic and relevant than a static exhibit. McCabe stated, “I was

interested in activating mobile technology to highlight the Museum's relationship to the urban landscape that surrounds it. I believe museums need to think beyond programs within their spaces. If we argue 'culture matters' as we do in the cultural and heritage sector, museums need to make the case for that social impact daily in people's lives." In the case of the Haiku Hunt app, it was created out of the tension between the desire to provide the visitor with information warring with the inability to do so without putting up signage. The app presented a solution. MAG wanted to create a tool that would facilitate guided inquiry for visitors who were not part of docent-led tours, and would be more interactive than the other interpretive tools (labels, artspots, gallery guides). In the case of Washington-on-the-Brazos, there was a desire to find a way to give a sense of the historical town that had been on the site in the past, in an immersive way. All of the motivations discussed involved a specific need of the institution, and the ways that they conceptualized the technology as being able to fulfill it. Not spoken of as a motivation, but likely relevant, is that most of these projects were funded by grants (see Appendix C for details), which enabled the development of the applications. If the funding had not been present, would the museums have developed a different interpretive strategy in order to fulfill that institutional need? What might that have been like?

### **Perceptions of the Audience for Apps**

None of the interviewees had a clear sense of who is using the apps or when or when, and two interviewees expressed regret specifically that there hadn't been, and couldn't be, formal evaluation, due to other institutional priorities and the lack of an on-staff evaluator.

When I asked for examples of how visitors used the app, most of the interview subjects were unable to answer, or referred to when the app had been pilot-tested or tested for usability.

One site had done some formative evaluation in which people were prompted to use the app, and talk through it, as part of the usability study. Other references to visitor responses were anecdotal such as family experiences with the app.

The Textile Museum of Canada did use analytics to get a better sense of who might be using the TXTilecity app. Here is what Shauna McCabe was able to tell me about the app's audience:

“Metrics for the TXTilecity website show over 20,000 hits in its first year, from around the world although the majority of users were based in Canada. TXTilecity videos were fully viewed approximately 10,000 times representing 55,000 total minutes of content watched. The most watched video – that featuring the history and politics of the Hudson's Bay Blanket – was viewed 2000 times. Among our other top stories are those related to the history of Eaton's Department Store and Factory, the Great Fire of 1904, Club Monaco's founder Joe Mimran, and the historic Balfour Building. Among mobile users, 87% accessed through Apple IOS, compared to 10% for Android and 3% for Blackberry systems, indicating the iPhone and iPad have been the preferred devices for encountering TXTilecity.”

### **Looking Forward**

When the interviewees reflected on the future, they focused on a number of ways museum apps could change. Most reflected on the changing technology, and what it might enable them to do in the future, or on their anxieties about the sustainability of the application. There was concern about whether the app content could be maintained through changing technological formats, as well as concern about whether future staff members would be trained in using and updating the applications. Some interviewees reflected on content that could be

added to the app in the future, or on the possibility of utilizing the format of the app for other projects. Three of the interviewees, when reflecting on the decision to make their application a native app, expressed the desire to create a web app in the future. The desire to use beacon-based technology was also mentioned by two of the interviewees, so as to have better responsiveness to the visitor's location. The adoption of new technology was regarded as a potential opportunity to improve the app, or subsequent similar projects. Jesus Rios hoped that JFG would work to create an iOS version of the Android app that he had developed. Shauna McCabe foresaw TXTilecity evolving in the future, given the right opportunity. However, the adoption of new technologies in the future was also cause for some cautious reflection. Susan Dodge-Peters Daiss worried about making certain that all the application content won't be lost as the technology platform, and the hosting, changes, or when personnel moves on from the external technology partners, and the museum. Future content that the interviewees hoped to add to the existing apps was only mentioned twice, in both cases by MAG staff. Perhaps this is because MAGart 2.0 is the longest lived of the apps surveyed in this research, or perhaps it is because MAGart 2.0 was described by one of the interviewees as consolidating content, in order to provide users with a multiplicity of ways of seeing the artworks, and even the museum, itself. Daiss mentioned her desire to increase the app's use of AR, if possible. The current AR content, which utilizes image recognition, had been developed by RIT students as part of a project, and had relied on the download of another mobile application to view the augments, which is no longer available. Lucy Harper also spoke of her hope of being able to integrate further content into the app, in this case, a past project involving authors' and poets' writings about the objects in the collection. This would be more of the consolidating of content that MAGart 2.0 does, as well as providing another way of seeing the collection, that is: through the words of poets and authors viewing it. The prospect of

reaching new audiences with the app was also on the minds of two of the interviewees. Daiss hopes that the museum will find a way to better integrate the use of the app into school tours, and to reach an audience of young people, which it was initially aimed at. Adam Arnold spoke of hoping to develop the Texas 1836 app further in a way that would reach a younger audience, as well, expressing the expectation that it's game-like, interactive format might appeal to them. Susan Dodge-Peters Daiss also reflected on the way that the field might approach the adoption of museum apps as an interpretive tool: "I would really encourage my colleagues who are continuing this conversation to really keep their ear to the ground about how museums are using technology to augment the visitor's experience." She believes that museums can learn from what is already being tried within the field, as well as outside of it, rather than trying to reinvent the wheel each time a museum app is created.

## **Implications**

If affordance is the opportunities created by technology that we perceive, and can act upon, then it is clear that we are using the affordances of smartphone technology to create new opportunities for museum visitors' learning and engagement. When developers decide to create a mobile application, they frame their perception of it as an interpretive tool in the unique experiences that they feel the technology will be able to provide, as well as the institutional need it will fulfill. Interpretation and visitor experience are considered during development, but not always in terms of the way that the app fits into a larger overall interpretive plan. The technology is viewed as enabling interpretation, allowing for new types of engagement with place and space, and the ability to take content outside of museum walls. However, technology is also viewed as limiting. If the app doesn't provide the experience that developers hoped for, it is generally

regarded as a downside of the limitations of the technology, rather than the design, or the interpretive content not being suited to a mobile device medium. The developers all see different possibilities for how their applications might be changed or added to in the future. Some even perceive the same change, that of the technology platform itself, very differently, viewing it either as a boon, to allow the app to do more, or as something to be planned for, or risk losing the current progress with the app entirely. There is a great deal of uncertainty about who the audience for smartphone apps as interpretive tools is, what motivates them to utilize the apps, and what impact this interpretive strategy has on them, either in the short-term, or in the long-term. Considering that drawing in new audiences, or providing current ones with new experiences, was a major motivating factor in the development of apps, or in plans for the future, this is a concern. How can we be certain that we are achieving what we set out to?

### **Limitations**

My study has a number of limitations. I had a small sample size, of quite different cases to analyze. While I chose to do this in order to be able to look for broad trends that hold true for all types of museum mobile applications, regardless of function, institution type and size, and content, I nevertheless may be missing trends specific to particular types of apps or museums, such as art or science museum apps. The absence of the visitor is the largest limitation of my paper. Like many other museum professionals, I am still trying to solve the problem of how to evaluate a visitor-initiated behavior (the use of museum apps), without prompting that behavior and risking the integrity of the data. I relied on my own experience as a user in performing the descriptive analysis of the apps, during the on-site tests. My own experience is by no means universal, or reflective of others' experiences.

## **Chapter Five: Recommendations and Conclusion**

This study describes the ways that the specific technologies available to smartphones afford new opportunities and strategies for interpretation of exhibit content and audience engagement. I selected four museum mobile applications, MAGart 2.0, Texas 1836, Haiku Hunt, and TXTilecity, to analyze in depth. I conducted on-site analysis of the applications, using principles of information design and interpretation in order to look at how they were effective, or ineffective, at presenting museum content to visitors. I conducted six semi-structured interviews with museum staff and software developers who had been involved in the development and deployment of the app, in order to gain an understanding of how they conceived of apps as interpretive tools, as well as what informed their choices during the design process. Developers view museum mobile applications as desirable interpretive tools when the smartphone technology is used in a way that augments existing content, and fulfills a need. Thoughtful design has the potential to facilitate effective interpretation by allowing the content of the interpretation to be the focus, rather than the medium. Instead of becoming frustrated by trying to navigate the technology, a museum visitor is able to focus on the experience.

I believe that the next step in understanding how museum apps function as an interpretive tool is to focus on understanding their audience. There have been some strides in this direction, such as the Tate Museum's recent evaluation work (Fildes and Villaespesa, 2015), but more research and collaboration are needed. It is my hope evaluation will be more widely deployed by the same museums that develop apps, with the evaluation plan as part of the development process itself, so that they can better understand how visitors interact with them, in comparison to other forms of interpretation. I would like to see more evaluation conducted dealing with visitor motivations and long-term outcomes. I would also like to know more about whether

museum apps are used primarily on site, or at other locations, whether for planning a visit, general interest, or for academic pursuits.

I also recommend that museums work to more fully to address the issue of long-term sustainability of apps, so that content is not lost when staff leaves an institution, or the technology format changes. Smartphone applications are large investments on the part of institutions. Rather than treating them as something entirely separate from other interpretation within a museum, it is useful to frame them in terms of how they fit into a larger plan. If institutions could encourage more involvement in the development and maintenance of apps across all departments, not only would there be less of a risk of loss of content and knowledge, museum staff from different departments might be able to think of more ways to integrate the app into existing (and future) programs or exhibits.

I recommend that museums take an interdisciplinary approach to developing an app, involving multiple museum departments, and drawing upon knowledge from many fields. All of the applications that I studied involved some sort of collaboration during the development process. This allowed institutions to draw upon a larger pool of resources and knowledge. The skill sets, partnerships, expertise, funding, and types of technology available to museums developing apps can differ substantially. I would like to see museums share the tools they have developed more freely with one another.

It is my intention that my research will help future developers, interpretive planners, education staff, and anyone with an interest in deploying smartphone applications in museums, consider how affordances of technology may or may not suit their needs, as part of an interpretive strategy. I hope that they take away from it the importance that an application be one fully integrated part of a holistic strategy of interpretation. Adherence to principles of design and

interpretation can help to create a more easy-to-use, effective museum app. When they are used in combination with an understanding of the idea of affordance, in which all of the functionalities of the technology work together to facilitate more personal and engaging visitor experiences, we may take forward an understanding of how to think about technology as an interpretive tool in the future, whether that is smartphone applications, smartwatches, Google glass, or something I can't yet begin to imagine.

## Appendix A: Interview Guide

### Consent Form:

Mobile Applications as an Interpretive Tool

University of Washington

Researcher: Lauren Messenger. Phone: (425)281-9585. Email: messel@uw.edu.

Thesis Advisor: Kris Morrissey, Director of the Museology Graduate Program. Phone: 206-685-8207. Email: morriss8@uw.edu.

I am asking you to complete an interview that is part of my Master's Thesis work at the University of Washington. The purpose of this research is to describe the ways that the unique combinations of technological capabilities available in smart phones, such as location awareness, image recognition, and access to social media afford new opportunities and strategies for interpretation of exhibit content and audience engagement. Your participation is voluntary, refusal to participate will involve no penalty or loss of benefits, and you may discontinue participation at any time. If you have any questions now or in the future, you may contact me through the numbers on this form, and the provided card. This interview will be audio recorded digitally for my use only. Your name and/or title may be used in the final paper. If direct quotations are used, you will have the opportunity to review the quotation for accuracy. Do you have any questions? Do you agree to participate in this interview?

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

### Card Text:

Mobile Applications as an Interpretive Tool

University of Washington

Researcher's name: Lauren Messenger. Phone: (425)281-9585. Email: messel@uw.edu.

Thesis Advisor: Kris Morrissey, Director of the Museology Graduate Program. Phone: 206-685-8207. Email: morriss8@uw.edu.

Mobile Applications as an Interpretive Tool: Interview Questions

- 1) What sort of experience do you feel your application provides for visitors? Probe: Does the app replace, augment, or imitate the experience of the exhibit?
- 2) Does your app make use of location awareness, AR, QR, or other specific mobile technology capacities? How has access to these specific technological features shaped the experience that the app creates for visitors?
- 3) How have you, and the museum staff, seen visitors respond to the app? Can you describe some examples of the ways visitors have used it?
- 4) What do you feel distinguishes your application from other interpretive methods and tools?
- 5) How does the mobile application change, or add to, the way audiences interact with exhibit content? Probe: What sort of things did the technology enable you to do that you couldn't have otherwise? Probe: Does the mobile app reach a different audience than you might have reached otherwise?
- 6) Is the application a native application, or a web app? Why did you make this choice?
- 7) How has your understanding of what an app can do as an interpretive tool changed because of your involvement in developing one?
- 8) Would you choose an app as an interpretive strategy again in the future? What might you do differently?

**Appendix B: Principles of Design Tables**

<b>Design Element</b>	<b>MAGArt 2.0</b>
Text Legibility	Medium
Color	High contrasts
Composition	Menus, with main menu icons at the bottom
Learning Styles	Visual, Verbal/auditory
Grouping Information	Location, Alphabet, Category
Wayfinding	Maps. Location Awareness limited
Information Density	Extremely dense
Ease of Use	Easy to use, except accessing some of the specific features

<b>Design Element</b>	<b>TXTilecity</b>
Text Legibility	Medium
Color	Sometimes low contrast
Composition	Map with pins. Listed sites.
Learning Styles	Visual, auditory, kinesthetic

Grouping Information	Location, Category
Wayfinding	Map-based. Location awareness hampered by technology
Information Density	Broken up by site. Comfortable density
Ease of Use	Difficult to use on location

<b>Design Element</b>	<b>Texas 1836</b>
Text Legibility	High
Color	Contrast. Evokes a time period
Composition	360-degree view of a virtual world
Learning Styles	Visual, auditory, kinesthetic
Grouping Information	Location
Wayfinding	Location Awareness. No maps

Information Density	Not dense. Provided when cued
Ease of Use	Very easy to use

<b>Design Element</b>	<b>Haiku Hunt</b>
Text Legibility	Very High
Color	High Contrast
Composition	Minimalist
Learning Styles	Visual, Auditory, Kinesthetic
Grouping Information	Location, Category
Wayfinding	Hampered by technology. Encourages wayfinding by means of environmental cues
Information Density	Not Dense
Ease of Use	Easy navigation, difficulty with Place Stickers

**Appendix C: Principles of Interpretation Tables**

<b>Interpretive Principle</b>	<b>What Does This Mean for an App?</b>	<b>MAGart 2.0</b>
“Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile” (Tilden 1957, p. 9).	Does the app present information in a way that the visitor can relate to?	Uses multiple approaches to seeing an object, so that user can find the way most personally meaningful.
“Information, as such, is not Interpretation. Interpretation is revelation based upon information. But they are entirely different things. However, all interpretation includes information” (Tilden 1957, p. 9).	Does the app encourage visitors to make connections?	The app has a section for some objects called “Collection Connections,” which showcases similar objects, inviting the visitor to view the further pieces, within the context of commonalities and trends
“Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is to some degree teachable” (Tilden 1957, p. 9).	Does it convey a story? Does it present content imaginatively?	Contains a multitude of smaller narrative pieces that do not connect to a uniting thematic story.
“The chief aim of Interpretation is not instruction, but provocation” (Tilden 1957, p. 9).	Does the app invite action or response on the part of the visitor?	This app invites the visitor to look more closely at the object through text prompts and highlighting details of paintings with the hotspots. It also invites participation and active looking in activities, such as “Find in the Sculpture Park” and “I Spy”
“Interpretation should aim to present a whole rather than a part, and must address itself to the whole man, rather than any phase” (Tilden 1957, p. 9).	Is the interpretation holistic? Does it address a visitor’s multiple contexts and needs?	The app tries to present multiple points of entry for a work (artist, theme, subject, history, etc.). It is integrated with some other forms of interpretation (labels, other technology interactives in the

		Renaissance Remix exhibit), but not all (docent-led tours, school tours).
“Interpretation addressed to children (say, up to the age of twelve) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best, it will require a separate program” (Tilden 1957, p. 9).	Does the interpretation address multiple age groups?	This app has activities meant for family groups.
“Every place has a history. Interpreters can bring the past alive to make the present more enjoyable and the future more meaningful” (Beck and Cable 2002, p. 8).	Does the app invoke a sense of place and time? Does it connect that to the present?	The app does not evoke a specific place and time, but it does recount the history of the building and collections, as they relate to present objects.
“Technology can reveal the world in exciting new ways. However incorporating this technology into the interpretive program must be done with foresight and thoughtful care” (Beck and Cable 2002, p. 8).	How is the app integrated with the other interpretive content, such as exhibits?	Labels in exhibits encourage visitors to use the app to learn more, as does signage outside. There is content for at least some works in all parts of the museum.
“Interpreters must concern themselves with the quantity and quality (selection and accuracy) of information presented. Focused, well-researched interpretation will be more powerful than a longer discourse” (Beck and Cable 2002, p. 8).	What information is being presented? Is it too much?	This application has a lot of content. It incorporates material from previous tours, new material, photos, text, activities. It could be overwhelming, but the ease of the search function helps make it easy to find what you need.
“Before applying the arts in interpretation, the interpreter must be familiar with basic communication techniques. Quality interpretation depends on the interpreter’s knowledge	What is the communication style by which the app presents information?	Conversational voice in text. Invites participation.

and skills, which must be continually developed over time” (Beck and Cable 2002, p. 8).		
“Interpretive writing should address what readers would like to know, with the authority of wisdom and its accompanying humility and care” (Beck and Cable 2002, p. 8).	What is the writing style of the app? Is it concise and readable?	Conversational tone. Attempts to follow best practices for label writing.
“The overall interpretive program must be capable of attracting support— financial, volunteer, political, administrative— whatever support is needed for the program to flourish” (Beck and Cable 2002, p. 8).	How was the app funded? What entities were involved in its realization?	IMLS grant, initially, later supplemented by an additional local grant, which allowed further content to be developed and added (the outdoor tours). Partnerships with the Johnson Museum, Spotlight Mobile, and RIT
“Interpretation should instill in people the ability, and the desire, to sense the beauty in their surroundings—to provide spiritual uplift and to encourage resource preservation” (Beck and Cable 2002, p. 8).	What sense of atmosphere and mood does it evoke? How does it contribute to my understanding of surroundings and collections?	Not a strong sense of atmosphere or mood. Educational and informational.
“Interpreters can promote optimal experiences through intentional and thoughtful program and facility design” (Beck and Cable 2002, p. 8).	Is the app easy to use?	Easy to use when navigating by search, more difficult if navigating through the menus to a specific object.
“Passion is the essential ingredient for powerful and effective interpretation— passion for the resource and for those people who come to be inspired by it” (Beck and Cable 2002, p. 8).	Does the app convey passion about its subject, and the experience it is affording its audience?	Yes. The sheer volume of content, and the engaging writing style convey passion for the subject matter. The interviews expressed it, as well.

<b>Interpretive Principle</b>	<b>What Does This Mean for an App?</b>	<b>Texas 1836</b>
“Any interpretation that does not somehow relate what is being displayed or	Does the app present information in a way that the visitor can relate to?	Uses the style of video game animation; may be especially relatable for

described to something within the personality or experience of the visitor will be sterile” (Tilden 1957, p. 9).		those who play games.
“Information, as such, is not Interpretation. Interpretation is revelation based upon information. But they are entirely different things. However, all interpretation includes information” (Tilden 1957, p. 9).	Does the app encourage visitors to make connections?	By exploring the imagined 1836 version of the town at the same time they are present in the current geography, the visitor can connect what Washington-on-the-Brazos was like in the past to the few traces present in the park today.
“Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is to some degree teachable” (Tilden 1957, p. 9).	Does it convey a story? Does it present content imaginatively?	It doesn’t contain a narrative, but it presents a creative artistic rendering of the past.
“The chief aim of Interpretation is not instruction, but provocation” (Tilden 1957, p. 9).	Does the app invite action or response on the part of the visitor?	The visitor is invited to explore and interact with the virtual recreation of the 1836 town and its residents.
“Interpretation should aim to present a whole rather than a part, and must address itself to the whole man, rather than any phase” (Tilden 1957, p. 9).	Is the interpretation holistic? Does it address a visitor’s multiple contexts and needs?	The interpretation is integrated into exhibits in the Visitor Center, as well as programs where a version of the app that is more of a game can be used in the classroom. It does not seem to address multiple contexts, unless it does so by presenting a variety of townspeople. They are not very developed, though.
“Interpretation addressed to children (say, up to the age of twelve) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best,	Does the interpretation address multiple age groups?	No differing content, but wide appeal. The style of presenting the content should be accessible to children and adults.

<p>it will require a separate program” (Tilden 1957, p. 9).</p>		
<p>“Every place has a history. Interpreters can bring the past alive to make the present more enjoyable and the future more meaningful” (Beck and Cable 2002, p. 8).</p>	<p>Does the app invoke a sense of place and time? Does it connect that to the present?</p>	<p>This app does this extremely well. It simulates 3D animated people, buildings, etc. from 1836, allowing you to overlay them on top of the real world of the present park site for an immersive experience.</p>
<p>“Technology can reveal the world in exciting new ways. However incorporating this technology into the interpretive program must be done with foresight and thoughtful care” (Beck and Cable 2002, p. 8).</p>	<p>How is the app integrated with the other interpretive content, such as exhibits?</p>	<p>It is very well integrated with other digital interactives in style (they were also designed by Eduweb) and content. School programs have incorporated at least some use of the app.</p>
<p>“Interpreters must concern themselves with the quantity and quality (selection and accuracy) of information presented. Focused, well-researched interpretation will be more powerful than a longer discourse” (Beck and Cable 2002, p. 8).</p>	<p>What information is being presented? Is it too much?</p>	<p>Very little information is presented. Some facts about buildings and events. Mostly intended to create a more complete sense of the historical town as an environment.</p>
<p>“Before applying the arts in interpretation, the interpreter must be familiar with basic communication techniques. Quality interpretation depends on the interpreter’s knowledge and skills, which must be continually developed over time” (Beck and Cable 2002, p. 8).</p>	<p>What is the communication style by which the app presents information?</p>	<p>Interactions with characters express their different personalities. Kinesthetic.</p>
<p>“Interpretive writing should address what readers would like to know, with the authority of wisdom and its accompanying humility and</p>	<p>What is the writing style of the app? Is it concise and readable?</p>	<p>Concise. The augment characters are allowed their own voices.</p>

care” (Beck and Cable 2002, p. 8).		
“The overall interpretive program must be capable of attracting support— financial, volunteer, political, administrative— whatever support is needed for the program to flourish” (Beck and Cable 2002, p. 8).	How was the app funded? What entities were involved in its realization?	A grant from the Texas Pioneer Foundation, with additional support from the Washington on the Brazos State Park Association. Partnerships with Star of the Republic Museum, Blinn College, Texas Parks and Wildlife, and Eduweb, Inc.
“Interpretation should instill in people the ability, and the desire, to sense the beauty in their surroundings—to provide spiritual uplift and to encourage resource preservation” (Beck and Cable 2002, p. 8).	What sense of atmosphere and mood does it evoke? How does it contribute to my understanding of surroundings and collections?	Immersive, entertaining. An intersection between virtual and real, past and present.
“Interpreters can promote optimal experiences through intentional and thoughtful program and facility design” (Beck and Cable 2002, p. 8).	Is the app easy to use?	Easy to use.
“Passion is the essential ingredient for powerful and effective interpretation— passion for the resource and for those people who come to be inspired by it” (Beck and Cable 2002, p. 8).	Does the app convey passion about its subject, and the experience it is affording its audience?	Yes. The extent to which it is connected to other content speaks to its value. The immersive environment it creates is imaginative, and intended to more fully inform a visitor’s perception of the historical site.

<b>Interpretive Principle</b>	<b>What Does This Mean for an App?</b>	<b>Haiku Hunt</b>
“Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile” (Tilden 1957, p. 9).	Does the app present information in a way that the visitor can relate to?	Uses environmental sounds as cues for wayfinding, relatable to the visitor’s immediate experience. Evokes situations where they have had to practice wayfinding without a map.

<p>“Information, as such, is not Interpretation. Interpretation is revelation based upon information. But they are entirely different things. However, all interpretation includes information” (Tilden 1957, p. 9).</p>	<p>Does the app encourage visitors to make connections?</p>	<p>Encourages, through the act of solving the puzzles, the connection of poetic and artistic renderings of geographic space and a physical and sensory understanding of geographic space.</p>
<p>“Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is to some degree teachable” (Tilden 1957, p. 9).</p>	<p>Does it convey a story? Does it present content imaginatively?</p>	<p>Does not contain narrative. Does present content imaginatively.</p>
<p>“The chief aim of Interpretation is not instruction, but provocation” (Tilden 1957, p. 9).</p>	<p>Does the app invite action or response on the part of the visitor?</p>	<p>This app invites visitors to solve puzzles, and explore the garden in the process.</p>
<p>“Interpretation should aim to present a whole rather than a part, and must address itself to the whole man, rather than any phase” (Tilden 1957, p. 9).</p>	<p>Is the interpretation holistic? Does it address a visitor’s multiple contexts and needs?</p>	<p>The interpretation is not connected to a larger interpretive strategy within the garden. It offers multiple ways for a visitor to begin to navigate the garden (image, poetry, and sound).</p>
<p>“Interpretation addressed to children (say, up to the age of twelve) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best, it will require a separate program” (Tilden 1957, p. 9).</p>	<p>Does the interpretation address multiple age groups?</p>	<p>No differing content, might be a bit simplistic for some adult visitors.</p>
<p>“Every place has a history. Interpreters can bring the past alive to make the present more enjoyable and the future more meaningful” (Beck and Cable 2002, p. 8).</p>	<p>Does the app invoke a sense of place and time? Does it connect that to the present?</p>	<p>By echoing the style of Japanese art (ink painting, haiku), and utilizing the recorded ambient noise of certain environments within the garden, the app creates a sense of place. The visitor</p>

		then has to read those clues and relate them to the garden, making the connection to their surroundings
“Technology can reveal the world in exciting new ways. However incorporating this technology into the interpretive program must be done with foresight and thoughtful care” (Beck and Cable 2002, p. 8).	How is the app integrated with the other interpretive content, such as exhibits?	The puzzle is connected to physical places in the garden, but nothing in the garden connects back to the app.
“Interpreters must concern themselves with the quantity and quality (selection and accuracy) of information presented. Focused, well-researched interpretation will be more powerful than a longer discourse” (Beck and Cable 2002, p. 8).	What information is being presented? Is it too much?	Very little information is presented. The largest amount of text appears when you solve a puzzle. I wanted more content sites, but it is certainly focused in presenting what is relevant to the locations in the garden it highlights.
“Before applying the arts in interpretation, the interpreter must be familiar with basic communication techniques. Quality interpretation depends on the interpreter’s knowledge and skills, which must be continually developed over time” (Beck and Cable 2002, p. 8).	What is the communication style by which the app presents information?	Multi-sensory puzzles presented as part of a game.
“Interpretive writing should address what readers would like to know, with the authority of wisdom and its accompanying humility and care” (Beck and Cable 2002, p. 8).	What is the writing style of the app? Is it concise and readable?	Variable. The instructions are concise and easy to understand. The crowdsourced haiku are intriguing. The interpretive writing provided when a puzzle is unlocked is longer, and more didactic.
“The overall interpretive program must be capable of attracting support— financial, volunteer,	How was the app funded? What entities were involved in its realization?	Crowdfunded on Kickstarter. Information Services International-Dentsu provided the

political, administrative—whatever support is needed for the program to flourish” (Beck and Cable 2002, p. 8).		location-based Wi-Fi chips. Partnerships of BPOC, PRIME, NICT, and ISI-D.
“Interpretation should instill in people the ability, and the desire, to sense the beauty in their surroundings—to provide spiritual uplift and to encourage resource preservation” (Beck and Cable 2002, p. 8).	What sense of atmosphere and mood does it evoke? How does it contribute to my understanding of surroundings and collections?	Thoughtful, curious, creative. The garden as understood through art forms (haiku, painting). Invites exploration. No didactic information given up front.
“Interpreters can promote optimal experiences through intentional and thoughtful program and facility design” (Beck and Cable 2002, p. 8).	Is the app easy to use?	Very easy to use.
“Passion is the essential ingredient for powerful and effective interpretation—passion for the resource and for those people who come to be inspired by it” (Beck and Cable 2002, p. 8).	Does the app convey passion about its subject, and the experience it is affording its audience?	Somewhat. The app’s concept suggests the desire to invite visitors to explore, rather than taking a didactic approach. However, the lack of connection to current programming and exhibit content creates a disconnect.

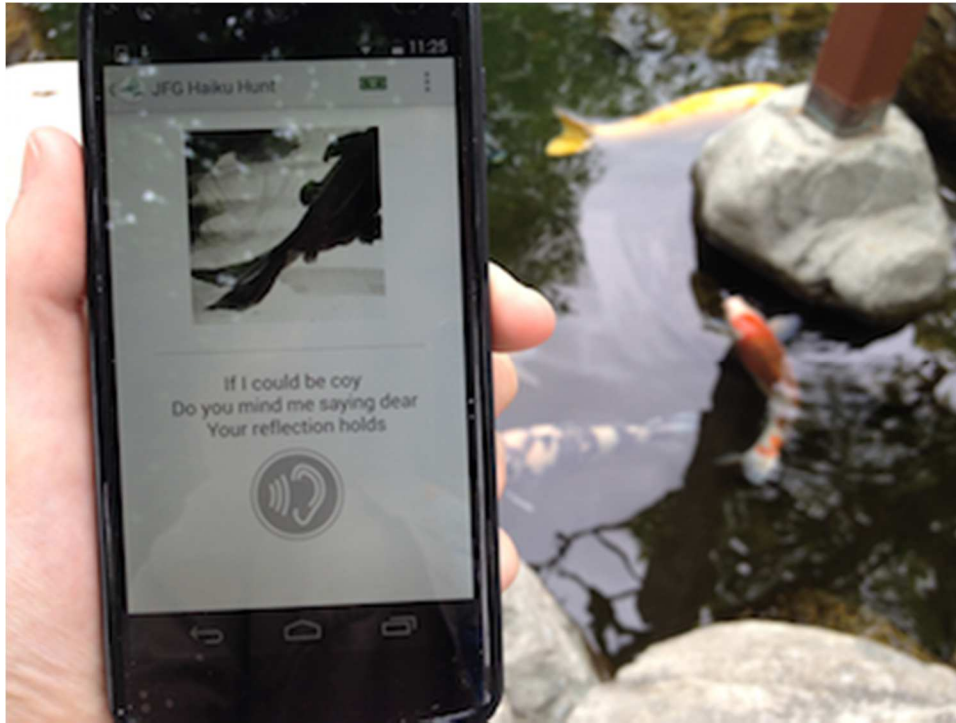
<b>Interpretive Principle</b>	<b>What Does This Mean for an App?</b>	<b>TXTilecity</b>
“Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile” (Tilden 1957, p. 9).	Does the app present information in a way that the visitor can relate to?	Relates historical events to the landscape the user encounters daily in Toronto. Aspects of textile creation and industry are explained and demonstrated by makers.
“Information, as such, is not Interpretation. Interpretation is revelation based upon information. But they are entirely different things. However, all interpretation	Does the app encourage visitors to make connections?	This app encourages visitors to make connections between Toronto’s garment industry history, and the modern cityscape, which was

includes information” (Tilden 1957, p. 9).		shaped by its influence.
“Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is to some degree teachable” (Tilden 1957, p. 9).	Does it convey a story? Does it present content imaginatively?	Does contain personal and historical narratives. Some content is presented imaginatively, some less so. It varies due to being uploaded by many people, rather than having a single voice.
“The chief aim of Interpretation is not instruction, but provocation” (Tilden 1957, p. 9).	Does the app invite action or response on the part of the visitor?	The visitor is invited to participate, and add their own story about the textile industry in Toronto.
“Interpretation should aim to present a whole rather than a part, and must address itself to the whole man, rather than any phase” (Tilden 1957, p. 9).	Is the interpretation holistic? Does it address a visitor’s multiple contexts and needs?	Presents multiple perspectives by virtue of users being able to upload their own content. Not seemingly connected with other interpretation.
“Interpretation addressed to children (say, up to the age of twelve) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best, it will require a separate program” (Tilden 1957, p. 9).	Does the interpretation address multiple age groups?	No differing content.
“Every place has a history. Interpreters can bring the past alive to make the present more enjoyable and the future more meaningful” (Beck and Cable 2002, p. 8).	Does the app invoke a sense of place and time? Does it connect that to the present?	To a certain extent. The stories evoke a sense of Toronto, both past and present, but the difficulty of finding the physical sites tagged on a map when using the app on the street mean that the connection doesn’t get realized fully.
“Technology can reveal the world in exciting new ways. However incorporating this technology into the interpretive program must be done with foresight and	How is the app integrated with the other interpretive content, such as exhibits?	It isn’t incorporated at all, that I could see.

thoughtful care” (Beck and Cable 2002, p. 8).		
“Interpreters must concern themselves with the quantity and quality (selection and accuracy) of information presented. Focused, well-researched interpretation will be more powerful than a longer discourse” (Beck and Cable 2002, p. 8).	What information is being presented? Is it too much?	Lots of information presented, but it is broken up by site, so it is easy to digest and navigate. It is also not text heavy, favoring audio and video.
“Before applying the arts in interpretation, the interpreter must be familiar with basic communication techniques. Quality interpretation depends on the interpreter’s knowledge and skills, which must be continually developed over time” (Beck and Cable 2002, p. 8).	What is the communication style by which the app presents information?	Video and Audio clips. Entertaining and educational.
“Interpretive writing should address what readers would like to know, with the authority of wisdom and its accompanying humility and care” (Beck and Cable 2002, p. 8).	What is the writing style of the app? Is it concise and readable?	Concise written text without much interest. The variations in tone and style come in the recorded audio and video clips, not in their text “labels.”
“The overall interpretive program must be capable of attracting support— financial, volunteer, political, administrative— whatever support is needed for the program to flourish” (Beck and Cable 2002, p. 8).	How was the app funded? What entities were involved in its realization?	Funded by the Department of Canadian Heritage Canada Interactive Fund and Community Grants from the Ontario Trillium Foundation. Partnerships with Year Zero One, [murmur], and the Toronto District School Board
“Interpretation should instill in people the ability, and the desire, to sense the beauty in their surroundings—to provide spiritual uplift and	What sense of atmosphere and mood does it evoke? How does it contribute to my understanding of surroundings and	Inconsistent sense of mood and atmosphere due to the variety of contributed content.

<p>to encourage resource preservation” (Beck and Cable 2002, p. 8).</p>	<p>collections?</p>	
<p>“Interpreters can promote optimal experiences through intentional and thoughtful program and facility design” (Beck and Cable 2002, p. 8).</p>	<p>Is the app easy to use?</p>	<p>Not easy to use as a mobile app.</p>
<p>“Passion is the essential ingredient for powerful and effective interpretation—passion for the resource and for those people who come to be inspired by it” (Beck and Cable 2002, p. 8).</p>	<p>Does the app convey passion about its subject, and the experience it is affording its audience?</p>	<p>Somewhat. It is a great concept, but I am not certain about how the museum uses it as part of a larger interpretive strategy. The passion is generated by the users who contribute.</p>

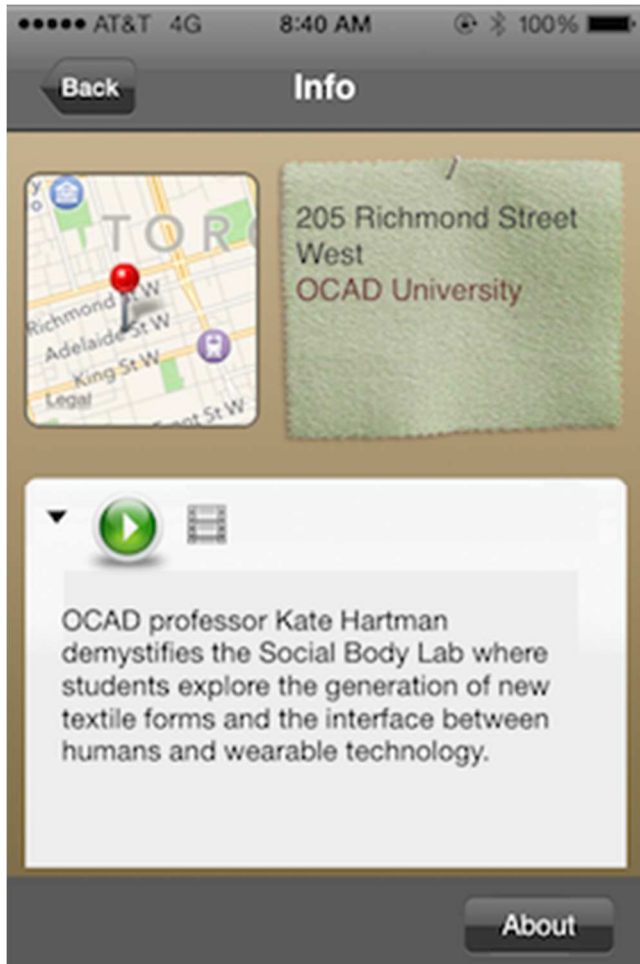
**Appendix D: Images**



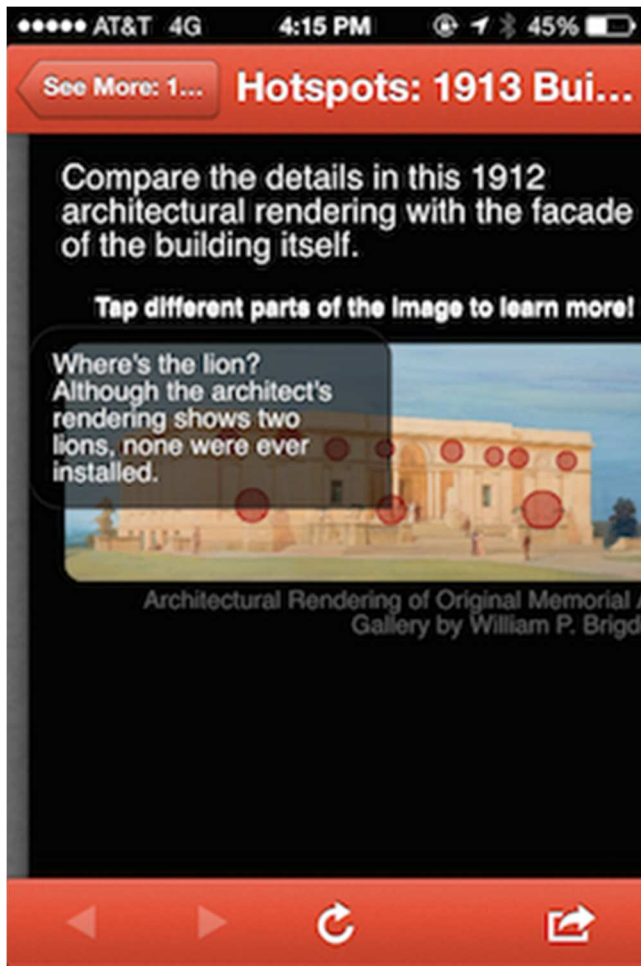
Photograph and Screenshot of Haiku Hunt app clue and Koi Pond



Screenshot of Texas 1836 app and historical characters



Screenshot of TXTile City app



Screenshot of MAGart 2.0 app and hotspots



Photograph of Memorial Art Gallery signage

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