Art is immensely complex by its very nature. Conceptual meanings and storied existences make art objects and cultural heritage sites valuable learning tools. Yet the very essence which transforms these precious materials from mere objects to fascinating, priceless cultural heritage artifacts often cannot be understood by present day viewers through observation alone. Art objects are reliant on external sources to communicate their messages and meanings for them, to reveal their hidden stories to the world. The transformative potential of digital mobile technology as a new means to engage global public audiences with art and cultural heritage sites is changing the nature of how ongoing visitor learning problems are addressed. Museums are now developing mobile applications to provide more in-depth and interactive learning experiences, which help users generally become more comfortable interacting with art and expand their audiences to include entirely virtual visitors from around the globe. Mobile applications can build meaningful context around art resources using the vast expert knowledge held by museums while allowing users more control over their learning as they develop their own understanding and personal relationships with art (Hartig 2013; Lewis 2013).

This paper will investigate how mobile applications designed to reveal hidden meanings of art effectively enhance user learning processes for understanding art. This paper will present the findings from a critical state of the art survey conducted on five illustrative location generic mobile applications produced by leading international art museums which focus on revealing hidden meanings in art within informal learning contexts that would most likely take place off-site from the museum. State of the art practices, outstanding best practice examples as well as current design weaknesses will be discussed. Additionally, this paper will also present a new prototype mobile application about Bulgarian Orthodox art, which was created from a series of requirements that were derived from the state of the art survey results.

Mobile applications are constructivist learning tools by nature because of their focus on contextual learning, making connections and building relationships, and allowing the learner to control their own
learning process (Hein 1991, 1999; Ravenscroft in Sharples et al. 2000:7). Location generic mobile applications allow users to learn outside traditional space and time constraints and are most effective and broadly appealing in informal, relaxed learning situations (Kukulska-Hulme 2013). The adaptability of mobile devices’ abilities to present practically limitless multimedia information from numerous information sources, voices, and perspectives is also transforming learning possibilities (Helal et al. 2014). One could speculate that being able to study works of art on a mobile device anywhere, in private, can have a transformative positive impact on learning through intimately interacting with digitized works of art, especially for audiences unable to view them in person as well as those who may feel intimidated going to museums because they are less comfortable, knowledgeable, or familiar with art.

The surveyed mobile applications reveal the often deceptively complex and subtle nature of the artistic process and enhance visual details of art objects which would otherwise go unnoticed to the untrained eye or are physically inaccessible because they are hidden or no longer exist. Numerous histories and other fascinating tidbits of knowledge are also given new life by being reintroduced to broad audiences. These objectives are commonly carried out by strategically combining new digital visual content with archival information to illustrate the human and nuanced nature of the myriad stories underpinning works of art. Museum practices are also becoming more transparent through digital methods, which helps raise the public profile of museums as research and educational institutions. Digital technology provides innovative and cost effective methods for museums to publish research and explain curatorial, art conservation, and other behind the scenes practices with broad public audiences and create new ways of learning unlike ever before.

Synthesized results indicate the most pedagogically successful guides presented the content in such a way that the works of art came to life in the mind: art topics became stories, paintings became settings, and artists, subjects, and museum workers became became characters in a vivid narrative explored in the diverse content of the application. One could speculate these are the stories that the user will remember long after the digital experience is over. Survey results indicate that when users control their learning environment and are guided to actively uncover hidden layers and meanings of art in an interactive environment it helps users actively learn about art objects' individual histories and significance while also encouraging users to develop their own personal meanings and relationships with art. Housen (2014) and Yenawine (1997) emphasize these are equally important to objective understandings of art.
Complex spatio-temporal concepts that would be difficult to otherwise explain to general audiences are easily understood through digitally enhanced methods. Interactive design capabilities of mobile devices including sophisticated native multimedia and multisensory features allows the user to manipulate, construct, compare, augment and respond to the environment in a fluid continuum in both physical and virtual space. Survey results indicate giving the user the ability to watch works of art transmogrify as a direct results of their actions and being able to see them in extremely close detail helps the user better understand the nuanced beauty, the emotional resonance, the personal artistic touches which demonstrate the deceivingly sophisticated nature of these works. These digitally enhanced features uniquely enhance users' critical visual investigative and comparison abilities, which are critical for constructing meanings of art (Alexander et al., 2013; Housen 2007, 2014; Isaacson et al., 2011; Isaacson et al., 2012; Rubino, 2011:9). In some cases content created for mobile devices provides opportunities for better, user-driven visual analysis and personal study of art objects than what is publicly viewable in the galleries or anywhere else. This makes them universally appealing for everyone, from those only casually interested in art, to students and educators, and even professionals including curators, conservators, and other researchers.

Results of the state of the art survey suggest the challenging nature of designing mobile applications because of the delicate balance that must be achieved between a number of factors in a dynamic digital environment. Weaknesses in content, design and navigation in several mobile applications indicate their negative influence on learning and user experience.

*Where Heaven Meets Earth: A Visual Guide for Understanding Bulgarian Orthodox Art,* is the first known attempt to help new audiences learn about Bulgarian Orthodox art with a mobile application. It exemplifies a practical solution to a common interpretive problem many museums and historic sites face: to provide sufficient didactic and innovative interpretive material to its visitors without interrupting the aesthetic experience on site. It is location generic by design, so it can also be used to prepare or reflect on a site visit or exclusively by virtual visitors who may never have the chance to physically visit a Bulgarian Orthodox heritage site. It was developed based on a set of requirements that were derived from the formative results of the state of the art survey, and it is an example of a low-cost and efficient method to produce an educational mobile application featuring extensible design without advanced technical skills.
According to Avgerinou and Pettersson's Theory of Visual Literacy, each person's ability to interpret art is constrained by their reasoning skills along with their existing knowledge, context clues and readily available resources because the visual language, symbols, and prescribed meanings encoded within works of art are culturally specific and therefore not universally understood (2011). Generally speaking, the Christian Eastern Orthodox religion and its artistic traditions, which the Bulgarian Orthodox Church is a part of, are not well understood by audiences outside countries where it is a dominant religion. Many tourists come to Bulgaria without much knowledge of Orthodox art, but are eager to learn more about it. However, most religious sites in Bulgaria do not have didactic and interpretive information available to help visitors understand and interpret the rich visual iconographic language and layers of symbolic biblical and cultural meanings that are hidden within Orthodox art because they are foremost working churches and monasteries. Without didactic information available on-site many visitors cannot fully engage, understand, and appreciate the artistic and religious value of Bulgarian Orthodox Art or its significance in broader Christian, Bulgarian, Balkan, Slavic, world religions, and global cultural heritage. Where Heaven Meets Earth provides mostly basic explanatory historic, artistic, and identification information for pre-literate Orthodox art audiences, which they can then use to construct more informed objective and personal meanings of Bulgarian Orthodox art (Yenawine 1997).

The paper will conclude with a list of actionable recommendations collated from research, the survey, and lessons learned during the mobile application development process to help practitioners get started on their first mobile application project.
Sources Cited


