

# Usability Evaluation of a Prototype iPhone App for Osaka Castle Museum: Outcomes and Reflections

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## Abstract

*The evaluation of the effectiveness of new technologies for cultural heritage is becoming increasingly relevant, as the number of tools and media for public presentation grows rapidly across the world. Amongst these technologies, smartphone applications are rapidly increasing, with museums releasing new Apps at an incredible pace. It is therefore important to understand how these Apps are re-shaping the behaviour of museums' visitors and the approach of heritage professionals. This paper presents the outcomes of a user evaluation of a prototype iPhone App developed for Osaka Castle Museum in Japan. It reports on the methodology adopted and the results gathered, but it also reflects on implications and cultural issues.*

Categories and Subject Descriptors (according to ACM CCS): H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems; H.5.2 [User Interfaces]: Evaluation/methodology.

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## 1. Introduction

The evaluation of the effectiveness of new technologies for cultural heritage is becoming increasingly relevant as the number of tools and media for public presentation grows rapidly across the world. The interest in the evaluation is, of course, driven by the necessity to assess and maximise the value of such media for the visitors' experience, and for the heritage institutions' investment.

Amongst the tools and applications available to museums' visitors, smartphone applications (thereafter Apps) have rapidly grown in number in the last few years. Thus an increasing number of museums and cultural heritage sites are releasing smartphone Apps that offer a variety of content to their users. These new platforms have the obvious advantage of freeing the cultural institutions from hardware and maintenance costs, allowing them to concentrate on the development and implementation of the content.

This paper briefly discusses the development of an iPhone App for Osaka Castle Museum (Japan) and then reports on the tests conducted on various prototypes and the usability evaluation of a high-fidelity prototype carried out at the Museum, along with some reflections on cultural issues that emerged during the study.

## 2. Related research

Since the release of the first iPhone App for the Van Gogh Museum in Amsterdam in 2009 [VGM09], many museums

and cultural heritage institutions around the world have launched smartphone Apps, both for iPhone or Android phones [Out11].

Although the majority of these Apps are mainly intended to be used in the museums, offering tours and providing general information, they nonetheless offer the advantage of being always available to the users. They can be used to 'preview' the visit, bookmark specific artefacts, engage in extra activities, but also allow 'virtual' visitors to experience galleries and exhibitions. On the other hand, the potential of smartphone applications is greater than guided tours, and some institutions are already experimenting with augmented reality and 3D content [V&A09] [ACM11] [DHQ11].

The increasing use of smartphone applications in museums has also attracted the interest of usability experts, eager to understand and assess the impact of such tools in re-shaping the visitors' experience and museums' approaches and expectations of new technologies [BA11] [PT10] [Smi09] [TF11]. Some museums are also involving the visitors in the development process, such as The Herbert Art Gallery & Museum in Coventry, UK, that invited its visitors "to test a new mobile app" [Her11] before releasing the definitive version on the market.

Following on this trend and building on user-centred principles already successfully tested [CREHA08], the authors developed and tested a series of prototypes of an iPhone App for Osaka Castle Museum.

### 3. Development of the iPhone App for Osaka Castle Museum

The development of the iPhone App was undertaken in collaboration with Osaka Castle Museum and its curators, as described in [CKC\*10]. Briefly, the first step was to understand the museums needs and expectations for a new application. Being the most popular cultural attraction of the city, Osaka Castle Museum has over one million visitors per year, thus it has opted exclusively for non-interactive technology, in order to avoid incurring high maintenance costs for the hardware. However, the chief curator underlined the desire to provide the visitors with some kind of interactive experience.

Thus, it was decided to develop a prototype of an iPhone App, because this allowed the museum to introduce some interactivity without installing hardware. Furthermore, the opportunity to test the App before its release would gauge public reaction and future possibilities.

The two Summer War of Osaka byōbu (Japanese traditional wooden screens) were chosen as exemplars, because they are amongst the finest and most important artefacts displayed at the museum. The iPhone App aimed to provide the visitors with an interactive tool to learn more about the events, people and places portrayed on them.

The iPhone App featured: an Introduction to explain to the users the function of byōbu in Japanese culture, the type of material used and the styles of the decoration; a section entirely dedicated to the description of the samurai and the places painted on the screens; and a third section with general information about Osaka Castle Museum (Fig. 1).

## 4. Evaluation of the iPhone App

### 4.1. Method and objectives

The experimental iPhone App and its evaluation were designed to help understanding if a mobile App could be a useful tool for Osaka Castle Museum, and enrich the experience of the visitors without being obstructive. In particular, it sought to provide rich interactive information to all visitors and possibly a more engaging experience for non-Japanese speakers. Indeed, although the Museum provides multilingual support to most of its ICT applications and panels, foreign visitors sometime struggle to fully appreciate the content provided. Thus, it was decided to develop the iPhone App in English, to also reach the non-Japanese visitors and allow them to test it.

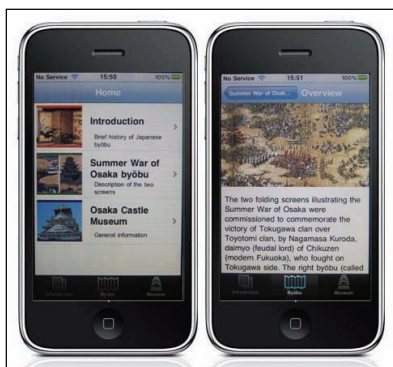


Figure 1: High-fidelity prototype of the iPhone App for Osaka Castle Museum.

The methodology adopted for the evaluation process included an expert review of the wireframe of the App, followed by tests in the NICT laboratory. This iterative approach allowed the iPhone App to be modified according to the findings of the tests, in order to develop a high-fidelity prototype to evaluate at Osaka Castle Museum with its visitors and the chief curator.

### 4.2. Expert review and user testing

The wireframe of the iPhone App was independently submitted to two usability experts to gather feedback on the graphical user interface (GUI). In particular, the review aimed to assess the intuitiveness and navigability of the GUI. Both experts highlighted some potential issues with the position and name of certain buttons, but also with the co-existence of a hierarchical and quasi-sequential navigation structure. This feedback led to the re-design of parts of the GUI, simplifying the navigation structure of the App and introducing a tab bar with three icons for quick access to the main sections.

The resulting prototype was thereafter tested by six users at NICT laboratory in Kyoto, because they represented the minimum critical mass needed to detect major interface issues [Nie93]. In order to provide a visual reference of the byōbu and therefore simulate the museum environment, an image of the screen was displayed on a tiled display wall system (Fig. 2).



Figure 2: User testing the iPhone App at NICT.

These tests aimed to assess the new GUI of the iPhone App and verify its intuitiveness in terms of navigability. Furthermore, because all users were Japanese, the tests made it possible to assess if the content displayed (in particular the written information) was clear and easy-to-understand for non-native English speakers.

The tests were task-based; the users were observed whilst using the iPhone App and, upon completion, they were asked to complete a questionnaire to gather feedback on the usability of the App as well as demographical data.

The results of the tests showed that the content associated with some of the options listed in the menus was difficult to understand, and impeded navigation through parts of the App. This feedback led to the introduction of a *Home* page, which displayed the main menu, so that the users could more easily identify the icons in the tab bar. It was also decided to have subtitles in each menu item, to give clues about the content of the sections, but also to reduce short-term memory load [Shn87]. Finally, to facilitate the

navigation throughout the App, the three main sections were colour-coded. This version of the iPhone App is thereafter referred as high-fidelity prototype [PRS02] because it had the functionality of the finished product and all the sections were complete in terms of content available.

#### 4.3. Evaluation at Osaka Castle Museum

The high-fidelity prototype of the iPhone App implemented after the tests was submitted to the chief curator of Osaka Castle Museum, to assess his reaction and verify if it met the original expectations. The App was very well received: he pointed out that having all the content on the smartphone would definitely improve the understanding of the byōbu, as the visitors could interactively explore them whilst standing in front of them. The two byōbu are displayed on the fourth floor of the Castle: before reaching them the visitors have already seen on the fifth floor a video on a multi-display wall system highlighting the events depicted, alongside a series of panels with biographies of the most relevant samurai (note that the visit at Osaka Castle Museum follows a route from the observation deck on the top floor down to the first floor). Thus, the iPhone App could facilitate the understanding of the two artefacts, and at the same time encourage visitors to view them more carefully.

Indeed, it was observed that many visitors spent just few seconds in front of the byōbu, even though they should be the climax of the visit. Interestingly, foreign visitors tended to spend more time looking at the byōbu, perhaps because they are not familiar with this type of object, and thus were more interested in their novelty.

The evaluation sought to assess whether using the iPhone App changed visitors' behaviour and how it affected their appreciation and understanding of the two objects. In order to interfere as little as possible with the visitors' personal experience, it was decided to allow free navigation of the iPhone App for as long as they wanted to use it. Then, the participants were asked to fill a questionnaire to gather demographical data and, more importantly, feedback on the level of appreciation and enjoyment of the App.

In total, 42 visitors participated in the evaluation; of them little over a third were Japanese (16). This discrepancy was mainly due to the fact that the iPhone App was only in English and some of the Japanese visitors weren't familiar enough with the language to use it. Non-Japanese visitors were also keener to participate in the evaluation, and were also more outspoken, providing interesting feedback whilst using the App.

Overall, the majority of the visitors used the iPhone App for around five minutes, with only 4 visitors interacting with it for 10 minutes or more. This was not due to the App itself, but rather to the fact that many did not have time to spare. In fact, a dozen foreign visitors declined to participate in the evaluation because they were on guided tours and had only limited time. Because the byōbu are located on the fourth floor, they still had to visit the rest of the museum and therefore said they did not have time. On the other hand, an average time of five minutes spent observing the byōbu already represented an impressive improvement over the few seconds that the vast majority of the visitors not using the App were dedicating to the artefacts.

The iPhone App proved to be interesting and engaging and certainly stimulated the curiosity of the users. Indeed, all of them but three moved closer to the byōbu to better observe the people or details highlighted in the App (Fig. 3). This behaviour certainly underlined that, by providing means of interpretation used in front of the artefacts described, the visitors were generally more interested and captivated. Furthermore, as they could select the details to explore, it was observed that some users preferred to concentrate mainly on one byōbu, whilst others moved from one to the other.



**Figure 3:** Evaluation of the iPhone App at Osaka Castle Museum.

Finally, almost all participants suggested extension to the App, in particular to provide a tour of the whole Museum and extra content related to Hideyoshi Toyotomi, the founders of Osaka Castle, and his family. This potential use was also envisaged by the chief curator, who also felt that the iPhone App could be used to provide multilingual translations of applications and videos already displayed at the Museum. Foreign visitors also suggested to link the iPhone App with the other ICT applications in the Museum, to provide multilingual translations.

#### 5. Reflections

The evaluation of the prototype of the iPhone App for Osaka Castle Museum highlighted that mobile technology and in particular smartphone Apps can be extremely effective for interpretation in a museum. In the first place, they can provide personalised content to virtually every visitor, which could prove useful in engaging a wider audience. By adjusting to individual needs, they might help overcome limitations, such as time or language. Furthermore, as one visitor from Singapore pointed out, smartphone Apps are useful to get more information before or after visiting a place, thus allowing the users to deepen their knowledge and give a real sense of not having missed anything.

The evaluation at Osaka Castle Museum also allowed observation of some differences between Japanese and foreign visitors, the latter being more outspoken and generally more available, possibly due to the fact that the Japanese can be reserved and not always comfortable at giving comments face-to-face. Indeed, this approach was also observed in the laboratory, where little oral feedback was given compared to the written ones in the questionnaires.

Finally, as the iPhone App assessed at Osaka Castle Museum was a high-fidelity prototype, the visitors had the

feeling of trying a finished product as they could fully navigate through it and access detailed information. Indeed, they overall positively commented on the quality of the design and the level of information given. On the other hand, this allowed concentrating on the evaluation of the effectiveness of the App, which highlighted the potential benefit of such media for the Museum and its visitors.

## 6. Conclusions and Future Work

It is important to underline that few participants were entirely absorbed by the iPhone App and paid little or no attention to the byōbu. Indeed this raises the issue of providing 'invisible' [FPP06] technology in cultural heritage sites. However, considering that museums and heritage sites are increasingly introducing technology, and that smartphone Apps are being released at an incredible pace, the focus should be on the effectiveness of such tools in enriching the visitors' experience and the museums' ability to engage and foster public attention.

The design, implementation and evaluation of the iPhone App for Osaka Castle Museum is part of a wider research investigating the effectiveness of ICT applications for cultural heritage in various cultural contexts. The results of this evaluation – and others carried out in Japan and UK – will help develop a framework and define a set of metrics to help evaluators, institutions and developers to assess the effectiveness of new technologies in museums and heritage sites.

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