

# ICT in Japanese Museums: a Strategic and Contextual Survey

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## Abstract

*Information and Communication Technology (ICT) applications have become increasingly widespread, driven by the increasing demands of visitors for more tools for interpretation and entertainment and the need of heritage professionals to diversify the cultural offer. Museums' objectives for technology investment can differ greatly around the world, influencing the type of technology used and the mechanisms of visitors' engagement. This paper presents the results of a survey conducted on a selected sample of museums in Japan to assess the type of ICT deployed and understand their strategic rationale for technology investment. The methodology adopted combined participant observation, interview with museums' curators and managers as well as a questionnaire modelled on the Holistic Heritage Impact Training Model, developed by the CUBIST Research Group at the University of Brighton Business School. This survey is a preliminary analysis for the future design and development of an interactive ICT application to display the stories depicted on two byōbus (Japanese traditional wooden folding screens) displayed at Osaka Castle Museum.*

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

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## 1. Introduction

The use of Information and Communication Technology (ICT) is widespread in European museums, because it has the potential to provide engaging and interactive experiences for the visitors, but also to diversify the cultural offer and provide learning tools. As a result, ICT applications for cultural heritage now range from audio-guides to immersive 3D virtual environments and can provide multiple forms of education and entertainment.

Similarly, Japanese museums offer their visitors a range of tools and applications to support their experience and their desire for a better and deeper understanding of the exhibits. Although some of these experiences have been shared with the Western research community, little is known about the strategic rationale and contextual factors that directly influence the technology investment. This paper presents the results of a survey conducted on a selected sample of Japanese museums, mainly from Tokyo and the Osaka-Kyoto-Kobe Metropolitan area, the two most populated areas in Japan.

## 2. Related research

The growing number of ICT applications in cultural heritage sites and museums has engaged the attention of the academic community, not only to understand and define the type of technology deployed [OBP04], but also to set the research agenda for future developments [AG08].

The research and surveys conducted in recent years have mainly focused on European experiences [NGV06], or specific research fields such as archaeology [Sug07]. As a result, experiences and technologies offered by museums around the world are known through individual publications of case studies, but it remains quite difficult to gather a general view of ICT deployed by cultural institutions. The survey here presented aims at providing such overview.

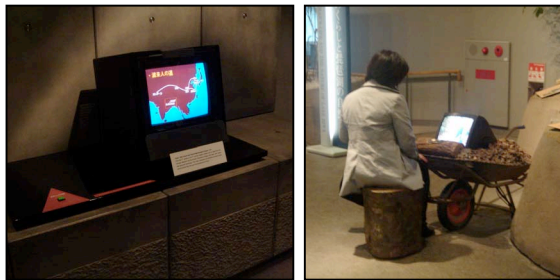
## 3. Information and Communication Technology in Japanese Museums

Japan is a country renowned for its technological development, but is also home to thousands of museums,

that in recent years have been exploring new ways to enrich visitors' experience, and attract and foster a wider audience. The introduction of technology has been constant since the late 1980s, with the result that the offer available today to the visitors ranges from audio-guides to personal digital assistants (PDAs) to CAVE environments.

Between the late 1980s and the early 1990s museums started to commission private companies to produce short documentaries, to be shown alongside exhibits as 'video-on-demand', played by the visitors usually by pushing a button (Figure 1). In 1997 HDTV technology became available to present high-resolution images of collections: the next step was to make available to the research community and the public that precious information. Although CD-ROMs were the preferred mechanism to store and distribute data, more complex applications were also implemented, introducing a certain degree of interactivity [Mat97].

Since then, Japanese museums have introduced new digital devices, focusing in particular on mobile technology, either to provide powerful tools for live broadcast and exchange of information [LOM07] [ML07], or to improve and enhance the visit to a museum or cultural heritage site [Awa07] [AKS07].



**Figure 1:** Two examples of 'video-on-demand' from *The Museum of Kyoto* (left) and *the Lake Biwa Museum* (right).

In the field of ICT for cultural heritage, the National Museums of Nature and Science in Tokyo has a pioneering role, constantly experimenting and introducing new technology for its public, from PDAs to Integrated Circuit (IC) cards [LSI07], from mixed reality [KSAK\*07] to CAVE environments.

#### **4. Survey of ICT deployed in Japanese Museums: objectives, sample selection and method**

The survey of technology deployed in Japanese museums sought to understand the contextual and strategic factors that directly influence the type of ICT adopted. Furthermore, it aimed at assessing the type of technology available to the public, with a particular attention given to multilingual tools.

The museums' selection criteria were determined to ensure that the sample could be as much representative of the variety of Japanese museums as possible, ranging from art galleries to natural science institutions. Due to time limitations, it was decided to focus on museums in Tokyo and in the Osaka-Kyoto-Kobe Metropolitan area, as they represent the two most important and populated areas of Japan. Furthermore, it was decided to visit some temporary exhibitions hosted in the museums to understand the type of approach and technology adopted for special events, because the majority of them are entirely organised by specialised private companies. A total of eight museums and six temporary exhibitions were surveyed between February and May 2010.

The methodology adopted for the survey used a questionnaire and structured interviews with managers and curators as well as a participant observation technique, done during the visits to the museums. This approach aimed at collecting qualitative data for the analysis. In order to gather information regarding the context in which Japanese museums operate, a questionnaire was sent to directors, managers and curators. It was modelled on the Holistic Heritage Impact Training Model developed by the CUBIST Cultural Business Research Group at the University of Brighton [MKS07], and in particular on its conceptual and strategic part (C1). This conceptual model is a training tool aimed at heritage professionals to help them identify and assess the socio-economic impact of their site. The 'Conceptualise and Understand (C1)' part focuses specifically at conceptualising the contextual factors that directly influence the site, such as funding and regulations, stakeholders and managements, etc.

The questionnaire used for the survey directly related to this component of the model, and included questions regarding the museums' contexts, funding opportunities, missions, objectives and priorities, but also the organisation and management structures, the type of cultural offer – adapted to the Japanese categories of cultural heritage; the number of visitors, and their role as stakeholders. The questionnaire also included questions on the content and features of the museums' websites and the visitors' feedback on the technology used.

The museums' managers and curators were also requested to participate in individual interviews in order to gather information regarding the strategic rationale behind the technology investment and the future prospects. In total, six museums' curators or managers agreed to be interviewed, although only five of them returned the completed questionnaires.

Finally, the survey methodology also used a participant observation technique, by visiting the museums and special exhibitions, and trying – where possible – the technology available. This task was often complicated by the fact that the majority of the ICT applications did not have multilingual content or interface (Table 1).

Museum	Audio-guides		Theatre/film projection		PDA/mobile device		3D content		IC card	
	Jap	Eng	Jap	Eng	Jap	Eng	Jap	Eng	Jap	Eng
Osaka Museum of History	✓		✓				✓			
Osaka Castle Museum	✓	✓	✓	✓						
National Museum of Japanese History	✓	✓	✓							
Edo-Tokyo Museum	✓	✓	✓				✓			
Tokyo National Museum	✓									
National Art Center	✓		✓							
The Museum of Kyoto	✓		✓				✓			
Lake Biwa Museum	✓	✓	✓							
National Museum of Nature and Science			✓		✓	✓	✓		✓	✓
Nara National Museum	✓		✓	✓						
Kyoto National Museum	✓									
Kobe City Museum	✓									
<b>Totals</b>	<b>11</b>	<b>4</b>	<b>8</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>1</b>

Museum	Interactive multimedia kiosk		Holography		Video boot (not interactive)		CAVE/immersive environment	
	Jap	Eng	Jap	Eng	Jap	Eng	Jap	Eng
Osaka Museum of History	✓				✓			
Osaka Castle Museum			✓	✓	✓	✓		
National Museum of Japanese History	✓	✓			✓			
Edo-Tokyo Museum					✓			
Tokyo National Museum	✓	✓						
National Art Center								
The Museum of Kyoto			✓		✓			
Lake Biwa Museum	✓		✓		✓			
National Museum of Nature and Science	✓	✓			✓		✓	
Nara National Museum								
Kyoto National Museum					✓			
Kobe City Museum	✓	✓			✓			
<b>Totals</b>	<b>6</b>	<b>4</b>	<b>3</b>	<b>1</b>	<b>9</b>	<b>1</b>	<b>1</b>	<b>0</b>

**Table 1:** Type of ICT applications deployed in the surveyed museums ('Jap' stands for Japanese and 'Eng' for English).

## 5. Outcomes of the survey

The data gathered through the five questionnaires ascertained that the museums almost entirely rely on public funds and on the revenue from admissions. They also tend to establish networks with other local cultural institutions and foster the connection with the community by promoting events, such as open-days and educational activities. As for their visitors, regular surveys are conducted annually using questionnaires, although so far none has specifically focused on the evaluation of the technology available.

The curators and managers interviewed also added that visitors can leave feedback, but they rarely comment on the ICT or leave suggestions for future developments. Curators and managers also unanimously lamented the lack of funding to dedicate to ICT, but underlined the total dependence from the private sector. Indeed, Japanese museums tend to outsource the production of digital media, with the results that the maintenance can only be conducted

by the companies that developed the ICT in the first place. In consequence, most of the technology now available is outdated and museums cannot afford to update it.

The types of ICT applications currently deployed in the surveyed museums are schematically presented in Table 1, with the indication of the language. Although only Japanese and English are reported, in some cases museums offered other options: the audio-guides, for instance, were usually also available in Chinese and Korean, and, at the Lake Biwa Museum, Portuguese, because a large community of Brazilian emigrants reside in the area.

However, multilingual audio-guides were never available for temporary exhibitions: organised by private companies, they mainly targeted Japanese people, as the percentage of foreign visitors is so limited that it is not worth the investment in multilingual tools, as explained by many of the curators interviewed. In these cases, the foreign visitors had to rely entirely on English explanatory panels and labels.

Audio-guides were the most widely used ICT application, as all museums or temporary exhibitions surveyed were offering them. The National Museum of Nature and Science in Tokyo provided touch screen PDAs with an earphone for the guided tour of the galleries. The screen of the PDA displayed the text of the audio commentary so deaf visitors could eventually use it. Furthermore, the PDA used an RFID (Radio-Frequency Identification) technology: every time the visitor came close to a receiving point he/she would hear a sound indicating that a commentary was available by pressing the start button. Signs were also placed throughout the galleries in correspondence of exhibits or on the floor. RFID technology was also used for the audio-guides of the Edo-Tokyo Museum.

The National Museum of Nature and Science was the only one providing the visitors with IC (Integrated Circuit) cards, used in combination with the multilingual touch screen kiosks in the galleries [LSI07]. This museum offered the widest variety of technology to its visitors, including big screen video documentaries and an immersive screen, the Theater 360. Shaped as a globe, it allowed visitors to watch short videos whilst standing on a floating bridge to enhance the feeling of immersion.

Apart from audio-guides, the majority of the museums offered 'video-on-demand', or facilities to watch documentaries, mainly on large screens, providing seats for the visitors, whether in a dedicated exhibition room, like at the National Museum of Tokyo and The Museum of Kyoto; in a connecting passageway, like at the Nara National Museum; or in a proper theatre, like at the Osaka Castle Museum.

Some of the museums deployed Tiled Display Wall (TDW) systems: amongst them, the 'Panorama Vision' at the Osaka Castle Museum (12 screens) explained the scenes depicted on the two *byōbus* (traditional Japanese wooden folding screens) of the Summer War of Osaka, with two smaller screens on the right-hand side with English, Chinese and Korean subtitles (Figure 2).

As for interactive technology, it was almost entirely limited to multimedia touch screen kiosks, deployed in half of the surveyed museums. In all cases the kiosks allowed access to multimedia databases, although only four museums had multilingual options. Of them, the National Museum of Japanese History was an interesting case, as it was the only one entirely developed, in terms of content and technology, by the museum's curators, using simple software like Microsoft PowerPoint.

Finally, only four museums had ICT applications displaying 3D content. One of the shows of the Theater 360 at the National Museum of Nature and Science used virtual models of dinosaurs. The kiosks of Osaka Museum of History displayed short QuickTime video clips of virtual reconstructions of ancient buildings; whilst The Museum of Kyoto special exhibition featured a video documentary with Japanese subtitles with 3D reconstructions of some of



**Figure 2:** Examples of Tiled Display Wall systems: Nara National Museum (top) and Osaka Castle Museum (bottom).

the buildings of ancient Carthage. The Edo-Tokyo Museum projected virtual models of structures of Edo, the ancient name of Tokyo, on a large screen at the entrance.

## 6. Conclusions and future work

The survey presented here allowed a better understanding of the type of digital media used in Japanese museums, but also their objectives and priorities for technology investment. Furthermore, the interviews with curators and managers highlighted the need to invest in the latest technology, mainly to appeal to younger generations, but also to promote repeat visits and enhance the understanding of the collections. Similarly, they recognised the necessity to preserve the current ICT applications, as they still represent a valuable resource. Indeed, some of the interviewees underlined that their average visitors (middle- and old-aged people) are not very interested in using technology in museums and they are more than happy to watch short videos or listen to audio-commentaries.

This survey was a preliminary analysis to understand the type of technology currently deployed in Japanese museums. The evaluation of the impact of such deployment, in terms of benefits for the museums and added value for the visitors will be addressed in the future, analysing specific technologies. The results will be thereafter compared with other surveys previously

conducted on the state of the art of ICT in museums in Europe, to understand the influence of cultural factors in shaping the approach towards technology for cultural heritage.

The research currently conducted in Japan also aims at developing an ICT application to display the stories, people and places depicted on the Summer War of Osaka byōbus displayed at Osaka Castle Museum. Since the latest trend in Japanese technology for cultural heritage is to provide content using mobile phones, and it has been agreed with the museum to develop an iPhone application.

The design and implementation of the application will be realised in collaboration with Osaka Castle Museum. Up to now, the museum has adopted non-interactive technology, mainly because of the large number of visitors (around 1 million per year). A mobile application will offer the chance to introduce interactivity without the need to invest and maintain new hardware.

## 7. Acknowledgements

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