

# The Changing Museum Environment in North America and the Impact of Technology on Museum Work

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## Abstract

This paper reports on a study of the impact of, and challenges posed by information on the museum, and the changing nature of museum work. The study involved semi-structured telephone interviews with sixteen senior North American museum professionals and academics teaching in museum studies programs. Our findings suggest that the ways museums interact with their publics and the areas of dissemination and collections management are profoundly changing. It found that the three most common challenges that museums face include: the cost of designing, implementing, and maintaining technology; a lack of in-house expertise; and information management. The study also indicates that the museum profession is facing a generational shift and that younger professionals perceive technology as a ubiquitous part of their environment.

**Keywords:** Museums, information technology, museum workers

## 1. Introduction

Many suggest that museums have been transformed by their societal context and the proliferation of information technology (IT) in our contemporary moment. Parry argues that digitality “helped to support a realignment of museography that was taking place, from object-centred to experience-centred design.” [1] Bearman and Gerber posit that new technologies have fundamentally changed the ways museums communicate. They state that, “since the late 1980s, computer-based interactive programs have delivered more varied and exciting information on the museum floor than traditional mechanical interactives or static signage. Today, a museum without a collections database and a Web presence is hardly considered professional.” [2] However, they go on to note “not all institutions are using online access equally well.” [2] The will of museums to participate may not be sufficient impetus and Loran found in a study of British National Museums that a favourable ‘political context’ energized museum uses of web services to reach broader audiences. [5] The 2002 DigiCULT Report analyzed the current state of technological deployment in the cultural heritage and indicated how a range of technologies could be used to unlock the potential of such cultural heritage institutions as museums [3].

There is a large and growing literature evaluating the intersection of new technologies and

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museums by writers such as Paul Marty, Ross Parry, Sarah Kenderdine, Fiona Cameron, and Katherine Burton Jones. This literature addresses issues ranging from museum informatics [as Paul Marty defines the field, “the study of the sociotechnical interactions that take place at the intersection of people, information, and technology in museums” [6]], to resource development (such as imaging, digitization, and integrated information systems), from new media technologies and critical digital theory (pertaining to object morphologies, virtual systems, digital objects, communication technologies) to visitor interaction and online technology. The diversity and profusion of this literature suggest museum professionals and funding agencies need a better understanding of the challenges information technologies pose for museums, and the ways museums are changes to meet these challenges. The technology observatory research of The DigiCULT Forum is indicative of the needs of the community for access to knowledge about emerging technologies [8] and how these needs might be met.

## 2. Methodology

To gain this understanding, we undertook a research project, funded by the Canadian Heritage Information Network (CHIN)<sup>8</sup>, involving semi-structured telephone interviews<sup>9</sup>. We devised a series of questions, grouped into 4 thematic sections: i. new technologies used in the participant’s own institution; ii. new technologies and the museum in general; iii. IT skills and training in museums; and iv. information technology and museums in the future. Telephone interviews took place between March 24 and April 9, 2009 and were conducted in either English or French, as appropriate. In consultation with CHIN, we identified twenty potential senior North American museum professionals and academics, whom CHIN contacted and invited to take part in the study. In the end due to time constraints on the part of potential interviewees we interviewed only sixteen individuals. The participants included three directors of collection management departments, three museum directors, three directors/chiefs of museum technology departments, three academics teaching in museums programs, one director of a museum education department, one project manager, one curator and one head of a museum standards program. We sent documentation to each participant in advance of their interview including a description of the project, a consent form, and an interview script. The researchers conducted the 30 to 75 minutes interviews, and digitally recorded all but one of the interviews. Each researcher took notes during her interviews, and subsequently replayed the recordings to gather additional comments and ideas. After completing all interviews, the research group met and reviewed the interview notes question-by-question in order to share findings. The research team identified recurring themes represented in the interview data and noted differing points of views. The research team then identified examples that illustrated these themes.

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<sup>8</sup> <http://www.chin.gc.ca/>

<sup>9</sup> The interviewees formally consented to participate in these interviews. The research was conducted in accordance guidelines governing ethical practices at the University of Toronto and with approval of the University’s Ethics Committee.

### 3. The Findings

#### 3.1 The Impact of New Technologies on Museums

Interviews revealed that there is no consensus on the extent to which new technologies have impacted museums. One interviewee argued that the museum has not been transformed by new technologies any more than society in general. That is, technology has not altered the traditional core missions of museums to collect, preserve, interpret, and make available cultural heritage. Nevertheless, it has allowed museums to express their missions to a broader audience, and to fulfill them in a variety of new ways. Another interviewee suggested that, although technology has not changed museums' rapports with the public, it has changed the way museums work. Others suggest that technology has changed the way museums think about themselves. For example, one interviewee suggested that information technology has changed the way her museum views itself. She noted that the days of circulating collections are over but the museum can now provide web seminars to teachers in remote communities or other parts of the province. Though some may view these changes as threatening, it is also liberating. Museums now help people make meaning from art and objects in entirely new ways. According to this participant, the museum has become more of a hub and less of a physical resource on which people draw. The development of Web 2.0 technology has also provided museum professionals with new ways of thinking about connecting with their publics online and involving these publics in the museum environment. An interviewee explained that it is "no longer about the visitor in the life of the museum but the museum in the life of the visitor," meaning that, with the interactive Web and new levels of connectivity, museum visitors access the museum before they visit it physically, and continue to visit the museum website after they return home.

Some interviewees urged new museum professionals to rethink the very role of museums, and to consider new technological projects, not just as tools, but also as museums in themselves. Online exhibits, for example, serve as museum spaces; websites are no longer an extension of the museum, but represent the museum as a whole, particularly to those visitors who cannot physically visit the institution.

Most interviewees agreed that museums have been transformed by the proliferation of information technology in our contemporary moment. Within exhibition halls, multi-media installations have provided the most visible manifestation of technology within contemporary museum practices. This aspect has profound implications for the manner that museums communicate with members of the public, and has fundamentally changed the ways that exhibitions are undertaken. The use of cell phones and digital cameras in the exhibition space, for example, is becoming increasingly prolific. Some museums have responded to these changes by easing up on limitations placed on these devices and even encourage the public to use their cell phones in order to access interpretive guides. One interviewee also noted changes in the use of kiosks. He suggested museums used to relegate kiosks to the corner of most museum spaces, but now technology is considered more holistically at the inception of exhibition planning. However, one interviewee pointed out that exhibition teams should include members of the IT department so these teams have adequate IT expertise at all stages of the development of new exhibitions. Museum professionals need to know how to work with kiosks and build new applications for their use; as well as when to use them and when more traditional approaches will be more effective.

An interviewee working in a collection management department suggested the greatest impact of technology on the contemporary museum environment has been in the areas of

dissemination and collections management. Another interviewee indicated that almost all museum departments use a collection management system, and a variety of museum professionals use the system and contribute information about objects. The collection management system is the backbone of the museum according to this interviewee. Today far more museum personnel (curators and project managers among them) are familiar with, and have access to, institutional collections because museums have begun digitizing their collections and making them available on-line since the 1990s. Today, researchers may use multiple collections databases and other information technologies to “go shopping” for artifacts. Browsing the collection has been made a feasible reality. According to one interviewee, expertise in creating and working with 3D imaging is becoming increasingly important for some museum professionals. He went on to explain that 3D authoring tools, such as a 3D camera, allow museum professionals to create a three-dimensional image of specimens based on data models. Not only does this permit researchers to access collections at a distance, but it also reduces the handling of the physical specimens by providing visitors with highly flexible digital representations. Imaging technology can increase access to the collection, while helping to preserve the original object.<sup>10</sup>

One interviewee emphasized that museums are *about* information. In his opinion, the collection remains at the core of information creation and knowledge production, and technology should be seen as a tool or interface to facilitate access to the collection for these purposes. This particular view of technology as a tool was also reinforced by another prominent interviewee who stressed the necessity for museum professionals to both remain curious and creative in their uses of technology, and to develop a solid understanding of the subject specializations of their respective museums, be it in the fine arts, material culture, history, or other. Thus museum professionals must understand and appreciate the capacity of technological tools and the value of these tools for the museum sector. An interviewee pointed out that a collection is compromised if the link between specimens and their information is broken. Therefore, collection managers must have fundamental knowledge of information management techniques and the management and use of databases. He also suggested that the management of legacy data whether still in analogue form or in antiquated collection management systems presents special challenges.

### 3.2 Challenges Imposed on Museums by New Technologies

The interviewees also discussed the challenges posted by new technologies and identified the three most common challenges: (1) the cost of designing, implementing, and maintaining technology; (2) a lack of in-house expertise; and (3) information management. Many interviewees noted that the collection resides at the core of any museum’s work; hence, many museums have committed to building databases or adopting off-the-shelf collection management systems, and/or strengthening metadata to facilitate access to their collections amongst researchers, the public, and other museums. Data-sharing also requires that metadata meets a specific standard of interoperability so that it can be easily migrated from one IT infrastructure to the next. Cleaning data and adding to metadata are, nevertheless, tedious and

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<sup>10</sup> As the comparable work of European projects such as EPOCH have effectively demonstrated, [http://www.epoch-net.org/index.php?option=com\\_content&task=view&id=212&Itemid=357](http://www.epoch-net.org/index.php?option=com_content&task=view&id=212&Itemid=357)

time-consuming tasks. There is no uniformly adopted shared vocabulary among museums for describing collections, nor is there a consistently deployed standard form of metadata used across all collections even within a single institution. Migrating legacy data to new formats takes time and digital asset production continues at a prodigious rate. Unfortunately, museums are not able to cope with the amount of work necessary, and its expense. Without capturing information about the physical collection, however, museums will not be able to fully participate in the possibilities offered by Web 2.0 technologies such as interoperability between diverse cross-institutional data resources.

Museums are undergoing a conceptual shift that many believe has been triggered by the advent of networked computer technology. Traditionally, collections have fallen under the exclusive domain of the curator; however, as previously noted, information technology allows each collection to be shared, at least as parcels of metadata and digital images traveling across the Internet. While the mission of the museum will continue to be the preservation of its collection, opening up access has changed the focus of the museum from its preservation function to its interaction and engagement with the public. This shift in attention has a number of ramifications for museums themselves. First, the public is not always comprised of savvy technology users. From young people to the elderly, much of the general population suffers from poor computer and information technology literacy skills. For example, few people make a distinction between the deep Web and the information retrieved by a Google search. In addition, museum educators often work with primary and secondary schools, which are chronically under-funded, and, to date, often do not have access to high-speed Internet connections or software packages needed to operate Web 2.0 technologies. Museums must, therefore, strike a balance between low-tech and high-tech services to the public. Second, museums are perceived as authorities on the collections that they preserve. Interviewees point out that bad data or poor information made available on the Web reflects poorly on the subject expertise of museum professionals. At the same time, other interviewees noted that the public demands access to data that museums simply have not had the time or money to properly review or types of data that they do not have the resources to capture. One interviewee notes that most users do not ask for 100% accuracy, and if we wait until all information is 100% accurate and available museums will never upload their material to the web. Finally, the pressure to serve the public has led many museums to pursue IT trends without understanding the costs, benefits, opportunities, and risks associated with these new technologies.

The proliferation of IT has resulted in increased rates of format obsolescence and, as a result, museums now face considerable challenges when attempting to preserve digital assets. One interviewee commented that digital photographs are sometimes mistreated by museums because they are perceived as ephemeral objects, saved *en masse* onto CD-ROMs and other media storage devices, which are sitting haphazardly on shelves. This is quite unlike “tangible” film negatives and analogue photographs that are being carefully preserved in the vaults. The transition from tangible to ephemeral objects is also forcing museum professionals to re-consider basic concepts of traditional museology. For example, if a digital image can be copied easily and effectively, and disseminated widely via the World Wide Web, which version of this image is the authentic record? Furthermore, how does this scenario impact the “authentic museum experience” for the public?

New media art is one area requiring particular attention, especially with respect to how the cycles of life of ephemeral objects are recorded. Organizations like the Fondation Daniel

Langlois pour les arts, la science et la technologie in Montréal<sup>11</sup>, whose fundamental mission is research and preservation, has partnered with many museums to further this developing area. Programs such as the Variable Media Network<sup>12</sup>, undertaken by an alliance of universities and museums from 2004-2009, are the products of such work.<sup>13</sup>

One interviewee stressed the importance of preserving the pertinence and authenticity of the museum experience, and this in light of a changing landscape of new technologies. Museum professionals must think carefully about their use of technology, recalling at all times the mandate of the institution and the needs of the institution's visitors. This, she observed, requires a great deal of maturity on the part of the institution. She cautioned that the content of the museum should always be considered the foundation, while the technological tools are always only the gateway

A further interviewee spoke of yet another challenge to the museum posed by the use of technology when evaluating the validity of user-added content to museum information. Museums, he argued, place a seal of quality on information that they produce, however when members of the public are invited to add images/tags/texts to this information in on-line environments, it becomes increasingly important to differentiate between voices, and to identify who has added what. With the growing developments of cybermuseology and exhibitions developed for the web, he argues that we must distinguish between institutional and public additions to content so as to avoid the pervasive dilemma facing the wider web: large content, but questionable validity.

Perhaps the most important challenge, however, is convincing management to understand both the benefits and limitations of technology within a dynamic working environment with conflicting priorities. Information technology is not a core function of the museum, and therefore it does not always receive adequate funding. Few museums can exist today without a level of technology and technological support. Acquiring expertise that understands both the museum context and new technologies, whether in-house or outsourced, is key to building a solid information management program and developing innovative and interesting content for the public.

### 3.3 Museum Professionals

As one interviewee noted, the museum profession is facing a generational shift. As older professionals retire and new professionals take their places, the museum environment is undergoing significant changes. He suggested that within the culture of museums, older generations do not tend to prioritize technology to the same extent as newer museum professionals. This he expresses this not as criticism, but merely as a reality of contemporary practices. An outcome of such practices is evident in the vision that younger generations have of the museum: their approach is broader ("transversale"), revealing a greater understanding of the many functions of the museum as a collective. This is especially true in small institutions, where professionals are encouraged to undertake many different roles.

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<sup>11</sup> <http://www.fondation-langlois.org/html/f/>

<sup>12</sup> <http://www.variablemedia.net/>

<sup>13</sup> European Centres of excellence include *The ZKM | Media Museum*, <http://on1.zkm.de/zkm/e/institute/medienmuseum> and *Ars Electronica* [http://www.aec.at/about\\_about\\_en.php](http://www.aec.at/about_about_en.php) to mention just two.

Interviewees suggested that Generation Y tends to perceive technology as a ubiquitous part of the professional environment, not as an add-on, but rather, as inherent in day-to-day work. The challenge is for new Generation Y professionals to stress the importance of new technologies and, more specifically, social networking and other collaborative technologies, to older management. The displacement of older professionals by a younger generation is also evident to others; one interviewee mentioned that there has been a noticeable decline in the number of museum professionals seeking training in specific technologies, indicating that professionals are either entering the field already trained, or have become accustomed to self-directed learning. Several interviewees, however, warned that it is dangerous to assume that all Generation Y professionals will come to the field well versed in new technologies. While it might be true that this cohort of professionals has been more exposed to digital technologies during their schooling both formal and informal (e.g. gaming), this should not be equated with having the ability to critically evaluate, select or use new technologies. Another change that was noted by interviewees was the shift to project-based business and collaborative work. According to one interviewee, museum professionals are entering the field more accustomed to working in groups, drawing on the expertise of many to perform complicated tasks. As a result, museums must respond to this conceptual shift in work organization to ensure that new professionals can perform in ways with which they are familiar. Institutions, for example, might introduce Intranets to facilitate information-sharing, or chat programs to allow for geographically dispersed real-time communication. Social networking tools are becoming more commonplace within the museum workplace, as more professionals are accepting these technologies as solutions for collaborative project-based work.

#### 4. Conclusion

The interviews with sixteen senior North American museum professionals underscored the vital role that information technologies have played in the transformation of their institutions over the past two decades studies in Europe [e.g. 3, 7] have produced similar conclusions. While the core mission of museums may have changed very little, the activities and operational requirements associated with expanding collections from primarily physical, to increasingly digital objects has necessitated the marshaling of customized resources and a new set of knowledge and skills. Whether collecting, curating, educating, programming, marketing, communicating, or fund-raising, all require, not only some basic engagement with associated hardware and software applications, but also a more critical understanding of the inherent strengths, opportunities, and deficiencies of information technologies to support the present and future direction of the institution. Addressing this level of required IT literacy, as well as a perceived generation gap in engagement with new technologies and tools, such as mobile devices, imaging systems, and Web 2.0 and social networking applications, demands timely, focused, ongoing training at all stages of an individual's career within museums. This is a conclusion that chimes with the results of other international studies [7]. The threshold for participation in the digital environment continues to rise and this has implications for educational needs of museum professionals. As the 2004 *The Future Digital Heritage Space: An Expedition Report*, made evident the diversity of mechanisms from the technologies that support the intelligent ambient landscape to those that underpin multimodal interaction such as virtual and augmented reality will increasingly change the relationship between the

museum and its audiences [4]. For this to happen continuous educational learning opportunities must become a core part of the life of museums and museums professionals.

## 5. Acknowledgement

The authors would like to thank Anne-Marie Millner, Irene van Bavel, Madeleine Lafaille and the Canadian Heritage Information Network (CHIN) for their help with this research. CHIN provided substantial funding for this research through Research Contract. No. 45247369

## 6. References

1. Parry, Ross (2007). *Recoding the Museum: Cultural Heritage and the Technologies of Change*. London: Routledge.
2. Bearman, David and Kati Geber (2008). "Transforming Cultural Heritage Institutions through New Media," in *Museum Management and Curatorship*, 23(4): 385-399.
3. Geser, Guntram and Mulrenin, Andrea. (2002). The DigiCULT Report: Technological Landscapes for tomorrow's cultural economy Unlocking the value of cultural heritage. European Commission: Directorate-General for the Information Society  
[http://www.digicult.info/pages/report2002/dc\\_fullreport\\_230602\\_screen.pdf](http://www.digicult.info/pages/report2002/dc_fullreport_230602_screen.pdf)
4. Geser, Guntram and Pereira, John (2004), The Future Digital Heritage Space An Expedition Report, (Salzburg: DigiCULT,  
[http://www.digicult.info/downloads/dc\\_thematic\\_issue7.pdf](http://www.digicult.info/downloads/dc_thematic_issue7.pdf)
5. Loran, Margarida (2005). "Use of Websites to Increase Access and Develop Audiences in Museums: Experiences in British National Museums". In: CARRERAS, Cèsar (coord.). "ICT and Heritage" [online dossier]. In: *Digithum*. No. 7  
<http://www.uoc.edu/digithum/7/dt/eng/loran.pdf>.
6. Marty, Paul (2008). "Information Representation: Representing Museum Knowledge," in *Museum Informatics*. Paul F. Marty and Katherine Burton Jones, eds. New York: Routledge, pp. 29-34.
7. Ross, Seamus (2001), "Budgetary Suicide at the Altar of ICT", (London, Heritage Lottery Fund,) [http://www.hlf.org.uk/nr/rdonlyres/50742b80-89d2-4e6e-8a71-2469a3bcda6c/0/needs\\_ict.pdf](http://www.hlf.org.uk/nr/rdonlyres/50742b80-89d2-4e6e-8a71-2469a3bcda6c/0/needs_ict.pdf)
8. For example see. Ross, Seamus, Donnelly, Martin, Dobrevá, Milena, Abbott, Daisy, McHugh, Andrew and Rusbridge, Adam, (2005), *Core Technologies for the Cultural and Scientific Heritage Sector*, DigiCULT Technology Watch Report 3, European Commission, 296 pages. ISBN 92-894-5277-3 <http://www.digicult.info/downloads/TWR3-highres.pdf>. For other examples see <http://www.digicult.info>