Finding the Skills for Tomorrow:
Information Literacy and Museum Information Professionals

Paul F. Marty
College of Information
Florida State University

marty@ci.fsu.edu

Abstract

This paper presents results from twenty-one semi-structured interviews with museum information professionals who were asked about their experiences working with information resources, tools, and technologies in museums. The interviews were analyzed to develop an understanding of the information literacy skills of museum information professionals. This paper presents the results of this analysis, and discusses the state of information literacy in museums and the increasing need for museum information professionals to possess information literacy skills. The results illustrate how information literacy is defined by information professionals in museums, and how perceptions of information literacy and its importance to museums have changed over time.

Keywords

Museum informatics; museum information professionals; information literacy in museums.

Notice

Introduction

Museum professionals work with a variety of information resources, from museum collections, to information about collections, to information about the contexts in which collections are displayed, studied, or interpreted. The ability to manipulate and manage information resources has long been an important skill for museum professionals (Lord & Lord, 1997; Orna & Pettitt, 1998; Washburn, 1984). Recently, changing ideas about the museum's position as an information service organization have prompted new questions about the role of information professionals in museums (Giannini, 2006; Grant, 2001; Marty, 2004b; Roberts, 2001; cf. Cannon-Brookes, 1992; Hooper-Greenhill, 1992; MacDonald, 1991). These questions are driven in part by the changing needs of museum visitors, in-house and online, whose expectations about increased access to museum information resources may pose difficult challenges for museum professionals (Cameron, 2003; Hamma, 2004a; Knell, 2003; Rayward, 1998).

To meet the constantly-changing information needs of the users of museum resources, a new type of museum professional has evolved, one whose interests lie in managing the unique information resources found in the museum environment (Hamma, 2004b; Marty, 2004b; cf. Hermann, 1997). Over the past several years, the author of this paper has been studying information professionals in museums, examining their roles and responsibilities (Marty, 2006), their educational backgrounds and career paths (Marty, 2005), and the changing nature of their work in museums (Marty, in press). These studies leave no doubt that information literacy skills, broadly defined, are extremely important for museum information professionals to possess (cf. White, 2004).

Despite the importance of information literacy for museums, little is known about how museum information professionals view, define, or evaluate information literacy skills. This lack of knowledge is supported by the findings of other researchers, who argue that information professionals in museums are among the least studied of all consumers and producers of museum resources (Gilliland-Swetland & White, 2004). The goal of this paper is to improve the overall understanding of information literacy skills of museum information professionals, as well as changing perceptions of information literacy and its importance in museums.

Literature Review

Information literacy, as defined by the American Library Association (ALA), refers to the ability to "recognize when information is needed and […] to locate, evaluate, and use it effectively" (American Library Association, 1989). In the years since the ALA formulated this definition, researchers have explored the importance of information literacy skills in various environments, including the home (Rieh, 2004), corporate research laboratories (Hirsh & Dinkelacker, 2004), and educational institutions (Fidel, 1999; Leckie & Fullerton, 1999; Whitmire, 2003). Others have analyzed the different approaches from which information literacy can be explored as a theoretical concept, including emphasizing learning and sociotechnical fluency (Marcum, 2002) and considering information literacy within "a complex system of social relationships, sociotechnical configurations, and work organization" (Tuominen, Savolainen, & Talja, 2005, p.329). According to Rader (2002), more than five thousand works on information literacy have been published since 1973, and it is beyond the scope of this paper to review information literacy

as a topic (for a recent overview, see Eisenberg, Lowe, & Spitzer, 2004). The degree to which information literacy has been studied in general makes all the more noticeable the lack of comprehensive studies of museum information professionals and their information literacy skills.

Defining museum information professionals can be challenging, in part because their responsibilities have evolved along with the changing roles of museums in the information society (see Marty, 2006, for a detailed examination of this problem that explores the different profiles of information professionals working in museums). The difficulties of defining museum information professionals are exacerbated by the fact that most museum professionals can be considered information professionals in some sense, as most museum employees deal with information management on a daily basis (cf. Orna & Pettitt, 1998). It is not uncommon for certain museum employees, such as museum librarians or registrars, to possess library and information science skills and backgrounds (Giannini, 2006; Koot, 2001; Reed & Sledge, 1988). Given the historical relationship between museums and information resources, it is surprising that so little is known about museum information professionals, their roles in modern museums, or the skills they bring to all types of cultural heritage organizations (Marty, 2004b). One potential explanation can be found in the changing nature of information work in museums, and the new roles and responsibilities these changes have necessitated (Marty, in press).

Over the past decade, a growing number of researchers have studied the interactions between people, information, and technology in museums, an area of research referred to as "museum informatics" (Marty, Rayward, & Twidale, 2003; cf. Marty, 1999). The increased complexity of the information science and technology challenges faced by today's museum professionals means museums need new skills and new staff to keep up with the growing expectations of their users. As Hamma (2004b) writes, "Adding information management as an integral part of a museum's routine activities will or should change the organization with the addition of at least some new staff, new skill sets and a new management effort" (p.12). The success of museums in the twenty-first century depends largely on the abilities of a newly emerging group of information professionals specifically trained to deal with the problems of museum informatics and the information needs of museum visitors and professionals.

The need to explore the role information professionals play in museums comes at a time when new technologies have the greatest potential to revolutionize the experience of visiting a museum (Besser, 1997; Jones-Garmil, 1997; Thomas & Mintz, 1997). Researchers and professionals have studied how museum visitors use interactive technologies to augment the museum-going experience, from online experiences that reach visitors beyond the walls of the museum (Galani & Chalmers, 2002; Parry & Arbach, 2005; Teather & Wilhelm, 1999), to kiosks and handheld devices that allow visitors to explore topics in greater detail and at their own pace (Economou, 1998; Evans & Sterry, 1999; Rayward & Twidale, 2000; Schwarzer, 2001). These studies have helped museum information professionals better understand the educational opportunities that new technologies can afford museum visitors, including increased access to online information resources (Devine & Hanson, 2001; Schaller & Allison-Bunnell, 2005), innovative ways of reaching audiences in museum galleries (Hsi & Fait, 2003; Wakkary & Evernden, 2005; Woodruff, et al., 2002), and the ability to target unique user needs through personalization and pervasive computing technologies (Bowen & Filippini-Fantoni, 2004; Paterno & Mancini, 2000).

Studies of the needs, characteristics, and interests of museum visitors have helped museum information professionals better serve their clientele and transformed the way museum professionals build relationships with their users. These studies include surveys of online museum visitors (Chadwick & Boverie, 1999; Sarraf, 1999; Thomas & Carey, 2005), visitor motivation studies (Falk, 2006; Haley Goldman & Schaller, 2004), and analyses of the use of digital information resources by museum visitors (Kravchyna & Hastings, 2002; Ockuly, 2003). Different users have different information needs, and it is important to evaluate how visitors conceptualize and use information resources in museums (Cameron, 2003; Coburn & Baca, 2004), and to use this knowledge to explore changing expectations for online museums engaged in outreach to different audiences (Hamma, 2004a; Müller, 2002; Zorich, 1997). Several studies have helped museum information professionals examine how they are meeting the information needs of their users, discussing a variety of evaluation methods (Gillard & Cranny-Francis, 2002; Peacock, 2002), techniques for creating accessible and usable information resources (Cunliffe, Kritou, & Tudhope, 2001; Harms & Schweibenz, 2001), and the importance of taking a user-centered approach to the design of museum websites (Dyson & Moran, 2000; Hertzum, 1998).

Few studies have focused on the information behaviors of museum professionals in general, or the information literacy skills of museum information professionals in particular. Bernier and Bowen (2004) evaluated the information behaviors of museum professionals online, including their use of online discussion forums. Gilliland-Swetland and White (2004) studied the ability of museum information professionals to use metadata standards that provide access to museum information online. Marty (2006) discussed the changing role of information professionals in museums as technologies change, and how these individuals adapt their work practices to coincide with these new technologies (cf. Marty, in press). Haley Goldman and Haley Goldman (2005) explored web development as a profession in museums, interviewing museum webmasters and asking about their work, their sources of inspiration, and their ideas about the future of museum website design (cf. Marty, 2004a).

The small number of studies focused on the information behaviors of museum information professionals is especially telling when placed in the context of the growing importance of change management and professionalism in the museum environment. Within the past few decades, significant advances have been made in studying change management in non-profit cultural organizations such as museums (Cossons, 1985; Philips, 1993; Suchy, 2004). Today's museums exist in an environment of constant change, and successful museum professionals at all levels within the museum must be able to adapt to changing situations, learning new skills and innovating new solutions in response to internally and externally imposed problems (Janes, 1997). It is particularly important that museum administrators promote an environment that encourages innovation and change, and rewards educational training and professional development (Griffin & Abraham, 2000). This emphasis on increasing professionalism echoes arguments about the need for museum professionals to reflect on the nature of professional conduct in museums, and explore the diverse characteristics of museum professionals (Kavanagh, 1994; Parr, 1964; Weil, 1988). Along these lines, a number of museum organizations have published guidelines for professional development, including general competencies (http://museumstudies.si.edu/ICOM-ICTOP/) and codes of ethics for museum professionals (American Association of Museums, 1999; International Council of Museums, 2006).

As museum professionals and visitors become more information-savvy, and their needs and expectations become more technically complex, the need for experienced information professionals well-versed in the museum's unique information needs becomes more pronounced. The lack of data about the information literacy skills of museum professionals makes it difficult for museum researchers and professionals to understand the role of information science and technology in museums, to address the information needs of current museum professionals, and to prepare students for future careers where they will be able to make effective use of information resources, tools, and technologies in museums.

Research Questions and Methods

This study explored the following research questions:

- How do information professionals in museums define information literacy?
- How important are information literacy skills in museums?
- What information literacy skills do museum information professionals need to perform their jobs?
- How have perceptions of the importance of information literacy skills in museums changed over time?

Answering questions about information literacy and information professionals in museums is particularly challenging given the lack of an existing national or international registry for museum information professionals. It is not possible, for instance, to develop a survey instrument that can be sent to all information professionals in museums worldwide, and attempts to identify appropriate individuals by their job titles are unhelpful as there is no uniform schema for describing the constantly changing roles of information professionals in museums. While it is possible to develop general profiles and identify types of museum information professionals (Marty, 2006), there is a need for more quantitative studies that will compensate for the limited knowledge about this emerging professional role in museums. In particular, international surveys of museum employees that attempt to determine the types of information work performed by different individuals would be a helpful first step toward developing a usable registry of museum information professionals for research purposes. Given the current limitations, research participants for this study were recruited from various national and international museum conferences where attendees are interested in the role of information professionals working in museums. Advertising at conferences likely to appeal to such individuals was determined to be the best way of locating and recruiting potential research participants.

To answer the research questions, semi-structured interviews were conducted with twenty-one information professionals working in museums, asking them about the information resources, tools and technologies they use daily on the job. Research participants worked at 17 different museums in the United States, including five history or cultural heritage museums, one science and technology museum, eight art museums, two museums of natural history, and one children's museum. Although they varied widely in technical skills and expertise, all participants were responsible for managing information resources, tools, or technologies in some way. Participants ranged from lower-level positions to middle-managers to high-level administrators, with one to 30 years of experience in the museum field. They came from diverse backgrounds and held a wide variety of jobs: four worked primarily as information and communication technology

specialists in museums, nine worked primarily as webmasters or new media specialists, six worked primarily as project managers (typically holding titles such as curators or educators), and two were high-level administrators such as chief information officers. For a detailed analysis of the types of jobs held by the participants, please see Marty (2006).

Participants were asked several questions during their interviews dealing directly with information literacy, its definition, and its changing nature over time. Throughout the interviews, additional probing questions were asked to explore in detail specific issues as they emerged. In asking these questions, the notion of what it meant to be "information literate" was kept open for interpretation. It was left up to the research participants to define information literacy, as any attempt by the researcher to provide specific details or definitions in advance would have biased the participants' responses.

Questions asked during these interviews included:

- Do you consider yourself to be information literate? Why?
- What are the information literacy skills you need to do your job?
- What are some examples of how you apply these skills on the job?
- How do you keep current with information literacy skills?
- Does your job have explicit information literacy requirements?
- Do you see a need for museum professionals to have information literacy skills?
- Do you believe this need has changed over time in the museum? How?

Interviews lasted approximately one hour each, and were transcribed completely and analyzed using grounded theory methodologies. Drawing upon the participants' answers to each of the above questions, a process of coding and memoing, as outlined by Strauss and Corbin (1998), was used to develop an understanding of problems faced by information professionals working in museums and the strategies they employ to solve those problems. This kind of analysis is an iterative, on-going process where participant responses are analyzed as part of a continual process of exploring the data to identify emergent themes and dimensions. A random selection of the data was also examined, using the final list of concept codes, by a second researcher. By studying the past and present experiences of information professionals currently working in museums, it was possible to improve understanding of how museum information professionals define information literacy, the importance of information literacy to museum professionals, and how the perceptions of information literacy in the museum have changed over time.

Information Literacy and Museum Information Professionals

The results of this study indicate that museum information professionals have very strong feelings about information literacy and its importance in the museum. Given the potential difficulties of defining a term such as "information literacy," it is unsurprising that no definition of information literacy emerged that was shared in its entirety by all research participants. Nevertheless, within the boundaries of each participant's interpretation of the term "information literacy," certain commonalities and shared understandings were identified. By examining where participants agreed and disagreed about information literacy and information literacy skills, it is possible to improve understanding of information literacy and its importance in the modern museum.

The data analysis is divided into three parts. First, the types of information literacy skills possessed by the research participants are presented. Second, the concepts of information literacy shared by all participants are explored. Finally, the importance of information literacy in museums as seen by the participants is examined. The results are illustrated with quotes from participants; participant numbers have been included for cross-referencing purposes, but all identifying information has been removed.

Information Literacy Skills

When asked about specific information literacy skills or to provide examples of how they use those skills, research participants took three different perspectives. Some (8 of 21) took technological perspectives, focusing on aspects of computer literacy or information technology literacy in the museum. These individuals defined information literacy in terms of their ability to solve technical problems and help others in the museum use information technology. This focus on information technology skills underscores the necessity for the modern museum to have someone on staff capable of meeting technical needs and helping the museum keep current with respect to changing capabilities and technical skills:

> I feel like I have the basic skills and understanding of different sorts of computer applications that allow one to make effective use of those tools that are on everybody's desktop. In other words, I can create an HTML page, I can create word processing documents, I can make macros work, I can make spreadsheets work. I understand about databases and how they relate to other kinds of applications. I know how to set up a computer, I know how to repair a computer, I know how to create users on a network, all of those things. So in almost any case, if a staff person in the museum asks me a question about how to make something work with technology, I can answer that question. [P09]

> We're also getting ready to hire an information technology person, one to manage all the databases, image databases and raw information databases, somebody to troubleshoot information as it's put on the kiosks, the touch screens, kind of an information guru for the building. […] we haven't put a job description up, but he should be again, extremely competent, not only in hardware, hard wiring, but in software packages and databases, information management technology. When something goes wrong with a kiosk, I would hope it would be this particular person that would help us figure out what we need to do. [P15]

Others (6 of 21) took an information-oriented approach to information literacy, discussing their skills and abilities with research strategies, information organization, documentation, information visualization, communications media, and so on. Research participants who chose to emphasize these skills frequently discussed the sheer volume of information they had to deal with daily. They credited their information literacy skills with helping them cope with information overload, both for their own sake and for other employees. Central to this perspective on information literacy was the ability to learn new things and keep up with changing capabilities, technologies, and methodologies:

> Certainly here at [our museum, we] constantly have to juggle more information and more diverse roles, […] so we're having to gather information from all of our colleagues and put it together, so we have lots of different hats, […] so we certainly had to develop skills to help us juggle these things and communicate effectively with everyone in the different ways that we need to […] We have to know who to communicate with and then what the most effective way of doing it is, and there's constantly new hats being added. [P14]

> I learn fairly quickly, and I'm pretty open to learning, and I think that's critical, the ability to learn and the ability to ask questions and to go to someone when you need help, because I don't know anyone who knows everything about every program and every little nuance in museums or anybody, website or email program or something like that. So there's always something changing. I think the ability to recognize when you are in over your head and need some help, I think that's critical, knowing who to go to. [P02]

The remaining participants (7 of 21) took a combination approach, discussing the need to balance technical skills with information-oriented skills when solving problems. Participants provided many examples of how these skills complemented each other as they coped with different information technologies. They valued their abilities to develop information systems and implement technology applications equally with their abilities to conduct research and identify potential solutions to problems:

> Obviously there's a lot of kind of specialized or specific technical knowledge in terms of how to develop websites and how to build software in Flash, because a lot of my role is working with the content development side or the content development specialist in a museum. I have to be able to kind of take the information that they're giving me and understand it, craft it to present it on the web or go out and do research and kind of find the information that's out there to create some of these content driven websites. [P06]

> We had a problem, and based on my literacy of what information technology exists in the world, I would be able to proffer up three whole solutions, and with a little more research, I could tell you which of those three fit our budget best, fit our workflow best, and really do the job, and then we could continue on with research to find that out. Now in all of it, we don't know the right answer when we start, and maybe even by the time we finish we don't know the right answer. But it's really an awareness of what the options are to really allow us to research those and come to some point of conclusion. [P07]

Information Literacy as a Concept

There were some general attributes of information literacy everyone agreed were important. These commonalities emerged when participants answered open-ended questions about the value of information literacy from their perspective as museum information professionals. When hypothesizing about information literacy and its general importance in the museum, research participants had no difficulty extending the phrase "information literacy" beyond specific, detailed skills to include general competencies with finding, accessing, evaluating, and using information resources of all types. All 21 participants agreed on three basic elements of

information literacy, which any information literate person would need to possess; these elements were mentioned at least once during each interview.

First, the research participants stressed the need to know what information resources are available and to locate appropriate resources that meet the information needs of all users. The ability to do so was often associated with the need to "meet expectations" for different audiences, from co-workers within the museum to the general public visiting the museum's website online. Participants frequently mentioned the difficulty of meeting (or exceeding) these expectations as the needs of their users changed over time. In order to access the correct information resource at the right time, one needs to be familiar with both the currently available museum information resources as well as those resources likely to become available in the near future:

> Information literacy for my purposes at work really has more to do with the ability to find out the necessary information to be able to match a need and expectations among the building and our audiences. [P03]

> We have a lot of information at our fingertips, but it's becoming harder and harder to know how to store it and have long term access to it over time, and I think that's one of the big issues. [P16]

Second, all research participants stressed the ability to think critically about information resources in museums, and to evaluate their use as necessary. Museum information professionals need to consider all ways the information resources at their disposal might be used, accessed, or needed by potential users, inside or outside the museum. They must be aware of the available information resources, able to locate appropriate resources when needed, and able to evaluate resources critically, considering the impact they might have on the museum as an information organization. As museum professionals strive to meet the changing expectations of all users of their information resources, someone in the museum needs to consider the changing role of the museum in the information society and the future direction of their own organization:

> Information literacy means critical thinking about the informational outcomes of the technology, really in the context of the knowledge assets of the organization, and the direction that the organization either is taking or might take. [P19]

> Information literacy is being able to understand information and how to use it and communicate about it. [P08]

Finally, all 21 research participants stressed the need for museum information professionals to develop new information literacy skills as needed, to "stay current" with this knowledge, especially as museum information resources, tools, or technologies change over time. In this way, museum information professionals can meet the information needs of all users, inside and outside the museum. As the needs and expectations of the users of museum information resources change, the skills necessary to meet their needs and expectations also change. Museum information professionals must adapt to changing circumstances, respond to changing expectations, and learn new information literacy skills as their job requirements change. This aspect of information literacy puts a premium on "keeping current," a theme which recurred

often throughout the interviews. When describing the information literacy skills they use on the job, research participants stressed the importance of keeping up-to-date over time:

> I think the big thing for information literacy for me is not only having the technical skills to hold a job in the information service field, but also have the skills to attain new skill sets. […] So information literacy not only means familiarity with what's going on now, but that ability to find out where we're going next and stay current as that proceeds. [P07]

The Importance of Information Literacy

All 21 research participants agreed that information literacy skills were extremely important for information professionals working in museums. There was a strong consensus among all participants that information literacy, according to their own interpretations of the term, was extremely critical for museum information professionals. Information literacy was considered important for meeting the information needs of both museum professionals and museum visitors:

> Information literacy is extremely critical now, because there's so much more information out there. […]. It's not a matter of having access to the information, now the real critical issues are what you're talking about, being able to use this mass of information and being able to boil it down into what you really need. [P03]

> I think that having both skills in information literacy helps me and people working for me understand the best way to organize information, and how to present it, so that we can present what the public is expecting to see in an interface. [P05]

No matter how information literate one might be, research participants believed it was always possible for one to become more so; they constantly strived to improve their own information literacy skills:

> As a grad student you're taught different informational skills – how to research, what databases are out there, I'm always learning about new databases that are out there, and as you wander your way through your master's and your Ph.D., you're learning new ways to research, new ways to get information. So I guess since I'm always learning, always looking like a sponge, I don't feel like I'm hugely competent because there's still so much that I'm trying to learn, and this job, because I think technology is infusing our jobs so quickly, I'm constantly learning. [P15]

Given the value of information literacy skills for museum information professionals, it is not surprising that participants believed museums should hire individuals with information literacy skills. They believed museum professionals should possess information literacy skills beyond practical abilities to find information or technical abilities to use information technologies. They stressed the need to hire people who can think critically about the role of information in the museum and evaluate the use of museum information. Without these abilities, it can be very hard for museum professionals to understand how their role fits into the museum's overall mission:

> As jobs evolve and develop, and you know, the relation to information technology and literacy generally, people need to be prepared with computer skills and organizational skills and just communication skills generally, that perhaps they could learn more slowly on the job previously. Now things move more quickly, and yeah, I think it's necessary that they come in with a certain higher level than in the past of information literacy. [P14]

> One of the things I find is that there are different levels of expertise and skill sets. One individual might be very well-versed and knowledgeable in technology, and how to incorporate and bring that into the mainstream and what they may be doing what they may plan or how they envisioned that particular area. In a lot of areas, this is sort of lacking, so you don't have the skill set among the professionals that would encourage the kind of incorporation of newer technologies. [P18]

Given how quickly things change in the modern museum, research participants stressed the need to hire people who can adapt to new information needs and technologies, and who can keep current as these evolve over time. As the museum adapts to its new role in the information society, it is extremely important that museum staff members are aware of these changes and have the skills needed to keep up with them over time:

> When we're bringing new members to the team or we're talking to people we want to work with, [we look for] not only having the skills for today, but having the means to find the skills for tomorrow. [P07]

> If you look at [information literacy] from a cultural perspective, it's always changing, because information is changing, society's always changing and the way that we take information and use it. [P08]

Keeping up with these changes is not simple. There is no one set of skills, no one magic solution which will work for all individuals and all organizations. Different museums have diverse organizational needs, and will need to hire different people depending on those needs. The size of the museum provides a good example: in larger museums, it is more likely that information professionals will work in specialized positions; in smaller museums, information professionals will need to have a wider variety of information literacy skills, as well as the ability to juggle those skills from task to task, and day to day.

Given the many ways information literacy skills can manifest themselves in museums, encouraging museum professionals to become more information literate presents a challenge that goes beyond any one institution. Museums with more skilled employees will have to reach out to museums with less skilled employees, helping push museums forward and increase information literacy skills across the museum community:

> [Information literacy] needs are very different based on the size of the institution. Here at [our museum] with a hundred and fifty some professional staff, our staffing needs and requirements on the job here are very different than a smaller museum, your museums where they have a staff of three, or six; that's a different environment, and we spend money differently, we have different priorities, a different reach, and that's one of the

> things that we always need to be considering, and we need to find out, 'How can we, as a field, grow information literacy for everyone?' [P07]

Discussion

These results pose challenges for museum professionals in general and for museum information professionals in particular. Having information literacy skills in museums means having the ability to identify and assess an information need, and then develop and implement an appropriate solution that will successfully meet that need within the boundaries of the unique information environment of the museum. What makes these skills particularly difficult to acquire is that the types of information problems faced by museum professionals are constantly changing (Marty, in press). In the current environment, the ability to use new technologies or develop new information systems is not enough to be considered information literate. Individuals who wish to improve their information literacy skills will need to understand the changing role of museums in the information society so they can identify and acquire the necessary skills to meet changing needs and expectations.

For museum professionals, the difficulties with becoming information literate lie with developing the abilities to cope with constant change and face the continual process of learning new skills. The ability to "find the skills for tomorrow" is increasingly important as museums face changing expectations about the access, provision, and use of museum information resources—expectations that come from information providers and consumers, inside and outside the museum. Museum visitors expect museums to provide online information systems that will guide them to desired collections data without their having to master the museum's metadata standards and classification schemes; at the Getty's website, online visitors having difficulties with their searches now benefit from a Google-like "Did you mean _____?" interface (Coburn & Baca, 2004). Museum professionals are exploring how Web 2.0 and social computing technologies will affect the way their institutions interact with online visitors; at the Cleveland Museum of Art, online visitors can use "social tagging" to help other visitors find objects by entering key words and descriptions that they feel will improve access to the museum's digital collections (Bearman & Trant, 2005).

The most challenging part of meeting these changing expectations is not building and implementing new technologies; it is the assumption that somewhere in each museum there exists, or should exist, an individual who can solve these problems. While this may pose less of a challenge for large museums than small museums (being able to draw upon the resources of a large museum will help), the problem is not so much one of staffing and resources as it is one of encouraging current and future museum professionals to develop the information literacy skills that will help them meet changing needs and expectations. The nature of information work in museums is changing so rapidly that nearly all participants stressed the importance—and difficulty—of developing new skills and keeping current with existing ones. Few museum professionals began their jobs with all the skills they use today; to keep up with the changing information resources, tools, and technologies they use on the job, they need the skill to develop new skills.

In today's museums, the ability to learn new skills in the face of new challenges is the most important information literacy skill museum professionals can possess. Without this skill, no amount of money or technology will help them understand problems or figure out solutions. Given the wide variety of museums, and that the resources of most museums are stretched so thin, what is the best way to help museum professionals develop this ability? In particular, how can museum information professionals work together to master the information literacy skills they need to meet these challenges and changing expectations?

Implications

The findings of this study help improve overall understanding of how museum information professionals cope with changing expectations of information use in museums, and how information literacy skills help them meet the challenges that ensue. The best way to ensure these challenges are met successfully is to promote an environment where information literacy skills are valued, and where current museum professionals are encouraged to develop new skills and keep current with existing ones. While achieving this goal can be difficult, taking the following steps can build on existing information literacy strengths in museums.

First, museum information professionals should strengthen inter-museum relationships as a way of helping larger museums work with smaller museums, sharing resources to solve common information problems. One way of achieving this is by encouraging museum professionals to join organizations such as the Museum Computer Network (MCN), the MDA (formerly the Museum Documentation Association), the International Committee for Documentation of the International Council of Museums (ICOM-CIDOC), and so on. The MDA, for example, has worked since 1977 to promote minimum information standards for museum collections management, resulting in such resources as SPECTRUM (Cowton, 1997) and Collections Link (http://www.collectionslink.org.uk). The broad nature of these groups, where individuals from many different types and sizes of museums collaborate on solving common problems, makes them invaluable resources for museum information professionals trying to get a handle on the changing nature of information work in museums.

As an integral part of strengthening these inter-museum relationships, museum professionals should work to improve connections among museums internationally. While the research participants in this study were employed in museums in the United States, the findings of this research are such that they likely transcend international boundaries. Despite the good work performed by many museum organizations to improve inter-museum relationships, much of this work has been regional or national, and it is important to extend this spirit of inter-museum cooperation past regional boundaries. Encouraging museum professionals to join and participate in international organizations (such as ICOM) would be an important step toward forming an international community of museum professionals sharing their information literacy skills to solve common information management problems.

Second, museum information professionals should promote extra-museum partnerships, encouraging their museums to work closely with libraries, archives, and other information organizations. Given the ease with which collections information can be made available online, and how this trend has encouraged the functional convergence of digital museums, libraries, and

archives (Rayward, 1998), meeting even basic information needs will soon require information professionals from diverse organizations to collaborate to address common concerns. Museums have a lengthy history of collaboration, and there is strong evidence that museum professionals are ready to face these challenges. In a recent study, Rodger, Jörgensen, and D'Elia (2005) found that museums are more likely to be involved in collaborative relationships than any other type of public institution, and that when organizations other than museums collaborate, they are more likely to collaborate with museums than with any other type of public institution. The benefits of collaboration extend to museum visitors, who gain greater access to broader information resources, and museum professionals, who develop the information literacy skills integral to sharing collections data in the information society.

This focus on collaboration reflects the changing role of museums as institutions, as well as the need for museums to play a more involved role in the information society. Information consumers look to the museum and its resources as a primary source of information, and museum professionals must be prepared to continually reassess their role as information providers, particularly in the online environment. If museums are to remain relevant for modern visitors, museum professionals must adapt to meet the changing needs and expectations of their users. As museum visitors evolve their conceptions of the information museums should provide, information professionals working in museums need to remain current with those changes and help other museum professionals survive the necessary shifts in focus, attitude, and philosophy. If museums are to meet the changing needs of their users, someone in the museum must work as the users' advocate, approaching problems from a user-centered perspective. The successful museum information professional, therefore, will have the information literacy skills to assess the changing information needs of all consumers of the museum's information resources, inside and outside the museum.

Finally, museum information professionals should encourage diversity among current and future museum professionals, hiring individuals with diverse backgrounds and helping existing employees develop new information literacy skills. The ability of museum professionals to understand and evaluate the role of information in museums is critical for the success of museums in the 21st century. Museum administrators need employees capable of setting information policy, managing information resources, administering content management systems, implementing metadata standards, evaluating information interfaces, etc. While some of these tasks may be performed by existing employees, a growing number of museums are seeking individuals from outside the museum who can guide them through the hazards of planning digitization projects, purchasing collections information systems, or joining online data sharing consortia.

The challenge lies in finding individuals with the information literacy skills to make decisions about such technical issues as digitization policies, metadata standards, and digital rights management, who also understand the culture of the museum and its role as an information organization. Simply hiring individuals because they know how to develop a database or design a web page is a recipe for failure for most museums. When looking for new employees, therefore, museum administrators should consider individuals with backgrounds in or experience with Management Information Systems (MIS) or Library and Information Science (LIS), in addition to experience working with museums and museum collections (Marty, 2005).

Along these lines, current museum professionals should be encouraged to pursue opportunities for continuing education, attend conferences and workshops related to museum information management, and keep current with general changes to the nature of museum information work. The Institute of Museum and Library Services (IMLS), for example, recently began funding opportunities for the continuing professional development of "21st century" museum professionals (http://www.imls.gov/applicants/grants/21centuryMuseums.shtm). This emphasis on continuing professional development reflects the new world of professionalism in museums, where training, mentoring schemes, professional development, and continuing education programs are increasingly important. Mentoring schemes where older professionals are paired with incoming employees can have dual benefits, where novices gain valuable firsthand experience about the museum profession while experts benefit from the injection of new ideas brought into the museum by recent hires. In addition, a number of museum associations, such as the American Association of Museums (http://www.aam-us.org/museumresources/), the UK Museums Association (http://www.museumsassociation.org/mentoring/), and the International Council of Museums (http://museumstudies.si.edu/ICOM-ICTOP/) now offer resources for mentoring, professional development, and training.

Regardless of the approach taken to improve information literacy skills, the results of this study demonstrate that simply having these skills is not sufficient. Successful museum information professionals will be able to apply information literacy skills within the culture of the museum, combining an understanding of museum work flows and processes with the ability to identify information needs and implement information-oriented solutions. The best way to find the skills of tomorrow is to broaden the areas of expertise available within museums while not losing track of the museum's core mission. Encouraging employee diversity, working with new partners, and expanding collaboration networks are all ways of ensuring that individuals with the necessary skills and experience are on hand as the changing information needs and expectations of museum professionals and visitors demand innovative solutions to new problems.

Conclusion

The changing perceptions of information literacy and its role in the museum are a reflection of how museum information professionals are adapting to meet the changing information needs and expectations of the users of museum resources. Keeping up with these changes requires continual growth and improvement on the part of museum information professionals. The difficulty in meeting new challenges lies not in implementing technologies, but in promoting an environment where developing new skills is encouraged and expected. While there is no question that technical skills are crucial (someone needs to be able to build web-enabled databases and museum websites), the museum information professional's ability to use information literacy skills to help museum visitors access museum resources is more important than possessing specific technical skills. From this perspective, information professionals in museums serve as user-centered mediators between the museum and its users, advocating information needs for multiple users, and ensuring, as much as humanly possible, that each user has a successful interaction with the museum's information resources.

As museum visitors evolve new expectations of what museums should provide, and museum professionals evolve new ideas about the information resources they should offer, information professionals in museums will draw upon their information literacy skills to meet the needs of all users, in the museum and online. It is imperative, therefore, that museum administrators encourage their employees to develop their information literacy skills through a continual process of knowledge acquisition and professional development. If museum information professionals are not encouraged to develop their skills in information literacy, museums risk becoming unable to keep up with the changing information needs of their visitors. The best way for museums to encourage a continual growth in information literacy skills is by broadening contacts and diversifying relationships so that the changing needs and expectations of all users of museum information can be met successfully today and in the future.

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