3D Technologies: New Tools for Information Scientists to Engage, Educate and Empower Communities

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ABSTRACT

This panel provides an overview of the adoption of three-dimensional (3D) technologies by librarians and information scientists as tools for community engagement. 3D technologies --scanning, printing, and design-- are some of the latest technical innovations making inroads into the library and museum environments. After a brief introduction on the technical aspects of 3D technologies, specialists from academic and public libraries discuss their experience implementing 3D services, with a special focus on newly established partnerships. In addition, they comment on the impact of the technologies on their institutions and communities. Empowering users to scan or create 3D objects often results in a growing collection of 3D digital files. An information scientist discusses how to manage these collections to ensure preservation and fair intellectual property practices. Finally, a museum professional describes creative ways of using 3D objects to enhance the museum experience and to expand the interaction of the public with museum artifacts. Following the presentations, the panelists engage in public discussion of the challenges and opportunities of these transformative technologies.

Keywords

3D printing, 3D scanning, libraries & communities, museums, technology.

INTRODUCTION

Manufacturing is fashionable again, although not the large-scale industrial type, but the smaller, individualized version known as personal fabrication (Gershenfeld, 2005; Highfield, 2013). This Renaissance is being fueled by two main factors: a grass-roots social movement, the “Maker” movement, which encourages invention through shared technology and craft, and a sharp decrease in price of rapid prototyping machines used to create solid objects from digital files (Moilanen & Vådén, 2013; Wittbrodt et al., 2013). 3D printers (Figure 1) are one of the most common prototyping tools used by makers to manufacture their creations. The files read by 3D printers are created using design/modeling software, or obtained through mapping the structure of an existing object with a 3D scanner (Figure 2). This combination of tools fits under the umbrella term “3D technologies”.

Libraries and museums were among the first learning institutions embracing the Maker culture and opening “makerspaces” or “fablabs” (fabrication laboratories) in their premises (Britton, 2012a; Colegrove, 2012; Institute of Museum and Library Services, 2012). 3D technologies are usually part of the service package that these pioneering institutions offer to their users.

Implementing a 3D service in a library or museum can be challenging, but the transformative opportunities that the new technologies bring to the user community are substantial (Gutsche, 2012; Britton 2012b). Institutions are still experimenting with different models of service. In some models users are trained and left to work independently, while in others most of the operation is
Users attracted to the idea of creating or copying objects using 3D technologies usually have to acquire a new set of skills, which involve spatial and visual learning and an understanding of basic geometry and simple engineering principles (Gershenfeld, 2005; Lipson & Kurman, 2013). Empowering users to acquire those skills requires a training structure, provided or facilitated by the institution, which brings staff and users together as collaborators (Britton & Considini, 2012). On the other hand, the challenges of the process and the reward of having a physical end-product are powerful attractants that bring a different, more resilient and creative population to the library or museum, eager to learn and to cross non-traditional boundaries (Hidalgo, 2012; Britton, 2012b). Thus, creating outreach strategies to contact and inform the community becomes another necessary step when establishing a 3D program. A successful initiative also requires an institutional plan to manage collections of 3D files for preservation and dissemination.

In sum, 3D technologies have the potential of benefiting both the institution and its users, but implementing the service demands true commitment to a program that informs, educates and empowers the users. This panel brings together librarians, information scientists and museum professionals to share their experience working with and researching 3D technologies as tools for community engagement.

ISSUES FOR DISCUSSION
Some of the challenging issues that the panelists hope to discuss with the audience are:

- Hardware selection & maintenance.
- Training (staff and users)
- Pre and post-printing processes
- “Green” materials
- File and metadata standards
- Intellectual property (copyright VS patent law)
- Pedagogical and creative applications
- Maker movement and makerspaces

PANEL STRUCTURE AND TIMELINE
1. Overview on 3D Technologies by the moderator (10 minutes).
2. Individual presentations by the panelists on their experience implementing 3D technologies at their institutions, establishing partnerships with their communities, and supporting the development of 3D collections (10 minutes each).
3. Open discussion by the panelists based on questions/commentaries from the audience and the moderator (25 minutes).
4. Closing remarks and summary by the moderator (5 min).

Total time: 90 minutes
3D technologies are not new, but recent technical advances have increased their affordability. The reduced price of hardware and materials is finally allowing learning institutions and individuals to acquire their own 3D equipment. Developments in design software and open source/access initiatives have also contributed to the ease of use of these technologies. To establish a successful 3D service, information scientists need to reflect on all the components that come into play: the hardware, the software, the objects (scanned or created), the space where everything comes together, and finally, the people interacting with and learning from the technology. Starting with a brief historical background, this presentation provides a basic overview of the technical aspects involved in 3D printing, scanning and design, highlighting the different elements involved in providing 3D services.

Kevin Messner (Panel participant)
Kevin Messner, M.S., Ph.D., is Acting Head of the Business, Engineering, Science and Technology (B.E.S.T.) Library at Miami University. He holds a doctorate in Microbiology from the University of Illinois at Urbana-Champaign. Kevin’s primary research interests, in addition to adoption of 3D technologies in libraries, are in library space utilization and user behavior, and attitudes towards e-books among the academic disciplines.

B.E.S.T library’s 3D service program exemplifies the successful use of partnerships with other institutional units to enhance the range and depth of its modeling, printing, and visualization services. The core equipment in the library are a MakerBot Replicator and a Replicator 2X printers. One library technician devotes approximately 67% FTE to operation and maintenance of the equipment, with approximately six other library staff trained to operate the printers routinely. Beyond this core, librarians have partnered with other departments to provide access to additional equipment (e.g. a high-end 3D printer and an holographic projector), enhance the library’s capabilities in 3D scanning and modeling, mentor students on engineering and materials research projects, and explore recent software enhancements that could enable the deployment of web-based 3D image galleries across a wide variety of platforms. These relationships have also helped in troubleshooting problems with equipment and software, and have provided a built-in panel of experts to discuss service needs, concerns, and priorities.

Richard J. Urban (Panel participant)
Richard Urban, M.A., MLIS, Ph.D., joined the iSchool at Florida State University in 2011 after completing a MLIS and Ph.D. at the University of Illinois at Urbana-Champaign. His background also includes an MA in History and Museum Studies certificate from the University of Delaware. Richard’s research interests are broadly concerned with representing cultural heritage collections online through quality metadata and usable interfaces. His research is informed by experience at the IMLS Digital Collections and Content Project, Collaborative Digitization Program, Historical Society of Pennsylvania, and Historical Society of Delaware.

Libraries, archives, and museums have been actively engaged in developing digital library services that present users with direct online access to representations of their collection. Until recently, however, the content of digital services has been limited to two-dimensional images or time-based media such as audio and video. Increased capabilities and decreased costs have put the ability to scan, publish, and print collections of objects in three-dimensions within our grasp. This presentation reflects on lessons learned from two-dimensional repositories that will help shape the emergence of collections of 3D representations.

Sam Tripodis (Panel participant)
Sam Tripodis, M.B.A., is the TechCentral Coordinator at the Cleveland Public Library (CPL). As a leader in CPL’s innovative technology and learning center, Sam manages computer education, and instructional and programming services at the Main Library downtown and at 27 branches throughout the city of Cleveland. As part of his 10 years at the Cleveland Public Library, Sam has worked his way up from page to clerk, to computer trainer, and now Assistant Manager. Sam holds a Bachelor of Business Administration in Management and Labor Relations, and a Master of Business Administration from Cleveland State University.

3D Printing is fairly new to the typical urban library patron. Getting the tools and knowledge to the people of Cleveland has been one of Cleveland Public Library’s main priorities in the last year. As more and more people learn or hear about 3D printing, the library has become a source of knowledge for its patrons. In the very beginning, one of the core duties of Mr. Tripodis was the training of library staff on how 3D printing worked and how it related to everyday patrons. The managers predicted that the new service was going to attract a different kind of patron, and that catering to them was going to be a challenge. Training the staff and knowing the profile of those new patrons became important aspects of the planning process and contributed to the success of the initiative. Since then, the staff learned that there are three different types of training related to 3D printing that occur in the workflow of the library makerspace: staff teaching patrons, patrons teaching staff and patrons teaching patrons. The new service has provided to all involved an incredible opportunity to learn, and has allowed newcomers to feel comfortable and have a sense of ownership while using the library makerspace and 3D printer.

Megan E. Hancock (Panel participant)
Megan Hancock, M.A., received her undergraduate degree in Studio Art from the College of Wooster and her masters in Modern Art, Connoisseurship and the History of the Art Market from Christie’s Education in New York City.
Megan came to Denison from the Gund Gallery at Kenyon College, where she assisted in the curatorial and education programs of numerous contemporary art exhibitions. Prior to her work at the Gund Gallery, Megan worked for two years at the Denison Museum and three years on the college’s successful capital campaign.

Museum interpretation and visitor engagement are two of the newest and fastest growing departments within museums. Educational theory emphasizes that people learn most effectively in a museum when they are actively engaged. Engaging visitors in thoughtful dialogue and hands-on learning provides opportunities to share observations, actively listen to others, and make connections between art in the museum and personal everyday lives. By using 3D printing and scanning, the museum can create in-depth and prolonged learning by turning patrons and participants into makers. These makers, both young and old, can then take these objects outside the museum/gallery walls, thus increasing the visibility and prolonging the visitor’s engagement with museum collections.

**Tod Colegrove (Panel participant)**

Tod Colegrove, MLIS, Ph.D., holds a Master of Science in Library and Information Science with a concentration in Competitive Intelligence and Knowledge Management from Drexel University, complementing his doctorate in Physics and over 14 years of experience as senior management in high-technology private industry. He is actively involved in multiple scientific and engineering disciplines in academia, and keenly aware of the issues and trends in scholarly communication in the sciences. At the University of Nevada, Reno, Tod served multiple years as manager of the Information Commons @One, part of the Mathewson-IGT Knowledge Center, and currently serves as Head of the DeLaMare Science & Engineering Library.

The DeLaMare Science & Engineering Library at the University of Nevada, Reno was the first academic library in the US to offer 3D scanning and printing to the public. Sharing the experience can help others trying to establish 3D services at their institutions. This presentation covers the potential opportunities available to libraries embracing personal fabrication, and how the process of “making” enhances and changes learning. It also describes the creative connections that new constituencies, attracted to libraries because of their communities, bring to the academic learning environment.

**AUDIENCE AND LEARNING OBJECTIVES**

The content of the panel will appeal to both practitioners and researchers, by providing a balanced view of practical applications and theoretical/technical questions, while highlighting opportunities for research and inquiry. Information scientists attending the panel will leave with a broad understanding of how 3D technologies work, what are the current applications in libraries and museums, and how its adoption influences and shapes their communities. In addition, they will have the chance to delve into some of the more controversial and challenging aspects during the final discussion.

**RELEVANCE**

The main topic of this panel, promoting the use of 3D technologies for community engagement, speaks directly to the 2014 ASIS&T Annual Meeting theme “Connecting Collections, Cultures and Communities”. Despite the enthusiastic adoption of these technologies by libraries and museums, the hardware and software to support them are still in development. This provides a window of opportunity for information scientists (practitioners and researchers) to help develop these technologies to their full potential, and ensure that they continue to evolve in the best interest of their communities.

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**REFERENCES**


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