Makers and Makerspaces Information Community

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Abstract

The maker community has revolutionized creating because now almost anyone can create through the use of personal computers. Just as making has become democratized so has information. Makers seek and share information and interact with each other through websites and social media and/or in physical locations called makerspaces. Since both academic and public libraries have constructed social capital within their communities, they appear to be obvious and trusted places for makerspaces. Scholarly research shows that libraries are beginning to meet the needs of makers and makerspaces as making is now being considered "information." However, some issues about makerspaces need addressing by information professionals. The empirical studies on makers' needs and information seeking behavior are from the librarians' viewpoint rather than on the users themselves. Moreover, the research indicates that to be truly effectively in offering makerspaces, librarians will require training on the emerging technology like 3D printers but also they will need to understand better copyright and intellectual freedom issues on the sorts of items being created in makerspaces. User agreements in library makerspaces could help with that. It is suggested that information professionals keep a confident, open and experimental attitude and a willingness to learn as both academic and public libraries readjust their roles for the 21st century and beyond.

Introduction

"Whether it's quilts, cookies or even chicken coops, nearly everyone is a maker" (Williams and Folkman, 2017, p.27)

The reason makers and makerspaces were chosen as an information community is because they are becoming an indelible part of our instinctive need to create. Neil Gershenfeld, author of *Fab: The Coming Revolution on Your Desktop – from Personal computers to Personal Fabrication* recognized this in his 2005 book. When he, as professor of Massachusetts Institute of Technology, offered a class "How to Make (almost) Anything," he was struck by how students were excited about making, modifying and using items for personal, not professional, reasons. Gershenfeld was also surprised at how students were willing to share their knowledge and resources with peers to help each other complete their projects. This infancy of the making movement was also mentioned by Anderson (2012) who felt that the maker movement began when the digital generation began experimenting and sharing their information on digital prototypes.

Anderson (2012) noted that in 2005, *Make* magazine was launched in print and then online to meet the growing maker movement who share through online community forums, websites, and social media to create, hack and fabricate objects. This collaborative sharing ethos is reflective of a classical information community as described by Fisher and Durrance (2003). The make community has the characteristics of an information community in four other ways. First, not only does the maker community share online, they also across time and space with other makers around the country and the globe with different generations (Peppler and Bender, 2013) and nationalities (Blikstein, Martinez & Pang, n.d.). Makers also join makerspaces in order to be helpful face-to-face with others to spread and accumulate knowledge. Next makers remove

barriers for everyone to participate through popular websites and other digital ways. Lastly, they foster social cohesiveness through their online and physical presence in the community (Van Holm, 2015).

Academic institutions are also recognizing the growing prominence of makerspaces. Makerspaces were listed in the 2016 Horizon Report (Johnson, Adams, Cummins, Estrada, Freeman, & Hall, 2016) as an important technology trend in higher education that would take hold in two to three years. The report states that more institutions of higher learning are using these spaces as a place to create and innovate, not just in the STEM field but also in liberal arts because it was felt that makerspaces could also help students with digital literacy and autonomous learning.

In order to better the growing maker community, this paper will review the scholarly research in the makers and makerspaces. This and an examination of popular sources of makers will inform the discussion on the social and intellectual needs that drive the information needs and behavior of makers who meet online and in physical makerspace locations. This paper will also discuss the role librarians play in makerspaces and what they will need to do in the future to advance the maker communities values of creativity and innovation.

Literature Review

A thorough search of the Library and Information Science (LIS) databases showed that the first article published on makerspaces was in 2012. Subsequent methodologies used in the scholarly articles located were qualitative interviews, case studies, and questionnaires. Within those five years, themes in the literature on makers and makerspaces have become evident.

One of the most common themes is why libraries are offering spaces for creation. Moorefield-Lang (2015c), Slatter and Howard (2013) feel that makerspaces within libraries are essential for today's creative generation who want to use tools and the knowledge of others in makerspaces. Wilson (2000) suggests that this kind of behavior is "collaborative information seeking" (p.53)

The maker community also exhibit everyday life information seeking (ELIS) behavior described by Savolainen (2009) as people who want to find out how to make something. More specifically, Dervin & Naumer (2009) said a component of information seeking behavior is when people seek to make sense of information. Slatter and Howard (2013) reiterate that previous generations of makers might have tinkered in tool sheds but now homes do not have those spaces so public places such as libraries are filling in with those creative needs. Similarly, Williams and Folkman (2017) felt library makerspaces offer opportunities, equipment, and support to users who might not ordinarily have access to such resources. Choy and Goh (2016) felt that creative spaces in academic libraries could give rise to greater community involvement.

Additional themes in the literature

Another important theme in the LIS literature was the redefining of library services. Howard and Slatter (2013), de Boer (2015) say that having makerspaces would keep the libraries relevant and could possibly future-proof the libraries. Likewise, Foure and Meyer (2015) state that makerspaces help libraries keep up with technology and help them stay current in the present and future. This redefining of library services is related to another topic which is librarian training for makerspaces. Purpur, Radnecki, Colegrove, and Klenke (2016) reported on a case study where librarians and LIS students had training on maker technologies and hands-on learning in a series of mobile workshops which concluded with a change in their mindset from

doubt to a positive about makerspaces. Williams and Folkman (2017) suggest that it is essential for information professionals to be confident and have necessary technical skills for makerspaces. In technical training, librarians could help makers close missing gaps in making information (Dervin & Naumer, 2009) in makerspaces.

Yet another theme was one of mobile makerspaces which were set up to give communities outside and inside of libraries a chance to seek out and practice non-traditional resources and technologies. Libraries in the Moorefield-Lang (2015b) and de Boer (2015) studies were keen to set up mobile units so that communities outside traditional brick and mortar libraries were given a chance to use makerspaces for "digital fabrication and open design" (de Boer, 2015, p. 507).

Weaknesses and gaps

Moorefield-Lang has emerged as an important and prolific author on makerspaces as she has published over 30 articles in peer-viewed journals and (non-scholarly) periodicals. She, so far, has been the only researcher to research a weakness in the literature which is the issue of copyright. Moorefield (2014) examined user agreements in 24 public and academic libraries user agreements. From her research, she concluded that user agreements are important as they outline rules of engagement that enhance learning and protection for makers, librarians, and libraries. Another limitation is the literature that needs to be addressed is intellectual freedom. Will or should makers be able to make anything like guns or narcotics in library makerspaces? Barnikis (2016) discussed this briefly but with no conclusion was reached.

Research into makers and makerspaces is relatively new so there is one gap in the LIS literature that has not been taken up yet. This issue is that there is only one scholarly article on the users' perspective of using makerspaces. Bieraugel and Neill (2017) conducted a

questionnaire of students at a university who used a makerspace (in the engineering building) and other spaces in the library and around the campus. Other than this study, all other scholarly articles were librarians' perception of the information needs and information seeking behavior of maker in makerspaces. More research needs to be done on users themselves to get a better understanding what drives their needs and wants in makerspaces.

Methodology

My research process was a four-pronged approach. First I wanted to get a basic understanding of maker culture and makerspaces so I read the materials and took notes on the video lecture in Module 14 *Creation Culture*.

In the second approach, I used the Library & Information Science Source, Library and Information Science Collection databases and the Encyclopedia of Library and Information databases to examine more deeply the information community of makers. From those three collections, I first selected peer-reviewed articles with the keywords *make, maker*, *makers*, *makers* and *information seeking*, *makers* and *information needs*, and *makerspaces*. The business database ABI/Inform (Proquest) and the multidisciplinary database of Academic Search Complete were also investigated since makerspaces have sometimes been considered a place for entrepreneurial and creative activity. However, the articles I found both in Proquest and Academic Search Complete were already materials I had discovered in the LIS databases.

The third research method employed was using Google Scholar with the keywords mentioned previously. From there I noticed a number of articles in journals in the Emerald Insight database. The articles in the database were available for a fee on Google so I perused the Dr. Martin Luther King JR (MLK) library website to see if it had the Emerald database. It does, under the name of Emerald Management Xtra. The issue with this database is that one cannot

refine the search to include only scholarly articles like Ebsco host. After locating a number of articles in the Emerald database, I checked to see if they were peer-reviewed with either the Electronic Journal Index or through the Ulrichsweb directory.

A fourth approach was to read through the scholarly articles to determine their usefulness of the article and to investigate other possible relevant cited authors. I looked at the author(s) reference list to locate cited works and consulted the LIS databases again to find the articles. Most of the resources used for my information community are from scholarly journals which include *Library Hi-Tech*, *Journal of Library Management*, *Library Information Research*, *New Library World*, *Public Library Quarterly*, *Library Management*, *The Australian Library Journal* and *College and Research Libraries*.

Community resources were located in two ways; one was from a suggestion in the Anderson (2012) book and another was from a Google search where I found a Makers Resource website developed by a librarian, John Burke (2017). He listed project sites, general makerspace resources and library-focused maker resources among many listed. Some of Burke's community sites were cross-referenced in articles by Van Holm (2015) and Mallon (2014).

After reading articles from peer-reviewed sources and periodicals plus community-based websites, I formed a clearer picture of how and why makers go online to create and why they often go to makerspaces. I also understand how and why libraries want to be part of the make movement as libraries definition of information is constantly evolving.

Discussion

Community-based resources

Anderson (2012) stated that Dale Dougherty was the first to publish a 'making' aid over a decade ago. Now Dougherty's *Make* magazine is published in hard copy and online. But there

are also other websites for makers such as *Instructables*, *Makebridge*, and *Thinkverse*. In these websites, other makers can learn how to make various objects but can also be highly interactive with makers putting their creations on online and sharing comments, suggestions, and questions with others through community forums, blogs and social media (Mallon, 2014). This online sharing is very much part of what Dresang and Koh (2009) say describes the information seeking behavior of the digital generation who want to interact and be in control of the information. However, from investigating the popular make sources, periodicals and scholarly articles, it appears that making is not only done by the digital natives but rather it is a cross-generational activity (Peppler and Bender, 2013). What is different about this making generation compared to previous generations is the type of social networks being constructed. These networks could be considered as information pools (Flanagin, Hocevar & Samahito, 2014) where like-minded individuals from dispersed geographical locations gather online to share information. Peppler and Bender (2013) had the same idea, "Despite its diversity, the [maker] movement is unified by a shared commitment to open exploration, intrinsic interest, and creative ideas" (p.23)

Although make websites give opportunities for makers to interact with others. Sometimes makers need to go makerspaces to make sense of the information on make projects, Slatter and Howard (2013) stated that makers come to the library to get input from other knowledgeable users and to use tools like 3D printers. Whether makers go online to get more information or if they go to physical makerspaces they display what Dervin and Naumer (2009) call sense-making behavior where they are filling in gaps of missing information.

Makers can go to physical locations where they can pay a membership fee to use the space, have access to more online materials, workshops, and expertise (Van Holm, 2015) but they can also go for free to academic and public library makerspaces. Makerspaces are often a

crucial part of the making process as Fontchario (2015) described when she quoted Massimo Banzi a blogger from *Makezine*:

> The whole idea of being a maker involves concepts of collaboration, community, and working with other people. It is very hard to be a maker and be by yourself locked in a room or even a lab. It is really something that involves a lot of collaborations at different levels. (p.193)

Rationale for makerspaces in libraries

Why have academic and public libraries joined the maker culture? Batykefer (2013) felt that libraries are expanding their idea of information to include collaboration, hands-on learning that the make movement encourages. Just as Anderson (2012) described the maker movement as one of democratization as anyone can do it, the democratization of learning and information sharing is part of libraries values (Purpur Radnecki Colegrove, & Klenke, 2016). Moorefield-Lang (2015c) felt that library makerspaces help stimulate innovation and creativity. Likewise, Bieraugel and Neill's (2017) study on various spaces on the California Polytechnic State University campus concluded that the makerspace in the engineering building lead to more of the behaviors associated with creativity and innovation compared to other spaces on the campus.

Moreover, Johnson (2011) says that public libraries build social capital within communities with their services, groups, and interactions between library and patrons. Choy and Goh (2016) feel that academic libraries do the same thing; they build social capital. Because of this, Choy and Goh (2016) suggest that academic libraries are the most obvious places to host creative spaces as libraries act as community centers where diverse academic fields can share their creative projects.

Evolving role of libraries

Another reason that libraries are offering makerspaces is because some information professionals feel that it keeps them relevant now and the future. The librarians in the de Boer (2015) and Slatter and Howard (2013) articles call this "future-proofing" (p. 277). Not only that, Foure and Meyer (2015) feel that when libraries offer the tools, technology, and know-how of makerspaces it gives a boost to the image of libraries as they could be seen as keeping current with technology. Managing library makerspaces resources and knowledge will become an important issue as librarians will need to up their technical skills to meet the growing demand. Williams and Folkman (2017) report on a study done in 2015 by the San Jose State University School of Information that examined over 400 librarian job postings. They discovered that 37% of the jobs advertised asked for emerging technology skills. Moorefield-Lang (2015c) said that many librarians do not know how to operate 3D printers or in making or hacking so they will need help with setting up makerspaces:

> It is noticeable, from interviewing librarians in the field, that training, a professional learning network, and online re- sources are vital when it comes to incorporating makerspaces and the technologies that are commonly housed within such spaces. Being willing to be an innovator, problem solver, and collaborator is necessary for a librarian to find success employing a makerspace in his or her library (p.108).

Makerspaces going mobile

In order to help serve the make communities even more effectively, libraries are going outside the brick and mortar structures to offer mobile spaces. A good example of this is when a mobile library was set up during the Occupy Wall street to bring information to the masses

(Lingel, 2012). She said this 'people's library' (para. 1) was important as it showed that libraries are more than their collections and that "…emergent, digital and participatory technologies are vital for the endurance rather that the demise of libraries…" (para. 2). Similarly, like the mobile people's library, some libraries have mobile makerspaces as part of their community outreach. Moorefield-Lang (2015b) case study of librarians and educators of five different mobile workspaces in the United States, Canada, and the Netherlands revealed that mobile makerspaces wanted to give the wider maker information community a chance to look for and collaborate on emerging technologies. It seems that making benefits both the makers and the personnel managing the makerspaces. Moorefield- Lang (2015b) quoted a team member on the Makerbus in London, Ontario who said "We learn from them [makers] as much as they learn from us" (p. 467)

In the Netherlands, a library set up a mobile makerspace called the FryskLab (de Boer, 2015) to bring technology skills to primary and secondary school students in rural provinces of the Netherlands. De Boer (2015) said the Frsyklab was valuable to these remote areas as this mobile lab as "it focuses on new ways of sharing knowledge and information and new ways to integrate emerging technologies in library services and making them available to the public." (p.514). Librarians are not just concentrating on the local maker community but also on their librarian peers. One library at on the University of Nevada set up mobile workshops for the benefit of librarians on the campus. Purpur et al (2016) describe how the University of Nevada's science and engineering library set up mobile makerspaces to make other librarians on the campus aware of non-traditional resources and technologies.

Both stationary or mobile library makerspaces appear to be equally important in meeting the information need of the maker culture. Not only that, Williams and Folkman (2017) say that libraries could be a key player in making culture.

> The growing making movement can revolutionize our country if libraries are willing and able to provide a venue and support for users who might not otherwise have the tools, spaces, skills, or community of their own. One small grant, in less than a year, provides library staff the impetus, confidence, basic skills, resources, and community to start the revolution. (p.33)

Conclusion

Information needs and behaviors

As the scholarly and community-based sources reveal, makers information needs could be as simple as looking up a recipe or more complex like using a 3D printer. Makers from different generations can connect, interact and contribute to each other' projects though make websites like *Makezine, Instructables* and *Makebridge*. The fascinating idea about makers is that anyone can make. This diverse maker culture ranging from the beginner to the veteran depends on collaboration to get their information needs met. This sharing gives other makers access to information through interactive websites and social media thus fitting the traits of an information community as defined by Fisher and Durrance (2003). Although makers seek information online how to make, they do not always make in isolation. Some makers go to physical locations for tinkering with the tools and face to face interaction with peers or other knowledgeable makers (Slatter and Howard, 2013). The locations called makerspaces are gradually becoming both public and academic libraries part of service.

An ideal place for making

Although makers can join private makerspaces for a free (Van Holm, 2015), many others are going to their local or campus libraries to make. The new democratization of making has libraries stepping into the fold as the making movement could be fit under the categorization of 'information' in the 21st century. Johnson (2011) has said that libraries build social capital with their communities by the resources and relationships they build. Because of this social capital, libraries could be a trusted place for makers to share their creativity and innovation. However, for this to happen, the scholarly research suggests that librarians need the right training.

Librarians and Makers

A San Jose State University study done in 2015 by the School of information shows that emerging technical skills are becoming more important in library job descriptions. Although more public and academic libraries appear to be including makerspaces, scholarly articles from Moorefield-Lang (2014) and Williams and Folkman (2017) indicate that librarians need training in operating 3D and other technologies in makerspaces which are essential to help the makers community. But it is not only the technical side of training that is required, libraries will need user agreements in place for safety of the patrons, librarians and libraries but even more importantly both Stephens (n.d) (module 13) and Moorefield-Lang (2014) reiterate that having an openness and willingness to explore new technologies will be the way of the future.

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