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International Librarianship, Information Communities, and Open Access Metadata.

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Welcome to the first issue of Volume 6 of the *Student Research Journal (SRJ)*. I'm proud to announce that San Jose State University's School of Information continues to provide information professionals with critically reviewed research articles on library information science topics. *SRJ* is a student-run, student-governed double-blind peer reviewed journal, and twice a year we publish articles written by graduate students. Our journal articles have been downloaded over 56,000 times by readers around the world.

In this issue, we have an invited contribution written by Melanie Sellar, an adjunct faculty member at SJSU iSchool and founder of Librarians Without Borders (LWB), a non-profit organization created to address global information resource inequities. The support that we receive from our faculty is critical to the continued success of the journal; we appreciate Ms. Sellar's willingness to write an article for SRJ. Her essay, *Strategies for Engaging in International Librarianship: Misconceptions and Opportunities*, reviews three popular conceptions of international librarianship and presents a more "intentional, reciprocal, and reflective application", which should be instilled in library practice.

Two articles that passed the rigorous peer review process by our competent content and copy editors appear in this issue. This past semester we reviewed several interesting articles on information communities; however, only one was accepted for publication. Stefanie Witt discusses an information community made up of individuals with Type 1 diabetes. *Glu: An Online Type 1 Diabetes Information Community* includes research and interviews of members of the Glu community, focusing on their information needs and how LIS professionals can integrate this type of community into library activities.

Open Access Metadata for Journals in Directory of Open Access Journals: Who, How, and What Scheme? by Lisa E. Cheby moves the discussion of open access journals forward through an investigation of DOAJ's metadata standards to determine the effectiveness of their methods.

I am honored to have served as the Editor-in-Chief since 2013; I am now passing the reins to SRJ's new Editor-in-Chief, Tamarack Hockin, a former content editor and published author at SRJ. I'm pleased that I am leaving the journal in good hands.

A special thank you to Gina Nichols, she has been an immeasurable help in producing this issue. And a big thank you to content editors, Laurel Diskin, Devon Lee, Melissa Anderson, Lindsey Travis, Julee Tanner, and copy editors, Mary Alice Kolonay and Cathryn Gowen.

I'd like to acknowledge and thank Dr. Anthony Bernier, our faculty advisor; and all the dedicated editorial team members from past issues, it's been a pleasure to serve the journal as Editor-in-Chief.

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Strategies for Engaging in International Librarianship: Misconceptions and Opportunities

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Our profession of librarianship can be practiced on three geographic scales: local, national, and international. With little effort we can conceive of what it means to apply our praxis locally to the communities in which we work directly, and by volunteering with our many national associations and organizations we understand what it means to engage in broader regional librarianship. When it comes to delineating international librarianship (IL), however, misconceptions abound.

According to Peter Lor (2009), perhaps the most pre-eminent scholar in the field, the concept of "international librarianship" first appeared under that name in the 1950s. The period of the 1950s-1980s brought a flurry of publishing owing partly to growing intergovernmental and interorganizational cooperation and to interest in examining the legacy of colonialism on global libraries. Nevertheless, IL still occupied relatively little real estate in our North American scholarship and professional conversations. How well it was understood and defined seemed only to matter to a small group of fervent scholars, allowing misconceptions to persist to the present day.

Times, of course, have changed. With our increasingly integrated world, internationalization (of curriculum, students, and faculty) is now an imperative in nearly every North American higher education institution's strategic plan. As a result, our library and information science programs are beginning to respond to that institutional priority by either formally encoding internationalization in program learning outcomes or by informally encouraging faculty to include such perspectives in student experiences. Our academic libraries are also responding to this priority by encouraging faculty-librarians to internationalize their scholarship and service.

Given this renewed focused on the international scale of our profession, it seems prudent to consider what is meant by "international librarianship" so that it might be studied, practiced, and funded in ways that are appropriate to its potential. This essay will first review three popular conceptions of IL and then present a more intentional, reciprocal, and reflective application, which we should aim to instill in our practice.

At first glance the term "international librarianship" seems an immense concept, possibly subsuming every kind of library activity and conversation under it, rendering the concept essentially inoperable. We can see international connections to and orientations for almost any work that we do; for example, participating on a listserv that includes colleagues from other countries, collecting works published abroad, or releasing library instructional materials into our institutional repositories under Creative Commons licenses. While this "international-immersion" approach is a perfectly reasonable step in cultivating a global orientation, it does not include activities that are intentional or ambitious enough, however, to constitute robust IL. Conversely, a narrow implementation of IL draws upon the deeply helping nature of our profession and situates it almost as a charitable project. We have all likely received appeals to assist with schools or libraries abroad that are "in need," and being a profession inherently socially-justice minded and philanthropic, we naturally want to help. The result is an inpouring of goods, services, and funds into a target region. There is a one-direction orientation to this kind of work—typically the Western librarian to the recipient community—which can run the risk of keeping the community at a distance and promoting exoticism, without the donor librarian experiencing reciprocal learning or innovation in cooperation with the partner community.

While the charity-project can be "...a good starting point to think about what we can do as librarians" (Saleh, 2010), it can be insufficient, even harmful, if not implemented thoughtfully with community leadership shepherding the work. Our profession is not immune to misguided efforts infused with one-sided ideologies and priorities, even if unconsciously done so. We need only to look back at efforts to build libraries in post-colonial Africa to find such evidence.

For example, Amadi (1981) wrote in *African Libraries: Western Tradition and Colonial Brainwashing* on the negative effects of the colonial influence on African libraries, particularly with its privileging of print culture over oral culture and the imposition of the Western model without regard for the communities themselves:

We conceptualize information problems in terms of a place, building, room or rooms set apart for the keeping and use of a collection of books and other materials, or a collection of books and other literacy material kept for reading, study, and consultation. In other words, we define what the library is or ought to become, rather than what the informational needs are and how they ought to be met. In the case of African libraries and educational development, the assumption tends to be that the very history and essence of Africa itself began with only the so-called "discovery" and subsequent settlements by Europeans.(p. 51)

Swank's (1963) "Six Items for Export: International Values in American Librarianship" speaks to Western librarians' sense of superiority at the time. He asks, "What is [the American] cultural product that merits emulation?" (p. 711) and also encourages the reader to "[not] overlook the contributions of British librarianship in Africa, or French librarianship in Latin America, or Australian librarianship in Indonesia" (p. 712). While he acknowledges that "we are beginning to understand that there also exists an Eastern heritage from which Western librarianship may benefit" (p. 712), Swank quite vigorously argued that there is much of the American library model that should be exported internationally given the advanced state of its library systems and profession.

What is nearly absent in this influential article is recognition of the cultural assets of global communities. They are talked mainly in terms of deficits. Fifty years later we now have important movements like critical librarianship (CL) growing to help us recognize privilege, redress power inequities, and give voice to our global partners. CL, as this essay will argue, should be a theoretical lens brought to any IL work.

Even now in 2016 when we receive international requests for "help," we need to intentionally slow down our processes, ensure that we engage thoughtfully and meaningfully with the partner communities, and challenge our own assumptions. While it is popular, for example, to include international projects in LIS courses where a student group "solves" or "makes recommendations" for a community abroad, this can unintentionally perpetuate stereotypes and power structures because time constraints of the semester require accelerated learning about or engagement with that community. These kinds of projects must be couched very carefully. To that end, consciously embracing a critical theorist mindset when implementing IL in our scholarship, service, and curriculum is an important habit to form.

A third approach to IL is the description of libraries and librarianship in one or more countries other than our own. Our professional literature has many examples of this kind of scholarship: these works may be "[...] geographical (that is, about a country or region) or topical (for example, about cooperation, buildings and so on) in nature" (Jackson, 2003). For example, a study may describe the state of rural public libraries in a given African country or present and briefly discuss the results of a survey on job satisfaction given to academic colleagues in an Asian higher-education library system.

Like the international-immersion and charity-project approaches, this "other-study" orientation seems a reasonable way to practice IL when one is first embarking in activities at this geographic scale. Unlike the other two approaches, other-study has the potential to lend itself to greater insights. That being said, most articles published in this orientation tend to be strong on description but weak on deeper analysis and theorizing. While we may come away with a better sense of the state-of-the-art of some library condition in some country, we may not necessarily come away with a better idea of why things may be a particular way and the implications for the advancement of our profession. For example, deeper analysis might yield insights into political, economic, and social factors that promote or inhibit a healthy environment for global libraries.

Where does this popular orientation of IL as studying the "other" come from? Peter Lor (2008) has interestingly argued that American English often treats the word 'international' to mean 'from another country,' whereas in British English this would be called 'foreign.' Therefore "[w]hat is not American, is 'international.'" Indeed, in this author's experience teaching international librarianship, most students enter the course assuming the focus will be studying "other (i.e. foreign) libraries." As one student reflected in a course discussion forum: "Up until now I assumed that international librarianship automatically involved libraries outside the US. I think that assumption was based on my American interpretation of the word international meaning not American (an assumption I'm working to correct)."

Thus far this essay has introduced international-immersion, charity-project, and other-study as three approaches to IL, but has also argued that while all three may be acceptable entry into the IL field, they do not realize its full potential. A more substantive implementation follows, and the author also includes a call to incorporate critical librarianship into this kind of work.

More than 40 years ago, Parker (1974) put forth this definition of international librarianship, one that has currency to this day among IL scholars:

International librarianship consists of **activities** carried out among or between governmental or non-governmental institutions, organizations, groups or individuals of **two or more nations**, to **promote, establish**, **develop, maintain and evaluate** library, documentation and allied services, and **librarianship and the library profession** generally, in any part of the world. (p. 221)

This definition establishes IL as a field of activity characterized by a reciprocal, cooperative relationship between two international actors around some common goal in order to advance librarianship.

Those actors should, in the author's judgment, be librarian-bodies or have significant librarian representation. Given that the pathways for becoming a librarian vary globally—an MLIS graduate degree is not the norm—one must be flexible and understand a librarian to be any person committed to the profession and intentionally engaging with its practices.

When one compares a typical other-study article against this definition, one can see the absence of some critical aspects of this Parker (1974) definition. First, the idea of reciprocity between two international partners is missing, as usually the "other-study" involves one researcher describing the library conditions somewhere else, perhaps without a local collaborator in the country under study. Secondly, this kind of work lacks action: there is no collaborative goal being undertaken nor are there any clear contributions to the advancement of our profession.

Lor (2008) provided useful examples of activities and publications that best fall within this definition. Building upon his structure, the author offers the following activities and publications as exemplars embodying critical aspects of the above definition:

- Various national library associations develop joint guidelines on information literacy instruction.
- The Progressive African Library and Information Activists' Group is founded to give voice to Pan-African librarians in localizing an African library model.
- An Asian Studies Librarian represents the Asian, African, and Middle Eastern Section of the Association of College and Research Libraries in the International Federation of Library Associations and Institutions.
- Two public libraries in different nations collaborate together in a sisterlibrary program for professional exchange and learning opportunities.

These kinds of activities may also yield publications that are insightful, evaluative, and theoretical. The following articles serve as excellent examples of IL publishing. There is international reciprocity and collaboration evident, as well as introspection and theorizing in order to advance the librarianship profession:

Miller, J. (2014). A comparative study of public libraries in Edinburgh and Copenhagen and their potential for social capital creation. *Libri: International Journal Of Libraries & Information Services, 64*, 316-326. doi:10.1515/libri-2014-0025

Lending and borrowing across borders: issues and challenges with international resource sharing. (2009). *Reference & User Services Quarterly*, 49, 54-63.

The author encourages her international librarianship students to think of the IL field like a target. Some activities are prototypically IL, possessing all of the ideal attributes. Then there are other activities that possess perhaps some or few of the attributes, and thus they fall somewhere on the outskirts of the target. Finally, there are others whose inclusion under the IL umbrella may be quite debatable.

For example, a question that frequently presents itself is whether nongovernmental organization (NGO) work in libraries constitutes IL. Consider Better World Books (BWB): it collects books from North American libraries, sells them online, and then allocates a portion of the profits to partner libraries in the developing world. The significance of its financial contributions to international libraries is without dispute. But is it international librarianship?

The author would argue that while BWB contributes to international libraries, those kind of activities do not constitute international librarianship. To begin there is no true collaboration around a common goal, but moreover, this work does not engage with the practices of librarianship nor contribute to its advancement. NGOs can certainly do IL work—Riecken Community Libraries and Librarians Without Borders are good examples—so long as they embody those critical IL characteristics.

The Parker (1974) definition lays out the core attributes of substantive IL work but leaves it to the practitioner to overlay theoretical perspectives of their choosing. That is, what ideas or values will influence the kind of activities one engages in and how one goes about doing them?

To that end, critical theorist perspectives are useful to learn about and to consciously apply in IL work. Because IL is centered upon cooperative relationships involving diverse partners, there are bound to be inequities in those relations. Without identification and examination of those inequities and sources of privilege, we risk doing (continued) cultural harm and deriving generalizations and practices that are flawed, non-inclusive, and biased.

In the author's international librarianship course at San José State University iSchool, students complete readings about and engage in discussions centered upon critical theories. Before moving forward in the course, students are asked to crowdsource a class manifesto (that is, a declaration of beliefs, motives, and intentions) that should be adopted for their international librarianship work in the course.

Margarethe McCall, for example, offered this powerful, insightful contribution to the Fall 2015 course manifesto:

We will read our assigned readings with an open and reflective mind and a critical practice focused on how biases related to such variables as race, ethnicity, class, gender, and sexuality might have impacted the author's as well as our own interpretations and conclusions. We will strive to seek out sources in international librarianship scholarship and reporting that reflect critically on underlying assumptions/theories and entrenched processes/methods.

Another Fall 2015 student, Jonathan P. Bell, reflected on how his understanding of IL evolved during the course and how critical theorist perspectives influenced his work:

I came into the International and Comparative Librarianship class thinking we would study how practicing librarians worked in countries other than the United States. I assumed our class would focus on day-to-day library operations and practices worldwide. I knew that the work of librarians in [other] countries wasn't the same as US librarianship, but I figured we would examine the core similarities that bridged international differences among practitioners. Instead I learned that the practice of librarianship varies globally, though the goal of providing responsible information service is the same. I did not expect to find such a rich theoretical grounding—especially in Critical Theory—in International Librarianship! That was quite stimulating and refreshing. If we aim to practice a form of international librarianship that is reciprocal, action-oriented, and focused on advancing our shared profession, while also applying a philosophical lens of critical librarianship, we can move our activities beyond short-term charity work or descriptive studies into work that can have an influential and long-lasting impact. With the imperative upon all of us to internationalize our work, now is the time to reflect critically upon what we have been doing and identify strategies for moving our work forward in the ways advocated for in this essay.

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Glu: An Online Type 1 Diabetes Information Community

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Glu: An Online Type 1 Diabetes Information Community

Cover Page Footnote

San Jose State University School of Library and Information Science INFO 200: Information Communities Dr. Kevin Bontenbal

Glu (www.MyGlu.org), a play on the words glucose and glue, is a health focused online community for people living with type 1 diabetes (T1D). Unlike the more common metabolic disorder known as type 2 diabetes that most are familiar with, the Mayo Clinic defines T1D as an inflammatory autoimmune disease that occurs when the body's own immune system, which normally fights harmful bacteria and viruses, mistakenly destroys the insulin-producing islet cells in the pancreas. When T1D occurs, the body has no insulin to let glucose into the cells, so sugar builds up in the bloodstream, where it can cause life-threatening complications (Collazo-Clavell et al., 2014). According to leading research by the American Diabetes Association (2014), T1D accounts for five percent of diabetes cases worldwide. Despite active research, the cause of T1D is unknown and has no cure. This paper discusses the composition of Glu and touches on the larger online type 1 diabetes information community, the motivations of its members, and the benefits that members gain through their participation in information exchange. Interviews with members of Glu provide insights into the major characteristics of the community and the real information needs of type 1 diabetics. The paper concludes with reflections on how librarians can better serve the information needs of chronic health communities like Glu and integrate such communities into library services, programs, and spaces.

In line with the definition of an online information community outlined by Fisher et al. (2003), Glu fosters social connectedness and collaboration among diverse information providers. Glu (2013a) describes itself as "an active and diverse type 1 diabetes online community designed to accelerate research and amplify the collective voice of those living with T1D." Community members are mostly adults living in North America; however, young adults 13 years of age and older are allowed to join the community discussions and research on their disease, and learn from the wealth of rich information found within the pages of the site (Glu, 2013a). Members access the site by creating a customized profile through which they can connect with others. Like more familiar social networking sites, Glu allows members to add friends, update statuses, and post responses to other members' pages.

Also in line with the findings of Fisher et al. (2003), one of the most compelling ways this online information community exploits the information sharing qualities of technology and yields multiplier effects for its stakeholders is through the gathering of clinical research from its diverse members via a social media platform. The Glu website posts a daily question that polls all community users that are online. Responding to the question is not mandatory, but the answers given are logged anonymously and used for T1D research. Within the online community, the poll data is updated continuously, revealing the results and individual members' answers to the entire community, sparking debate, spreading knowledge, and encouraging connectedness within the community. Short answer polling is another method used by the researchers behind Glu, which uses the same techniques and reinforces these same communal qualities; members are allowed to voice their expert opinions and experiences living with the disease as they discuss key issues with others like them while also contributing to research that works towards providing a cure for their chronic medical condition.

As a rare form of diabetes that often causes feelings of isolation, Glu allows type 1 diabetics around North America to meet, communicate, and share personal experiences with one another, helping them to overcome the feelings of isolation often experienced by

sufferers of this rare disease. The community also informs members of clinical research opportunities outside of Glu, recent articles on T1D, individualized group discussion boards, and online events such as recipe exchanges. With these offerings, formed as they are around members' needs, the site promotes community building as defined by Fisher et al. (2003), enabling participants to transcend real and perceived barriers to information sharing. A community for people living with T1D, the focus of Glu is to expand medical research, advocate for those living with the chronic autoimmune disease, and provide an opportunity for their real-life supporters, such as parents, guardians, and spouses of type 1 diabetics, to make accounts and take part in the information sharing of the community.

Literature Review

Limited research has been done on T1D-specific online communities, as more focus has been placed on researching online health communities (OHCs) in general. Many schools of thought have emerged from the writings on what defines such a community and thus a T1D-focused online community such as Glu. In their analysis of an online T1D community based in the United Kingdom, authors Armstrong et al. (2011) define OHCs in relation to their members, explaining that OHCs are "shaped in important ways early on by the community users, including how the character and focus of discussion is formed, and how both information and users can be constructed as authoritative and reliable" (p. 347). Newman et al. (2011) choose to define online health communities by purpose, explaining that members join them in pursuit of emotional support, motivation, accountability, and advice regarding their health goals. Both definitions support this paper's research findings on Glu.

In line with Newman et al., analysis by Gilbert et al. (2012) also defines online T1D communities in relation to purpose, honing in on their ability to serve as peer support programs. In their study of 18 OHCs specifically related to T1D, authors Ho et al. (2014) define these communities as opportunities for effective health management, providing members with a chance to share health information, network, engage, and learn. However they are referenced, the literature unanimously concludes online health communities provide members with emotional support and imperative health information while helping them deal with the stress of living with a chronic disease such as T1D.

The literature sets forth many pros and cons that should be considered by T1D patients when deciding whether or not to participate in an OHC. Within the set of pros, an overarching theme arises from the literature: That sufferers of T1D face emotional hurdles and information challenges when managing their chronic illness and that OHCs such as Glu can empower patients to gain better control over their health. Armstrong et al. (2011) emphasize that "day-to-day management is carried out almost exclusively by the patient and can often be complex and emotionally challenging, meaning many do not achieve good control over their blood glucose levels" (p. 348). Gilbert et al. (2012) conclude that ". . . uncertainty and knowledge of the potential for death or disability can compound psychological strain. There can be a tangible burden associated with the considerable time, energy, and focus required to establish and maintain metabolic control ..." (p. 180). Ho et al. (2014) echo this same theme in their findings on online T1D communities for adolescents and explain, "a wide range of psychological issues have been related to adolescent self-management such as stigma, social support, stress and burn-out, depression, peer relationships, and diabetes-related family conflict" (p. 1184). In the face of overwhelming stress caused by chronic illness, OHCs offer type 1 diabetics

empowerment through low-cost information exchange and emotional support.

That is not to say the literature has found OHCs to exist without controversy. Ho et al. (2014) take issue with the fact that none of the T1D online communities they analyzed require any type of verification that users actually have been diagnosed with diabetes, the community of Glu included. Gilbert et al. (2012) find that members of type 1 diabetes OHCs also complain about gossip spreading and "criticism of health professionals," as well as antagonism towards type 2 diabetics, conflicts of opinion, censorship, and "feeling judged by other participants" (p. 186). Newman et al. (2012) find that while OHCs provide many benefits, community members do have complaints: "Some participants felt that goals such as emotional support and accountability were best served by people who knew them personally as opposed to only through their online identity" (p. 348). Bartlett and Coulson (2010) also address the "lack of strong ties" among OHCs members, which "can make flaming or hostile comments more likely" (p. 113). However, quoting research findings by Uden-Kraan et al., Bartlett and Coulson concede that hostile messages are rarely exchanged while accurate information often is, concluding that OHCs are "a viable medium for support" (p. 113).

In terms of gaps or biases, the literature on OHCs indicates a need for further research on how chronic illness is affected by positive and negative relationships and social experiences. Chen (2012) points out previous studies on OHCs highlight further examination of the "social aspects of the illness experience" (p. 254) is needed beyond the caregiver and patient role. Though established research on OHCs in general certainly correlates with the type of information sources and services this unique community requires, research on the diabetes online community is significantly lacking.

Methodology

In order to understand the information needs of the online type 1 diabetic community of Glu, this research began with an examination of secondary sources. An initial search of "diabetes online community" in the King Library databases yielded few hits, only one of the results being peer-reviewed. A broadened search of "online health communities," provided over 100 scholarly articles on OHCs; however, few focused on the diabetes online community. The articles came from a range of databases including: Academic Search Premier, Library, Information Science & Technology Abstracts, PsycINFO, and Business Source Complete. Recently published research was sought out by interviewing an endocrinologist who recommended the biomedical database PubMed, which yielded articles focused on the impact social support has on the overall health of members participating in T1D online health communities.

While some secondary sources of information focused on certain aspects of the diabetes online community and OHCs in general, few to none have covered the full scope and depth of a specific online type 1 diabetic community, much less Glu itself. After consulting the King Library databases and PubMed, searches were conducted on Google Scholar and Google, which yielded helpful results, including articles from the British Medical Journal (BMJ) and the American Diabetes Association's Journals for Professionals; these sources focus on the many aspects of treating, living with, and researching treatments for individuals with type 1 diabetes.

In addition to secondary sources, this paper includes interviews with four Glu community members. These interviews give insight into the nature of the information persons living with T1D seek and the types of resources they use. The Glu interviewees

vary in age, sex, location, and length of membership in Glu. All members are type 1 diabetics (as opposed to supporters of people living with T1D), of the same race (white non-Hispanic), and strangers outside of the Glu community. All members of the community answered the interview questions via an open forum on the Glu website and chose to remain anonymous. This firsthand data is very revealing of the member experience and gives insight into the importance of online information exchange to members of the T1D community. This insight correlates with the potential power of OHCs proposed in the scholarly literature, and is revelatory of the T1D online experience in particular.

Motivations, Benefits, and the Needs of the Community

Glu exists as an online health community that connects people living with T1D to each other and to researchers in order to do two main things: allow type 1 diabetics to obtain and share information with others like them and to obtain and share information with researchers trying to find a cure. The motivations of and benefits to the community are just that, individuals with T1D are able to obtain more information about their condition, not just in terms of treatment, but for all the different aspects of living with the chronic disease, sharing information with everyone from experts to the newly diagnosed. Here the term expert is not solely applicable to medical professionals, but also to experienced type 1 diabetics who share their knowledge, advocate, and exchange information with others in the online community through forums and postings.

Topics that are frequently discussed on Glu include: How do you go to the beach or wear a bathing suit with an insulin pump? Should you share the fact that you're type 1 diabetic on a first date or would that scare away your date? If not, how long should you wait before telling a significant other about your condition? Is it wrong to conceal that you have T1D on job interviews? What are the real-life pros and cons of using a particular insulin pump? Clearly, this type of information is outside the scope of a patient's endocrinologist or typical healthcare team; the answers come from the experience of members living with the chronic illness. In their study of health-related virtual communities, Ilioudi et al. (2014) point out that benefits of the community are cost-effective and instant health services such as building social connections with peer patients, sharing experiences, setting common goals, and helping each other find solutions to common problems within the online patient community: "Chat rooms, group meetings, and consultations are all virtually brought in the patient's home, anytime, anywhere." (p. 9).

This kind of interaction with other type 1 diabetics supplements gaps in Glu members' current treatment plans and has the potential to offer the emotional support they may not be able to receive elsewhere. Oh and Lee (2012) refer to this type of patient empowerment as computer-mediated social supports and propose that "as patients spend more time in an online community and communicate with other members more frequently, they have more opportunities to receive CMSS from fellow members of the same online community" (p. 31). Thus, information is exchanged and different needs are met in a cyclical manner; members of the community are motivated by the therapeutic sharing of their experience and by having their voice heard, as other members simultaneously benefit from hearing advice from peers and adopting new methods of treatment.

It should also be pointed out that members are motivated to join Glu for reasons

outside of emotional support. In their study of OHCs, Massimi, et al. (2014) found that:

Another reason for joining was to develop a better understanding of the condition more generally, without necessarily seeking emotional support. . . they [participants] were interested in obtaining scientific (and non-scientific) information about their condition, and worked to develop an expertise on the topic through both study and personal experience (p. 1496).

As found in the following interviews, Glu provides members a range of benefits, from empowerment and social support to better understanding of the disease through reliable sources including peer experts and scientifically backed data. Due to Glu's involvement in clinical research, its benefits to members also include allowing them to actively give back to the community by participating in current research on curing and treating T1D. "Glu is part of the T1D Exchange, a nonprofit organization with a mission to improve the lives of people touched by T1D by facilitating better care and accelerating new therapies through a collaborative data collection and sharing network" (Glu, 2013b).

The Glu Community's Perceptions of Information Services

The Glu website is composed of forums, research surveys, informative articles, and social media features such as member profiles, groups, and status updates around which people living with T1D and their supporters may connect. In their research on the user-generated web and online information sharing, authors Flanagin et al. (2013) state, "The capacity of the Web to facilitate information sharing among disaggregated individuals is among its most important features" (p. 1). Four individuals in the Glu community report finding important information and genuine support from other Glu members despite living in separate locations across North America and never physically meeting. The importance of such connections are pointed out by the research of Massimi et al. (2014): "While the exact mechanisms by which social relationships affect health remains unclear, nearly 30 years of research has consistently demonstrated that they have a powerful effect on physical and mental health, and may extend survival" (p. 1492). This research aims to examine some of the information resources used by the community and the community's perceptions of those sources. It should be stated that the findings refer to the informationseeking behavior and information sources utilized apart from the patient's endocrinologist and other healthcare team members.

In line with interview findings in this research, Flanagin et al. (2013) state that "One of the most valuable features of information pools is that they enable widely dispersed and diverse users to seek out and interact with others who are different from the people they may encounter regularly offline" (p. 1). The interviews reveal how important online information exchanges, or what Flanagin et al. define as "information pools" as opposed to brick and mortar libraries, are to members of the T1D community.

Interviewee 1 has been a member of Glu since 2014. He is an engineer in his late 50's residing in Texas. He provided the most information about how he manages his disease outside of conferring with his doctor. He lists diabetes associations such as the ADA, books, the diabetes online community other than Glu, and blogs as his main sources of information. Out of all the online sources, he prefers Glu because the community is "active and filled with interesting topics and research on type 1 diabetes." He also states his favorite aspect of Glu is that there is "always something new each day and I love the surveys." His interview makes clear that he highly values sources that

reference current clinical research on T1D, as well as the opportunity to share the vast experiences of others, stating that "... being an engineer, everything interests me. I love all the different perspectives, even if they really don't affect me and I love sharing my own [perspective]." This individual's viewpoint is in line with the findings of Flanagin et al. (2013): "This sense of shared group membership may help sustain these communities by encouraging users to trust in information sources and their input, and by encouraging them to also contribute information to these pools themselves" (p. 2). On Glu, information is a cycle; the more people share, the more others want to also share.

Interviewee 2 has been a member of Glu since 2014. She is a 29-year-old mother of one residing in Quebec, Canada. Interviewee 2 says she uses Glu almost exclusively for research on her disease and can no longer relate to information given by diabetes associations because, "The Canadian Diabetes Association is very type-2 oriented and JDRF [Juvenile Diabetes Research Foundation] is very child-oriented, that's why I turned to Glu!" For any other information she needs, including what she refers to as "scientific articles on T1D research," she relies on Google. When speaking more about her experience of obtaining information from other members in the Glu community, she says that she "... started exploring and sharing on myglu.org two months ago and have already learned a ton of things from other type ones! I find this very exciting!" Her excitement matches the findings from Flanagin et al. (2013): ". . . potential content contributors may be more motivated and likely to contribute useful material to information pools when they appear to be populated and used by similar others" (p. 4). Both interviewees 1 and 2 seek information from scientifically backed research and from the experiences of others living with T1D, revealing with enthusiasm in their interviews that they found these types of information sources to be the most credible and relevant.

Although both interviewees seek credible sources, they list the Web and Amazon.com over the local public library as places where they seek information. Both respond negatively to the resources provided by their public libraries. Interviewee 1 says the books are "outdated and on type 2 at my library." Interviewee 2 says "everything I want I can find by Googling. I want the latest research, not an outdated book." These individuals find traditional libraries to be lacking in up-to-date resources on their disease.

Interviewees 3 and 4 are both males in their mid-thirties residing in the United States. Interviewee 3 has been a member of Glu since 2013 and states he seeks out his information about T1D from various online sources, including the online diabetes research newsletter DiaTribe, blogs, YouTube, the social media personality Diabetic Danica, and Facebook groups. He likes the connection the Glu community gives him, stating, "Glu is pretty awesome as far as online T1D info and support." This statement reveals that Interviewee 3's interaction with other Glu members goes beyond information-seeking to support-giving behavior, solidifying Glu's presence as a community. Like Interviewee 3, Interviewee 4 is very tech-savvy and is well versed in several social media platforms. Interviewee 4 blogs about living with type 1, creating his own information source. He is also very active on Glu, and has been a member of the community since 2012. He seeks information about T1D from blogs, other online communities such as carbDM, online organizations centered on T1D activism like AYUDA, diabetes research institutes, and Facebook and web forums. He also mentions taking part in the creation of a "type 1 diabetes lingo Wikipedia" that is being developed by other Glu members. Neither Interviewee 3 nor Interviewee 4 lists the library as a resource for information about managing and coping with T1D. Both seek out information sources created by others living with their disease, preferring the ease and quick response of online sources.

Findings from Flanagin et al. (2013) show that "People tend to find information contributed by similar others to be more credible and are also more likely to indicate that they will act on this information" (p. 10). This is evident in the Glu community; members trust and seek the advice of other members. Interviewees 3 and 4 differ from the first two in that they are invested solely in online- and social-media style sources of information. Although their information-seeking behavior is very social, it is also aligned with the research-based information that Interviewees 1 and 2 value. It is intriguing that all of these types of information sources may be obtained through Glu community interaction, making it the epicenter for people seeking to discover scientific research and share real world experiences about their disease. These interviewes also reveal how libraries are lacking as a resource for people living with T1D. All interviewees have negative opinions of the local library when it comes to finding relevant information about T1D and prefer instead the currency of online information sources, including information created by others like them, in the from of blogs, vlogs, Facebook, and social collaboration tools similar to Glu.

Ethical and Legal Issues

Participants in the Glu community are self-aware and determined to access and share the most current information about their chronic disease, which has led the community to connect online. The public nature of information sharing on Glu and OHCs in general makes legal and ethical concerns around issues of privacy and confidentiality inevitable. In order to serve such specialized health communities, LIS professionals must be prepared to handle these challenges. Policies on privacy are confounded as patrons share not only circulation information, but also private medical information via social media sites. Just as it is unethical and illegal to divulge a patron's personal information, librarians using social media to serve members of this community must also take care to avoid exposing a patron's private health information. The library, as well as other information communities that make use of social media platforms, must be aware of the potential confidentiality and privacy breeches the very nature of social media creates. Information communities must learn to adapt policies in order to contend with a new set of information ethics.

According to Armstrong et al. (2011), as members become more comfortable in an online community, they begin to share more personal and private information, potentially compromising their privacy and revealing their identity. This is certainly applicable to the online information community of Glu; members ask each other questions about their experiences living with T1D and some users share more information than others. The private medical information members divulge may exist forever on the Internet and be found by anyone, including potential employers, insurance companies, or anyone capable of performing a quick Google search.

Many aspects of the Glu website mimic popular social media websites; members create profiles complete with pictures, join groups, and give out personal information. In doing so, the OHC promotes sharing and creating an open dialogue on all issues related to the chronic disease. However, Glu does not have an established method of protecting community members' information. Anyone can make a profile and pose as a T1D patient or as "someone touched by type 1 diabetes" in order to access the personal information of other Glu members. As already indicated, the profiles of Glu members can be found just by Googling their names. This alone creates a plethora of issues surrounding confidentiality and privacy. Like many T1D patients, members of the Glu community often choose not to share with others that they have T1D. Some members have stated that this is because of the misinformation surrounding the disease, while others have said that they do not wish to be judged or identified solely by their medical issue. For example, one member of Glu stated,

I do not want to be seen as diabetic or sick first and a person second. I have type 1 diabetes, type 1 diabetes does not have me. Previous frustrating and ignorant comments from coworkers have led to my decision of no longer disclosing my private medical information with others. (Mardot, personal communication, 2014)

By joining Glu and creating a profile, members potentially give out not only personal information such as date of birth and location, but also private medical information, like how long they have had T1D, what medications they have used, and whether their disease is well managed or spiraling out of their control. For some members of the Glu community, losing their privacy could be devastating. In line with the writings of Michael Zimmer (2013) on social media and information ethics, not only libraries, but all information communities must increase education and outreach to members on the privacy issues that typically accompany the incorporation of the Internet and social media in disease management. Glu and other OHCs are no different, and must be vigilant in protecting members' privacy and making them aware of the risks of sharing their personal information online.

Special Populations

The T1D community is composed of people of all ages, races and backgrounds, and within this chronic disease community exists a plethora of special populations. One special population of major concern is young, uninsured T1Ds living with limited medical access. Surviving on little to no healthcare besides what they glean from free clinics, emergency rooms, and OHCs like Glu.org, these individuals are at higher levels of risk for chronic stress and poor health management.

In their analysis of research conducted by the Harry B. Helmsley Charitable Trust of 20 young adult T1D patients of low socio-economic status, Pyatak et al. (2013) report that chronic stressors and adverse circumstances make controlling the disease especially difficult for this population. The authors say these "Psychosocial stressors, such as mental health problems, negative family climate and diabetes-related distress, are known to play a significant role in adherence to diabetes self-care and glycemic control . . ." (p. 1140). Other psychological stressors found to affect young adults with T1Ds and no reliable health care include alcohol and drug abuse, low education, incarceration, a history of being abused as a child, learning disabilities, homelessness, and leaving home at a young age. At the time of the study, 80 percent of the participants reported facing at least one of these stressors in their lives.

Young adults living in these circumstances no doubt seek refuge in the free access to health information they find from online diabetes communities like Glu.org. In their conclusion of the research analysis, Pyatak et al. (2013) state that,

The association between psychosocial stressors and glycemic control demonstrated in the present study, and evidence that these stressors are frequently unidentified by care providers, reveals a significant need to address these issues in routine diabetes care, particularly in settings which provide care to underserved populations. (p. 1144)

Just as doctors need to develop methods to treat this significant need, i.e. treating the whole T1D patient and not just the disease, so must librarians. By providing chronic-health communities access to healthcare resources and physical spaces for support groups, and by developing strategies for community outreach, the library has the opportunity to become a beacon for the underserved T1D population.

Technology

Members of Glu rely daily on technology to treat their condition. Members report using smartphone apps, such as BlueLoop, as tools to manage glucose levels and to connect with one another. Members of the community also use a variety of specialized wearable tech to keep an up-to-the-minute, detailed watch on their health and share it with their doctor. These wearable technologies include the insulin pump, which acts as external artificial pancreas, helping to regulate insulin release in the body. The continuous glucose monitor (CGM) acts as a sensor and works in conjunction with the pump, alerting the patient to glucose drops and spikes, helping type 1 diabetics avoid dangerous and embarrassing episodes of low and high blood sugar.

These specialized-health versions of wearable tech help T1D sufferers record glucose levels over a period of time. Otherwise known as life logging, this data is then uploaded to a computer and shared with a doctor in order to find patterns and make adjustments. As Hall (2014) points out, ". . . Collecting, sharing, and analyzing of individual health data can both improve health outcomes for those involved in the data collection and provide those individuals with a level of insight about their health-related behaviors that is not easily achievable through other means" (p. 28). In a consumer health report featured in the **Journal of Engineering & Technology**, author Kris Sangani (2014) points out:

However, the medical sector and the health and fitness fields are divergent in their approach to products and services, mainly due to the fact that the consumer buys their own fitness gadgets while medical devices tend to be procured by healthcare professionals on the behalf of patients. (p. 50)

However for type 1 diabetics, these two sectors are rapidly converging. As medical devices that monitor blood glucose are being adapted to work on smartphones, patients are finding it easy to share this data with loved ones and people in their social network outside of medical professionals. One excellent example of this convergence that has recently been introduced to the market and is being talked about amongst members of the Glu community is the Dexcom SHARE. The Dexcom SHARE is a sensor device that allows T1D patients to closely monitor glucose levels and share the data with others via a smartphone in real time. The Dexcom SHARE can be used anywhere as long as the patient is wearing the device and the person monitoring them has the app on a smartphone. Dexcom's YouTube video suggests the device could be used by parents to monitor their T1D child's glucose levels as they sleep, or by spouses to monitor the

glucose level of their significant other while on a business trip (Dexcom, 2014). Since this device can be used anywhere, it is obvious it is not only tracking pertinent health data but also the location of the user. Although this social sharing of biometric data is promising for type 1 diabetics and their loved ones, it does bring up a host of privacy and legal issues that have yet to be fully explored and understood.

Conclusion

This paper examines the online health community Glu (MyGlu.org), a type 1 diabetes social media site. Type 1 diabetes is a chronic medical condition that requires constant and specialized medical attention. Online health communities like Glu are an important part of maintaining a healthy lifestyle for many members of the T1D community. The Glu community also includes persons living with the chronic medical condition, as well as family members and other supporters touched by the disease who interact with each other and seek out information on T1D by utilizing the Internet, more largely known as the diabetes online community. The motivations and benefits to the community are reciprocal in nature; those affected by T1D benefit from sharing information just as much as receiving information from others like them on a range of topics from medications to social issues surrounding the disease. Members of Glu and the diabetes online community prefer the latest medical research and opinion on their disease and seek out this information by utilizing research databases, medical journals, and type 1 diabetes-focused blogs, vlogs, and other socially-based media platforms; in short, members highly value technology and social information exchange when it comes to managing their chronic medical condition. The T1D community is composed of people of all ages, races, and backgrounds. The economically disadvantaged and underinsured are more likely to suffer from depression, incarceration, and homelessness, especially when living with T1D at a young age (Pyatak et al., 2013). There are ways the local library can reach out to the most vulnerable in this community and make a difference.

Serving the T1D patient community and others like it is a natural fit for libraries seeking to remain relevant by facilitating learning and information sharing for all. A major way the T1D community could be served is by providing space for local support groups to meet. Library staff could also contact and collaborate with local chapters of the American Diabetes Association (ADA), the Juvenile Diabetes Research Foundation (JDRF), and social workers on ways to invite this community into the library and connect them to local services. Librarians should also realize that it is not just students and researchers who need quick and easy access to peer-reviewed and scientific articles; gaining access to current medical research is also highly regarded by T1D patients. Members of communities like Glu do not wish to dig through volumes of irrelevant or outdated books, or to explain their medical history to library staff in order to obtain the information they desire. Library and information science professionals must also realize that diabetes and other chronic diseases are not only a concern of senior citizens; both young and old face the challenges of managing serious health conditions. Serving the information needs of such specialized health communities requires librarians to find a happy medium between discretion, advocacy, understanding, and information accessibility. Although the traditional library may not be able to remedy all of the challenges the T1D community faces, giving their particular information needs thoughtful consideration would be a great start.

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Open Access Metadata for Journals in Directory of Open Access Journals: Who, How, and What Scheme?

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Introduction

Shrinking library budgets, rising vendor profits, ethics of freedom of information in scholarly research, and advancements in digital archiving and information retrieval have spurred the open access (OA) movement. While OA most often implies an open system of publishing and licensing, there are really two components to OA: publication and metadata. OA publications seek to create outlets for publishing that are free to access outside of databases or other costly modes of distribution. OA metadata seeks to make data about any type of resource in all types of institutions available for harvesting. While OA metadata is necessary to make OA publications discoverable, OA metadata may be created and released for content that is not published as OA. Various schema and crosswalks have been developed in efforts to make metadata interoperable. Additionally, in order to facilitate OA distribution, initiatives to define procedures for creating OA content have emerged from institutions including Harvard and The National Information Standards Organization (NISO).

While some schemes and protocols seem to be emerging into possible standards, there seems to remain confusion when it comes to who creates the metadata and the role of the publisher in coordinating this creation and distribution of metadata. Though the *Directory of Open Access Journals* (DOAJ) uses OA metadata standards, it does not create the metadata, as traditional, for-profit distributors would. Creating metadata requires specialized knowledge and a high level of collaboration and communication between library professionals, programmers, publishers, and distributors. This project investigates how OA journals in the DOAJ are using OA metadata standards for interoperability through coordinated efforts with librarians, programmers, and distributors and provide preliminary insight into how consistent and effective the methods are.

Background Information

Open Access Publishing, Economics and Ethics and Definitions

Traditionally content creation and distribution in scholarly publication has been tightly controlled. Academics review and approve articles for publication as part of their scholarship, which publishers and vendors distribute through subscriptions to individual journals or to databases (Suber, 2012; Brienza, 2011). The OA movement gained strength when the rise in prices for journal subscriptions and the decrease in library budgets increased the pressure to reduce obstacles to access to research (Dobson, 2003; Suber, 2012; Terry & Kiley, 2006; Shockey & Eisen, 2012). The OA movement also was strengthened when orders for monographs were reduced, further limiting publishing opportunities for scholars and the flow of the exchange of knowledge (Brienza, 2011; Fitzpatrick, 2011). Finally, scholars and librarians questioned the ethics of research funded by government or institutions being owned and controlled by for-profit publishers, and sought OA options as alternatives (Shockey & Eisen, 2012).

As a result, the benefits of building an OA system that is more equitable and offers more opportunity to engage in research to advance current knowledge allowed the OA movement to gain traction. In 2001, the Budapest Open Access Initiative (BOAI) defined the key elements of OA publications as "freely available," "online," "scholarly works" that are peer-reviewed and created as part of academic research, and licensed for free reuse with attribution (Bailey, 2006, p. 15). The Berlin Declaration and The Bethesda Statement adopted the BOAI guidelines, specifying the need for OA content to also be deposited in a repository to facilitate access and archiving (Bailey, 2006, pp. 17-18). Together, these formed what is known as the "BBB" definition of OA. OA journals vary from new publications using OA models to established publishers adding OA distribution to independent self-publishing models run by scholars and institutions (Bailey, 2006, pp. 24-25). However, management of that information remains an issue: "While open access theoretically provides greater and freer access to scholarly work, it can only do so if the material can be indexed in a way that people can find it and if the technology is made accessible to all" (Cheby, 2012, p. 4). Thus the question of who is responsible for the planning, management, and creation of metadata for individual journals remains a bit undefined.

Metadata and Open Access Metadata

Understanding and implementing OA metadata is essential for the success of OA publishing. In library science, "metadata is commonly used for any formal scheme of resource description, applying to any type of object, digital or non-digital" (*Understanding metadata*, 2004, p. 1). OA metadata is simply metadata that is "openly licensed and freely accessible," making any bibliographic metadata exposable and harvestable, whether the full content of the resources are OA or not (Flynn, 2013, p. 29). In that sense, OA metadata is broader in scope than OA publishing as it may be applicable to any publishing model. Since the function of metadata is primarily to facilitate the "discovery of relevant information," OA journals should use OA metadata to make their content discoverable in relevant searches (*Understanding metadata*, 2004, p. 1).

Interoperability

Interoperability is necessary for OA metadata to be used for discovery of content. Interoperability allows metadata to be read by "multiple systems with different hardware and software platforms, data structures, and interfaces ... with minimal loss of content or function" (*Understanding metadata*, 2004, p. 2). Interoperability may be achieved through *cross-system search* or through *metadata harvesting* (*Understanding metadata*, 2004, p. 2). A cross-system search maps searches to "a common set of attributes" (*Understanding metadata*, 2004, p. 2) rather than directly sharing metadata. *Metadata harvesting* requires providers produce OA metadata as "a common core set of elements" (*Understanding metadata*, 2004, p. 2) available for harvesting by a central index that may be searched by other repositories, databases, or libraries. As a result, OA metadata may appear in search results from

search engines like Google Scholar or from aggregate databases like EBSCOhost. This allows searchers to find the most relevant content regardless of where that content resides and is essential for OA content to be discoverable.

Composing, Coding, and Distributing Metadata

Metadata may be created by catalogers, who may be minimally trained or hold degrees in library and information science, working for any number of stakeholders, such as libraries, vendors, or publishers (Flynn, 2013, p. 30; Understanding metadata, 2004, p. 10). Metadata is composed by following a scheme. A scheme is any set of elements applied to a specific purpose, such as describing an object (Understanding metadata, 2004, p. 2). Each element in a scheme has a meaning, referred to as the semantics of the scheme, and the content of the metadata record is created by assigning a value to one or more of the elements (Understanding metadata, 2004, p. 2). For example, if an element titled 'creator' refers to the person or entity who created the object being described, then the value that should be assigned for that element is the name of that person or entity. Common schemes include Dublin Core (DC), Text Encoding Initiative (TEI), Metadata Encoding and Transmission Standard (METS), Metadata Object Description Schema (MODS), and Encoded Archival Description (EAD). Other schemes, like Learning Object Metadata (LOM), <indecs>, and Online Information Exchange (ONIX) are specialized for certain types of media, such a learning objects, visual objects, or multimedia objects, or certain types of information, such copyright and attribution for ecommerce (Understanding metadata, 2004, pp. 3-8). Schemes are coded using computer-programming codes, such as Standard Generalized Markup Language (SGML), Extensible Markup Language (XML), and Hypertext Markup Language (HTML) (Understanding metadata, 2004, p. 2). This requires catalogers to know some programming, programmers to know some cataloging, or, ideally, for the specialists to work together.

Indexers or creators of metadata may use various software tools to assist in composing and coding the metadata, including templates, extraction tools, and conversion tools (*Understanding metadata*, 2004, p. 10). For templates, the information is entered by trained information professionals. Extraction and conversional tools are automated programs, but should be reviewed and edited by professionals since extraction and conversion are imprecise and subject to losing or incorrectly assigning values (*Understanding metadata*, 2004, p. 10). Thus, while tools may be helpful in speeding up the process, the human factor and cost cannot be completely eliminated.

OA metadata may be exposed or distributed through initiatives created by individual institutions, such as Harvard's OA Initiative and Online Computer Library Center's (OCLC) Open Data Commons Attribution License, or by housing OA metadata "in the cloud" from where it may be harvested or "pulled into local OPACs" (Flynn, 2013, p. 30). Either way, quality and interoperability of metadata is essential to fulfilling the mission of all OA initiatives and to the success of OA publishing.

Statement of the Problem

The unique traits of various types of content and the variety of missions of organizations and institutions that are indexing content calls for a variety of metadata schemes (*Understanding metadata*, 2004, p. 11). Thus, interoperability of metadata created for OA journals is essential for the content of these journals to be discoverable to users. A study by Cummings (2013) looked at the number of OA journals indexed in prominent databases, such as EBSCOhost, ProQuest, and Gale, but did not include information about who created the metadata and how it was exposed for harvesting. This project investigates how OA journals are applying emerging OA metadata standards and standards of inoperability in order to create quality metadata to make their content discoverable. In particular, the following questions are posed:

- 1. What metadata schemes and coding languages are OA journals using to create metadata?
- 2. Who creates this metadata for OA journals?
- 3. How do these practices compare with the best practices and standards for providing metadata for discoverability?

Methodology

Given the limited time and scope of this study, the researcher chose five journals in the subject area of library and information science from the DOAJ. Once each journal was identified, metadata records from two articles in each journal were examined for scheme choice as well as quality of metadata based on the inclusion of ample elements with assigned values for discoverability. The findings were compared to the standards or best practices proposed by prominent OA initiatives. The results provided preliminary insight into how OA journals create and provide OA metadata to make their content discoverable.

Literature Review

Lagace, Kaplan, and Leffler (2015) note "the creation of standards builds consensus within a community and facilitates interoperability among systems" and that standards start as recommended practices before becoming standards (p. 192). The emerging fields of OA metadata and publication are in the process of finding consensus among emerging recommended protocols. The literature on OA metadata and publishing covers the following areas: standards for OA metadata harvesting and the identification of OA content, metadata protocols based on the DC scheme and XML coding, best practices for creating OA collections, and practicalities of implementing these protocols and best practices.

Why We Need Better OA Metadata for Metadata Harvesting

Flynn (2013) defines OA metadata as "bibliographic information describing library content that is open licensed and freely accessible" (p. 29). While OA repositories

have flourished from one in 2003 to 250 by 2013, "the underlying infrastructure to support and sustain OA publishing" is just taking shape (Hodgson, 2014, p. 6). The community needs automated systems that are able to identify OA content regardless of where it is published and metadata standards to make this information readable by any system or by humans (Chumbe, Kelly & MacLeod, 2015; Graham, 2001; Hodgson, 2014). One example of insufficient standards is the lack of a metadata standard to clearly identify the licensing of content which results in OA articles in hybrid journals being overlooked by subscription services (Chumbe et al., 2015, pp. 143-144; Hodgson, 2014, p. 8). Another example is the use of PDFs that are not easily or accurately parsed by discovery systems for metadata and the lack of direct HTTP access to item information in online public access catalogs (OPAC), rendering that content undiscoverable by web crawlers or discovery systems (Graham, 2001, pp. 291-292). Metadata standards also should utilize unique identifiers for authors, institutions, and articles, such as DOI, in order to make OA content as discoverable as possible (Hodgson, 2014, p. 11). Creating OA metadata standards to make OA publications discoverable makes OA a more desirable form of publishing by allowing authors to publish in prestigious journals that may be made accessible via OA; it also allows web discovery services to discover OA content, which is currently hidden behind subscription walls (Chumbe et al., 2015, p. 145).

Recommended Protocols: OAI and NISO

Metadata harvesting protocols rely on the cooperation of two groups: data providers and service provides (Graham, 2001, p. 291). The data provider manages repositories or other systems that contain content and chooses the protocol, perhaps an OA metadata protocol, for exposing the metadata for items in their collection to harvesters (Lagoze, Van de Sompel & Nelson, 2002; Graham, 2001). A harvester issues OA metadata requests and is operated by service providers that deliver the item information to the end user (Lagoze et al., 2002; Graham, 2001). Open Archives Initiative (OAI) and NISO are the organizations leading the way in recommending protocols for OA metadata for metadata harvesting, though specialized groups have also created recommended protocols for metadata.

OAI's protocol, OAI - Protocol for Metadata Harvesting (OAI-PMH) "provides an application-independent interoperability framework based on *metadata harvesting*" (Lagoze et al., 2002, para. 1) in an attempt to create a lowcost standard that will make hidden content more discoverable (Graham, 2001, p. 291). OAI-PMH provides detailed specifications for creating and sharing OA metadata using the DC scheme and XML coding (Lagoze et al., 2002; Graham, 2001). The protocol supports sharing of metadata in multiple formats while requiring that each record use coding that identifies the metadata scheme, the URL for that scheme and the scheme's global identifier (Lagoze et al., 2002; Graham, 2001). However, to make the metadata interoperable, Dublin Core without qualifications must be used by repositories to share information (Lagoze et al., 2002; Graham, 2001; Efron, 2002). OAI-PMH also specifies the parts of the XML template that are required, including a header including unique identification information and date, metadata describing the item in DC format without qualifications, and an optional code that provides data about the metadata using the XML scheme (Lagoze et al., 2002; Graham, 2001).

NISO provides four standards for information, one of which is the Open Access Metadata Indicators (OAMI) (Lagace et al., 2015, p. 191). OAMI is primarily focused on a metadata standard that indicates what level of open access the article provides, if any, and the copyright stipulations for the reader for that particular work (Lagace et al., 2015, p. 195). OAMI does not specify a scheme or coding, but proposes the inclusion of <free_to_read> tags or license_ref> tags in order to indicate openness and the licensing of content (Lagace et al., 2015, p. 195). Under this protocol, the licensing tag must "include an Hyper Text Transfer Protocol (HTTP) uniform resource identifiers (URI) to point to license terms" (Lagace et al., 2015, p. 195) that are readable by machines and humans. An example might be directing the reader to a Creative Commons license. This recommended practice may be implemented and accessed by "readers, authors, publishers, funders, discovery services and search engines, and libraries" (Lagace et al., 2015, p. 195).

The Open Language Archives Community (OLAC) is an example of a specialized community that is working to standardize metadata for their own group. OLAC specifically requires "an XML format to interchange language-resource metadata within the framework of the Open Archives Initiative [OAI]" using all fifteen elements of DC (*OLAC Metadata*, n.d.). Similarly, the Journal TOCs: Expanding Market Opportunities (JEMO) project aims to expedite standardization of metadata by embedding strict OA elements in metadata, such as elements from DC and Creative Commons (CC), schemes publishers are already using (Chumbe et al., 2015, pp. 144-147).

Some find DC problematic and are not willing to specify it as a recommended protocol. Suber, from the Harvard Open Access Initiative, supports "adoption of community or discipline-specific *metadata vocabularies* that are more robust than Dublin Core" (Hodgson, 2014, p. 8). Efron (2007) calls Dublin Core "a rudimentary, weakly expressive standard in comparison to other archival metadata standards such as METS," ("Implications", para. 6) though he is not sure if more complex schemes are sustainable in for OA metadata interoperability. While not everyone likes DC, it is easy and cheap to convert from MARC, making it a strong contender among emerging recommendations (Graham, 2001, p. 293).

Best Practices for Creating Open Access

Statements of best practices for creating OA initiatives cover the drafting, adoption and implementation of policies governing requirements for OA publishing within an institution, but do not specify metadata schemes or formats (Scheiber & Suber, 2015; NISO Framework Working Group, 2007, p. 58-62). The Harvard Open Access Initiative's *Good Practices for University Open-Access Policies* specifies that indexing should allow items to be discoverable by search engines, but gives no scheme or coding specifications (Scheiber & Suber, 2015). NISO's *A Framework of Guidance for Building Good Digital Collections* provides six principles of metadata, such as following community standards, interoperability, and indications of rights and licensing (NISO Framework Working Group, 2007, pp. 58-62). The Open Data Commons recommends that all data be made publicly available and have a license, such as the Open Data Commons Attribution (ODCA) (*Making your data open: A guide*, n.d.).

Implementing OA Metadata Standards

OA metadata is more likely to be implemented and accurate when it fits with schemes and coding that are already being used, when there is already an organized process and space for creating and storing metadata, and when there is motivation to use OA metadata (Chumbe et al., 2015, p. 150; Efron, 2007). For example, since "60% of publishers are already using DC elements" (Chumbe et al., 2015, p. 150) and licensing OA articles through Creative Commons (CC), it was not difficult to implement standards as suggested by the JEMO project. When the publishers create metadata in-house there is the "flexibility, skill, access and resources to modify the production systems" (Chumbe et al., 2015, p. 150) so that implementation may be quick and successful. Efron found that when catalogers use a strict structure for creating metadata and use multiple elements in their metadata schemes, information retrieval is better. Based on these two studies it is clear that buy-in from publishers by employing skilled catalogers is essential to successful implementation. Mandates from funders for OA publication and metadata also encourage implementation of OA protocols. Wellcome Trust requires OA publication and verifies through PubMed's central automated searches whether or not researchers are making their results available through OA; the results indicate approximately 70% compliance with some margin of error for false hits and missed articles (Hodgson, 2014, p.8).

Efron's (2007) study of how institutional repositories exposed metadata using OAI-PMH found that 19 out of 23 sampled repositories provided properly formed XML data and averaged more than 18 elements in each record. This shows improvement over an earlier study by Jewel Ward that showed an average of eight defined elements (Efron, 2007). Of the 65% of the records in the sample that used subjects, each often listed two or three subjects per record, a key element for appearing in relevant searches (Efron, 2007).

Obstacles to the implementation of OAI-PMH standards include incompatibility with word processing software used by content creators, the cost of programs that will easily and accurately convert the content to match the protocols, and the need for specialized knowledge to use tools designed for OA publishing and metadata creation, which is now in the hands of publishers rather than librarians (Hodgson, 2014, p. 12). There were four repositories in Efron's (2007) study that provided ill-formed XML with errors such as improper formatting or unpermitted characters in the code. Efron suggested two areas of improvement for OA metadata implementation: better XML formatting and proofreading, and an increase in the use of less common DC elements such as rights, coverage, and source to increase points for information retrieval.

Data Collection, Description, and Analysis

DOAJ Metadata Guidelines

DOAJ's website provides detailed expectations for how metadata should be formatted and provided to DOAJ. For both article and journal metadata DOAJ provides OAI-PMH feeds. DOAJ maps the OAI-PMH article metadata to DC elements according to definitions of each element as provided by the table on their website. DOAJ also lists additional DOAJ OAI fields – such as volume, issue, start and end pages – and definitions of each field to guide publishers who want to include such information in their metadata.

It is the publisher's responsibility to provide DOAJ with metadata for the journal and articles. Publishers may get article metadata into DOAJ by uploading an XML file or by completing a metadata information form for each article. If uploading, the DOAJ requires publishers convert their data to DOAJ XML file format. DOAJ provides a template for the XML scheme that may be edited in a basic text editor. This template includes elements that correspond to the DC scheme and the DOAJ-OAI fields. To assist publishers not fluent in coding languages, DOAJ also provides an example article record with explanations (see Figure 1) to make it easier to see where the specific journal and article information should be entered. For example, the right column points to where the publisher should replace the values of elements within the code, such as the ISSN number, author's name, and so on. The code could be copied and the element values edited. For instance, looking at this section of code:

```
<title language="eng">Roses and Lilies</title>
```

<authors>
<authors>
<author>
<aname>Fritz Haber
</name>

The publisher may replace value for the title in the sample, "Roses and Lilies," with the title of the article being described in the metadata file. Likewise, the publisher may replace the author's name in the sample, "Fritz Haber," with the author's name in the article being described in the metadata file. Once the file is manually created, it may be uploaded to DOAJ.

<pre><?xml version="1.0" encoding=" UTF-8"?> <records <records="" <ul=""> <language>eng</language> <publisher></publisher> <journaltitle>Botanical Ma</journaltitle> gazineBotanical Ma gazineBotanical Ma gazineBotanical Ma gazine <journaltitle>Botanical Ma</journaltitle> gazine <journaltitle< li=""> <issue>22/issue></issue> <startpage>1235</startpage> <doutnotate></doutnotate> <doutnotate></doutnotate> <doutnotate></doutnotate> <doutnotate< li=""> <doutnotate< li=""></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></doutnotate<></journaltitle<></records></pre>	<= The language tag content m ust conform to the iso 639-2b standard. Find the correct language code. <= Here is the issn number of the journal in which the article has been publi shed. If you have an eissh number instead then this l ine should be replaced by ison and eissn numbers then the eissn tag should occur after the issn tag. <= The author name should be f ormatted First Name, Middle Na me, Last Name <= Note that the affilitation Id numbers denote the affilitations in the affil iationslist below.
<pre><abstract language="eng"> The catalytic formation of ammonia from hydrogen and atmospheric nitrogen under conditions of high temperature and high pre ssure. </abstract> http://www.science.org/article s/HaberBosch.pdf <keywords language="eng"> <keywords language="eng"> <keywords language="eng"> </keywords></keywords></keywords></pre>	
<record> </record> 	<pre><= Here is where your first r ecord ends. You may add as many more as you wa nt of similar kind below.</pre>

Figure 1. This figure presents the XML Sample Record image for the DOAJ recommended coding.

The metadata entry form, shown in Figure 2, allows publishers who are not familiar with coding or who cannot hire programmers to provide metadata without having to worry about errors in coding. Catalogers should recognize that the form contains the DC and DOAJ-OAI elements outlined in the XML instructions and may use the guides on the website to know what values to assign to each element to provide accurate and complete metadata.

Article Title *	Enter the article title here			
DOI	10.1234/article-32			
Author(s) *	Name	Affiliation	Affiliation	
	Name Name	Affiliation	Affiliation	
	Name	Affiliation	Affiliation	
	Add More Authors			
Abstract	Enter the abstract here			
Keywords	Enter some keywords for	the article		
Keywords	Enter some keywords for Use a , to separate keywo	the article rds		
Keywords Full-Text URL	Enter some keywords for Use a , to separate keywo URL to the fulltext of the	the article rds article		
Keywords Full-Text URL	Enter some keywords for Use a , to separate keywo URL to the fulltext of the (The URL for each article r	the article rds article must be unique)		
Keywords Full-Text URL Publication Date	Enter some keywords for Use a , to separate keywo URL to the fulltext of the (The URL for each article r 07 • 2015 •	the article eds article must be unique)		
Keywords Full-Text URL Publication Date	Enter some keywords for Use a , to separate keywo URL to the fulltext of the (The URL for each article i 07 • 2015 •	the article rds article must be unique)		
Keywords Full-Text URL Publication Date Journal ISSN (print version) *	Enter some keywords for Use a , to separate keywo URL to the fulltext of the (The URL for each article r 07 • 2015 •	the article rds article must be unique)		
Keywords Full-Text URL Publication Date Journal ISSN (print version) * Journal ISSN (online version) *	Enter some keywords for Use a , to separate keywo URL to the fulltext of the (The URL for each article r 07 • 2015 •	the article eds article must be unique)		
Keywords Full-Text URL Publication Date Journal ISSN (print version) * Journal ISSN (online version) *	Enter some keywords for Use a , to separate keywo URL to the fulltext of the (The URL for each article r 07 • 2015 • Volume Vol Issu	the article eds article must be unique)		

Figure 2. This figure presents a screenshot of DOAJ's publisher's metadata entry form.

Choosing Journals & Retrieving Metadata

Five journals from a subject search for Library and Information Science in the DOAJ search tool were randomly chosen:

- Informing Science The International Journal of an Emerging Transdiscipline
- Code4Lib Journal
- Journal of Library Innovation
- *In the Library with the Lead Pipe*
- Journal of Librarianship and Scholarly Communication

Two articles from each journal's main website were selected for OA metadata retrieval and examination.

DOAJ makes metadata records available to any OAI compatible service. Since the researcher does not have access to an OAI compatible service, Ann Agee, Librarian for the School of Information at San Jose State University (SJSU) and Steven Higaki, the Head of Cataloging for the King Library at SJSU, were contacted to see if the university could request the metadata. Neither has access to OA metadata files. Higaki explained the King Library does not harvest metadata directly from DOAJ, "The catalog records you see are part of a service we subscribe to that assists with the management of our electronic resources/journals" (personal communication, July 23, 2015). Both Agee and Higaki suggested using the page source code or contacting the publishers directly (personal communication, July 23, 2015). Though WorldCat contains metadata, a permission code is needed to access them.

Metadata for two articles from each journal was requested directly from DOAJ and each journal along with information about which method was used to provide the metadata to DOAJ. The links to metadata provided by *Journal of Librarianship and Scholarly Communication (JLSC)* resulted in an error code and *In the Library with the Lead Pipe* did not respond, eliminating both from the study. Of the three remaining journals, one does not yet provide metadata to DOAJ, one uses the DOAJ publisher's form, and one provides metadata through XML files. For each article chosen a title search in the DOAJ search tool was conducted. The journal that did not provide metadata did not have article level search results in the DOAJ, though all were discoverable by title in Google Scholar. Both the journal that provide the XML file to DOAJ and the one that used the online form to provide metadata were discoverable by title using the DOAJ search tool. The journals' responses to how they provide metadata, the articles to be examined, and the availability of article level information in the DOAJ search tool are presented in Table 1.

Table 1			
Metadata Provided and Article Findability by Title Search			
Journal	Article	Title Found in DOAJ?	Format Metadata Provided
Informing Science The International Journal of an Emerging Transdiscipline	Information Gatekeepers – Aren't We All?	No	None ¹
Informing Science The International Journal of an Emerging Transdiscipline	The Impact Facebook and Twitter has on the Cognitive Social Capital of University Students	No	
Journal of Library Innovation	Addressing Rural Library Technology Budgets with Single Board Computers: Testing the APC 8950 Rock Circuit Board Computer for Patron Access	Yes	DOAJ Form ²
Journal of Library Innovation	Open Education Resources: The New Paradigm in Academic Libraries	Yes	
Code4Lib Journal	Recognizing Cultural Diversity in Library Interface Development	Yes	VMI
Code4Lib Journal	"What If I Break It?": Project Management for Intergenerational Library Teams Creating Non-MARC Metadata	Yes	Upload ³

Notes:

¹E. Cohen, personal communication, July 22, 2015.

²D. Schoen, personal communication, July 24, 2015

³S. Amato, personal communication, July 22, 2015

This discrepancy in title searches in DOAJ and Google Scholar implied that information might be available in the HTML coding even if the OA metadata is not coded by DOAJ standards and provided to DOAJ. Since all were not able to provide metadata files, in addition to XML or other metadata file provided by the journal, the following data was also gathered for each article, as available, in order to see if any of the DOAJ metadata protocols were being included in the source code for articles and if the source code, which is what Google Scholar would search, for each article is different than the metadata provided to DOAJ:

- Source code from the article page on the journal website using a Safari browser,
- Source code from the article page on DOAJ using a Safari browser.

Analysis of Article Metadata

Each article's source code was examined for required DOAJ elements as DC, XML, or XSD scheme and values and compared to the XSD template and example record. This allowed for a sense of how successfully the shared metadata conveyed the needed information for discovery of the articles by researchers.

The code from *Journal of Library Innovation* clearly contains XML and DC metadata within the source code from the website. The following tables show excerpts of the source code next to the DOAJ XSD file code. Overall, the source code of each article contains the same elements as the XSD file and contains explicit DC code to map with DOAJ. In Table 2 it can be seen that all the codes begin with the identical XML line, however, rather than mapping to the W3C XMLScheme, the page code maps to the W3C XHTML.

In Table 3, the source code excerpted shows how the HTML code includes meta tags for elements such as the article and journal title that have no parallel in the XSD file. As seen in Table 4, this information repeats in code that does follow the DC scheme.

Table 2			
Excerpts of Source Code for Journal of Library Innovation			
Article 1 Source Code	Article 2 Source Code	DOAJ XSD file	
xml version="1.0"</td <td><?xml version="1.0"</td><td><?xml version="1.0"</td></td></td>	xml version="1.0"</td <td><?xml version="1.0"</td></td>	xml version="1.0"</td	
encoding="UTF-8"?>	encoding="UTF-8"?>	encoding="UTF-8"?>	
html</td <td><!DOCTYPE html</td> <td><xs:schema< td=""></xs:schema<></td></td>	html</td <td><xs:schema< td=""></xs:schema<></td>	<xs:schema< td=""></xs:schema<>	
PUBLIC "-	PUBLIC "-	xmlns:xs	
//W3C//DTD	//W3C//DTD	="http://www.w3.org/	
XHTML 1.0	XHTML 1.0	2001/XMLSchema"	
Transitional//EN"	Transitional//EN"	xmlns:iso_639-	
"http://www.w	"http://www.w	2b="http://www.doaj.	
3.org/TR/xhtml1/DT	3.org/TR/xhtml1/DT	org/schemas/iso_639-	
D/xhtml1-	D/xhtml1-	2b/1.0">	
transitional.dtd">	transitional.dtd">		
<html< td=""><td><html< td=""><td></td></html<></td></html<>	<html< td=""><td></td></html<>		
xmlns="http://www.w	xmlns="http://www.w		
3.org/1999/xhtml">	3.org/1999/xhtml">		
<head></head>	<head></head>		

Table 3		
Excerpts from Source Cod	de for Journal of Librarv In	novation
Article 1 Source Code	Article 2 Source Code	DOAJ XSD file
<meta http-<="" td=""/> <td><meta http-<="" td=""/><td>No equivalent code in</td></td>	<meta http-<="" td=""/> <td>No equivalent code in</td>	No equivalent code in
equiv="Content-Type"	equiv="Content-Type"	this file.
content="text/html;	content="text/html;	
charset=utf-8" />	charset=utf-8" />	
<meta< td=""><td><meta< td=""><td></td></meta<></td></meta<>	<meta< td=""><td></td></meta<>	
name="description"	name="description"	
content="Open	content="Addressing	
Education Resources:	Rural Library	
The New Paradigm in	Technology Budgets	
Academic Libraries" />	with Single Board	
	Computers: Testing the	
<meta< td=""><td>APC 8950 Rock Circuit</td><td></td></meta<>	APC 8950 Rock Circuit	
name="keywords"	Board Computer for	
content="Scholarly	Patron Access" />	
Communications; Open		
Scholarship; Alternative	<meta< td=""><td></td></meta<>	
Educational Materials;	name="keywords"	
Open Access; Open	content="Single board	
Educational Resources;	computers; Raspberry	
Institutional	Pi; rural libraries; linux;	
Repositories" />	android; budgets;	
	technology" />	

Table 4 shows where the source code in both articles includes a reference to the DC scheme. The XSD file does not show this, though the DOAJ does map to DC. The inclusion of DC elements in all three codes is seen in the rest of Table 4.

Excerpts of common points where the DC and XSD may map smoothly, such as the fields for language, title, descriptions, ISSN, are included in Table 4. Thus, in the journal's source code for each article, metadata tags that duplicate the DC elements comingle with html coding that makes the content visible on journal's webpage. Since this journal included DC coding in the source code, it is interesting to note that the publisher used the DOAJ form to provide the metadata to the DOAJ rather than excerpting that portion of the code to send in XML format.

Table 4		
Excerpts of Source Cod	e for Journal of Library I	Innovation
Article 1 Source Code	Article 2 Source Code	DOAJ XSD file
link	link	
rel="schema.DC"	rel="schema.DC"	
href="http://purl.org/d	href="http://purl.org/d	
c/elements/1.1/" />	c/elements/1.1/" />	
name="DC.Language	<meta< td=""><td><xs:element< td=""></xs:element<></td></meta<>	<xs:element< td=""></xs:element<>
" scheme="ISO639-1"	name="DC.Language	name="language"
content="en"/>	" scheme="ISO639-1"	
<meta< td=""><td>content="en"/></td><td>type="iso_639-</td></meta<>	content="en"/>	type="iso_639-
name="DC.Source"	<meta< td=""><td>2b:LanguageCodeTyp</td></meta<>	2b:LanguageCodeTyp
content="Journal of	name="DC.Source"	e"
Library Innovation"/>	content="Journal of	
<meta< td=""><td>Library Innovation"/></td><td>minOccurs="0"/></td></meta<>	Library Innovation"/>	minOccurs="0"/>
name="DC.Source.IS	<meta< td=""><td></td></meta<>	
SN" content="1947-	name="DC.Source.IS	<xs:element< td=""></xs:element<>
525X"/>	SN" content="1947-	name="publisher"
<meta< td=""><td>525X"/></td><td>type="xs:string"</td></meta<>	525X"/>	type="xs:string"
name="DC.Source.Iss	<meta< td=""><td>minOccurs="0"/></td></meta<>	minOccurs="0"/>
ue" content="1"/>	name="DC.Source.Iss	
<meta< td=""><td>ue" content="1"/></td><td><xs:element< td=""></xs:element<></td></meta<>	ue" content="1"/>	<xs:element< td=""></xs:element<>
name="DC.Source.U	<meta< td=""><td>name="journalTitle"</td></meta<>	name="journalTitle"
RI"	name="DC.Source.U	type="xs:string" />
content="http://www.l	RI"	
ibraryinnovation.org/"	content="http://www.l	<xs:element< td=""></xs:element<>
/>	ibraryinnovation.org/"	name="volume"
<meta< td=""><td>/></td><td>type="xs:string"</td></meta<>	/>	type="xs:string"
name="DC.Source.Vo	<meta< td=""><td>minOccurs="0"/></td></meta<>	minOccurs="0"/>
lume" content="5"/>	name="DC.Source.Vo	<xs:element< td=""></xs:element<>
<meta< td=""><td>lume" content="5"/></td><td>name="issue"</td></meta<>	lume" content="5"/>	name="issue"
name="DC.Subject"		type="xs:string"
xml:lang="en"	<meta< td=""><td>minOccurs="0"/></td></meta<>	minOccurs="0"/>
content="Scholarly	name="DC.Subject"	<xs:element< td=""></xs:element<>
Communications"/>	xml:lang="en"	name="startPage"
	content="Single board	type="xs:string"
	computers"/>	minOccurs="0"/>
		<xs:element< td=""></xs:element<>
		name="endPage"
		type="xs:string"
		minOccurs="0"/>

The source code for the articles from *Code4Lib* does not start with the XSD code of the sample file. Even though the journal that provided they XML file to DOAJ, they did not include the XSD coding in the source code as seen in the source code from the *Journal of Library Innovation* in Table 4. Like the *Journal of Library Innovation*, rather than mapping to the W3C XMLScheme, the page code maps to the W3C XHTML scheme for public presentation, again, likely because this is code for the actual article page on the journal's website.

Table 5		
Excerpts of Source Code	e for Code4Lib	
Article 1 Source Code	Article 2 Source Code	DOAJ XSD file
html</td <td><!DOCTYPE html</td> <td><?xml version="1.0"</td></td></td>	html</td <td><?xml version="1.0"</td></td>	xml version="1.0"</td
PUBLIC "-	PUBLIC "-	encoding="UTF-8"?>
//W3C//DTD XHTML	//W3C//DTD XHTML	<xs:schema< td=""></xs:schema<>
1.0 Transitional//EN"	1.0 Transitional//EN"	xmlns:xs
"http://www.w3.org/T	"http://www.w3.org/T	="http://www.w3.org/
R/xhtml1/DTD/xhtml1	R/xhtml1/DTD/xhtml1	2001/XMLSchema"
-transitional.dtd">	-transitional.dtd">	xmlns:iso_639-
<html< td=""><td><html< td=""><td>2b="http://www.doaj.</td></html<></td></html<>	<html< td=""><td>2b="http://www.doaj.</td></html<>	2b="http://www.doaj.
xmlns="http://www.w	xmlns="http://www.w	org/schemas/iso_639-
3.org/1999/xhtml"	3.org/1999/xhtml"	2b/1.0">
lang="en-US">	lang="en-US">	
<head></head>	<head></head>	
<meta http-<="" td=""/> <td><meta http-<="" td=""/><td></td></td>	<meta http-<="" td=""/> <td></td>	
equiv="Content-Type"	equiv="Content-Type"	
content="text/html;	content="text/html;	
charset=UTF-8" />	charset=UTF-8" />	
<title>The Code4Lib</title>	<title>The Code4Lib</title>	
Journal –	Journal –	
Recognizing Cultural	"What If I Break It?":	
Diversity in Library	Project Management	
Interface	for Intergenerational	
Development	Library Teams	
	Creating Non-MARC	
	Metadata	

Though the elements, such as the article title, the author, and the ISSN, required by the DOAJ schemes are visible in the code from *Code4Lib*, these items are not coded using the DC scheme, as seen in Table 6. Therefore, it is unclear if these values will successfully map according to OAI-PMH standards for metadata. Since this journal provided XML files to DOAJ, it is surprising to not find this scheme included in the source code. Instead, it appears the journal chose to code

two separate metadata files, one for the website and one to provide the metadata to
DOAJ according to their specifications.

Table 6	
Excerpts of Source Code for Code4Lib	
Article 1 Source Code	Article 2 Source Code
<pre><div class="article" id="post-10456"></div></pre>	<pre><div class="article" id="post-10395"></div></pre>
<pre>Issue 28, 2015-04- 15</pre>	Issue 28, 2015-04- 15</a
<h1 class="articletitle">Recognizing Cultural Diversity in Library Interface Development</h1 	<h1 class="articletitle">"What If I Break It?": Project Management for Intergenerational Library Teams Creating Non-MARC Metadata</h1>
<div class="abstract"></div>	<div class="abstract"></div>
The rapid increase in complex library digital infrastructures has enabled a more full-featured set of resources to become accessible by autonomous users,exploring the redevelopment strategy for the New York University Libraries' web presence, which serves a broad and global set of users.	Libraries are constantly challenged to meet new user needs and to provide access to new types of materialsorient themselves when embedded in a "traditional" library setting.
	5
<div class="entry"> <abbr <br="" class="unapi-id">title="http://journal.code4lib.org/?p=1 0456"><!-- --></abbr> by Nik Dragovic</div>	<abbr <br="" class="unapi-id">title="http://journal.code4lib.org/?p=1 0395"><!-- --></abbr> by Kelly J. Thompson

The source code from *Informing Science*, presented in Table 7, contains more lines with metadata with DC elements than that *Code4Lib*, though it also does not follow the DC scheme or the XML requirements for the DOAJ. Since this journal did not provide any metadata to the DOAJ, it is not surprising to find the DC and XML elements missing from their source code.

Table 7		
Excerpts from Source Code for Informing Science Articles Source Code for Article 1 Source Code for Article 2		
html	DOCTVPF html	
[if IE 8]	if IE 8?	
http://www.selfangerica.com	<pre><html class="no-is lt-ie9" lang="en"></html></pre>	
endif?	endif?	
if gt IE 8?	if gt IE 8?	
<html class="no-js" lang="en"></html>	<html class="no-js" lang="en"></html>	
<![endif]	<![endif]	
<pre><head> <meta charset="utf-8"/> <meta content="IE=edge" http-equiv="X-UA- Compatible"/> <meta content="An international association advancing the multidisciplinary study of informing systems. Founded in 1998, the Informing Science Institute (ISI) is a global community of academics shaping the future of informing science." name="description"/> <meta content="width=device-width" name="viewport"/> <ti><meta content="width=device-width" name="viewport"/> <ti><title>Informing Science Institute - Information Gatekeepers – Aren't We All?</title> </ti></ti></head></pre>	<head> <h< td=""></h<></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head></head>	

Table 8			
Excerpts of Source Code from DOAJ for Code4Lib and Journal of Library			
Innovation Articles			
Journal	Source Code for Article I	Source Code for Article 2	
Code4Lib	<meta <br="" name="citation_journal_title"/> content="Code4Lib Journal"> <meta <br="" name="citation_publisher"/> content="Code4Lib"> <meta <br="" name="citation_author"/> content="Nik Dragovic"> <meta <br="" name="citation_author"/> content="Nik Dragovic"> <meta <br="" name="citation_title"/> content="Recognizing Cultural Diversity in Library Interface Development"> <meta name="citation_publication_date" content="2015/04/01"> <meta <br="" name="citation_issue"/>content="28"> <meta <br="" name="citation_issn"/>content="1940-5758"></meta 	<meta <br="" name="citation_journal_title"/> content="Code4Lib Journal"> <meta <br="" name="citation_publisher"/> content="Code4Lib"> <meta <br="" name="citation_author"/> content="Kelly Thompson"> <meta <br="" name="citation_author"/> content="Kelly Thompson"> <meta <br="" name="citation_title"/> content=""What If I Break It?": Project Management for Intergenerational Library Teams Creating Non-MARC Metadata"> <meta name="citation_publication_date" content="2015/04/01"> <meta <br="" name="citation_jissue"/>content="28"> <meta <="" name="citation_jissn" td=""/></meta 	
Journal of Library Innovation	<pre><meta content="Journal of Library Innovation" name="citation_journal_title"/> <meta content="Western New York Library Resources Council" name="citation_publisher"/> <meta content="Michael D. Wells" name="citation_author"/> <meta content="Michael D. Wells" name="citation_author"/> <meta content="Addressing Rural Library Technology Budgets with Single Board Computers: Testing the APC 8950 Rock Circuit Board Computer for Patron Access" name="citation_title"/> <meta content="2014/04/01" name="citation_publication_date"/> <meta content="5" name="citation_publication_date"/> <meta content="4" name="citation_issue"/> <meta content="1" name="citation_firstpage"/> <meta content="1" name="citation_firstpage"/> <meta content="1" name="citation_firstpage"/> </pre>	<pre>content="1940-5758"> <meta content="Journal of Library Innovation" name="citation_journal_title"/> <meta content="Western New York Library Resources Council" name="citation_publisher"/> <meta content="Carmen Mitchell" name="citation_author"/> <meta content="Carmen Mitchell" name="citation_author"/> <meta content="Carmen Mitchell" name="citation_author"/> <meta content="Carmen Mitchell" name="citation_author"/> <meta content="Melanie Chu" name="citation_author"/> <meta content="Open Education Resources: The New Paradigm in Academic Libraries" name="citation_author"/> <meta content="2014/04/01" name="citation_publication_date"/> <meta content="5" name="citation_volume"/> <meta content="13" name="citation_issue"/> <meta content="13" name="citation_lastpage"/> <meta content="29" name="citation_issu"/> <meta content="29" name="citation_lastpage"/> <meta content="29" name="citation_issu"/> content="20"> content="20"> content="20"> content="20"> content="20"> content="20"> content="20"> content="20"> content="20"</pre>	

The source code from the articles from *Code4Lib* and *Journal of Library Innovation* that appear on the DOAJ website are more uniform and reflect the DOAJ protocols. All begin with the same html code header:

<!DOCTYPE html> <html dir="ltr" lang="en"> <head> <meta charset="utf-8">

The fourth line directs any metadata to the same encoding language used in the first line of the sample XSD file "<?xml version="1.0" encoding="UTF-8"?>." Further down in the file, as presented in Table 8, we can see metadata information that corresponds to the elements required by DC and included in DOAJ's XSD sample. Though not in DC scheme, it contains the elements and the XML is able to be mapped to DC scheme. For example, the elements of "citation_journal_title", "citation_publisher", and "citation_author" have equivalent elements in DC to which they may be easily mapped. Notice these files do not have the extra HTML tags that were seen in the source code from the journals' websites.

The XML file provided by *Code4Lib* looks identical to the example XML file provided on the DOAJ website as seen in Figure 1 above. Here is the first record in that file:

```
<?xml version="1.0" encoding="UTF-8"?>
<records>
 <!--
  Generated by the DOAJ Export WordPress plugin.
  http://wordpress.org/extend/plugins/doaj-export/
 -->
 <record>
  <language>eng</language>
     <publisher>Code4Lib</publisher>
    <journalTitle>The Code4Lib Journal</journalTitle>
     <issn>19405758</issn>
       <publicationDate>2015-07-15</publicationDate>
  <issue>29</issue>
    <publisherRecordId>10796</publisherRecordId>
  <documentType>article</documentType>
  <title language="eng">Editorial Introduction: Changes on the Editorial
Board</title>
  <authors>
   <author>
```

```
<name>Sara Amato</name>
```

```
</author>
```

```
</authors>
```

<abstract language="eng">The publication of the 29th issue of the journal brings with it several changes to the editorial board.</abstract>

<fullTextUrl format="html">http://journal.code4lib.org/articles/10796</fullTextUrl> </record>

Thus it is clear this journal consulted and followed the DOAJ specifications for metadata creation and specified this as a part of the process for publishing as an OA publication.

Though *Code4Lib* is the only one that creates XML files, *Journal of Library Innovation* has the most metadata information in their source code on their website. When looking at the source code for the article from both journals on the DOAJ website, the metadata information seems to be equal. *Informing Science* does not provide metadata and its articles are not accessible on the website since no metadata information was uploaded so only the website source code was available.

Conclusions

A few obstacles to creating complete OA metadata for journals in DOAJ are implied by the information gathered in this project. Based on the lack of consistency of the source codes, not to be confused with accuracy, which was not part of the scope of this investigation, and communications with the journals, further studies might seek to confirm these obstacles to creating accurate and interoperable metadata:

- 1. the awareness by publishers of the standards and options to get metadata into DOAJ despite both being on the website;
- 2. the level of technical knowledge about coding and cataloging of publishers and its relation to their ability to implement the guidelines on the DOAJ site or to the option to use the form to enter metadata information;
- 3. the cost of personnel, especially for OA journals, with expertise in cataloging and/or programming to either manually enter metadata information for each article into the DOAJ website or to create xml files to upload to DOAJ.

Additionally, the impact of discrepancies in metadata creation on harvesting of metadata and discoverability of individual articles is an area that needs further research. If the discoverability does not correlate to the journal providing the metadata to DOAJ, then how are these OA journals, or any article, being indexed to be discovered in these searches? While much research has been done around the ethics and economics of OA publishing and indexing, there are not many studies about the creation, costs, and effects of OA metadata in relation to OA publication and discoverability. Moreover, with the emergence of hybrid journals in which some articles are published as OA and others not, and traditional journals publishing under modified forms of OA, these questions about OA metadata concern more than just OA journals.

While standards for metadata in the many areas of library and information sciences are still emerging, a forerunner for OA metadata standards seems to be the OAI-PMH, using XML and DC, as outlined in the DOAJ guidelines. The analysis

of the source codes gathered from the article pages on the journals' websites and from the article pages on DOAJ, and of metadata files provided by DOAJ or the journals, shows that there are multiple ways to include and share OA metadata. Though all have overlapping elements containing bibliographic information, there does not seem to be much consistency from journal to journal. Moreover, OA metadata is not explicitly created and shared, it could render articles invisible in some searches even if the elements of emerging schemes like DC are included. This is seen in the *Informing Science* articles that contain DC elements, but do not use the DC scheme or code in XML to be shareable with the DOAJ, resulting in the articles not being discoverable in a title search on DOAJ. There seemed to be little difference in the ability to do a title search for the other two journals' articles, though they included different elements in their source code and provided the OA metadata to DOAJ using different methods.

Since the creation of OA metadata was found to be the responsibility of the publishers, publishers must include a plan for creating and sharing metadata in order to ensure the discoverability of their journal's content. For any journal seeking to implement a plan for creating OA metadata, using XML and DC as outlined in the DOAJ guidelines and following OAI-PMH protocols are viable and effective options. However, many publications seem unaware of this. As more journals move to some form of OA publication, there needs to be more communication and collaboration in creating OA metadata in order to ensure that content is consistently discoverable. One way to do this is to foster collaboration between librarians and programmers, each who have specialized skills required to provide accurate content for the elements in the metadata scheme and to properly program these schemes into code that is readable by machines and humans. Though further study is needed to determine if greater standardization would help this process or if is adequate for each journal to have their own method as long as they are using scheme and coding that is interoperable.

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