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Term Circles: Using Linked Data as a Tool to Mitigate Colonial Subject Bias

F. Tim Knight

Osgoode Hall Law School of York University, tknight@osgoode.yorku.ca

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"The inequalities and discrimination of the past continue, often in more subtle forms, into the present. This is usually without overt malice, but as workers in the information industry, our attitudes and practices have far reaching effects. It is our ethical and professional responsibility to examine our attitudes and to deepen our understanding."—Heather Moorcroft (1993)

Introduction

In April of 2017 the Canadian Federation of Library Associations (CFLA), under the guidance of Camille Callison, released their *Truth and Reconciliation Report and Recommendations* a reflection on the earlier work of the Truth and Reconciliation Commission of Canada (2015). The CFLA Report provided a number of recommendations for libraries to consider including number five which calls for the "decolonization of library access and classification." This recommendation proposed that "decolonization" could be approached by "addressing the structural biases in existing schemes of knowledge organization and information retrieval arising from colonialism by committing to integrating Indigenous epistemologies into cataloguing praxis and knowledge management" (Callison 2017, 6).

Identifying and removing colonial biases in cataloguing practices will be challenging because metadata and classification schemes are social constructs (Albrechtsen and Jacob 1998; Beghtol 1998; Farnel 2017; Hirschheim 1992; Hjørland 2002; Kam 2007; Olson 1999). As Andrew Hinton noted in relation to context and information architecture "we're typically unaware of just how strongly the social environment affects our own thinking and behavior" (2015, 118). What one person considers an "objective reality" is based on perceptions absorbed, often unconsciously, from their social environment (Christie 1994; Hart 2010; Hinton 2015; Hirschheim 1992; Hjørland 2002; Little Bear 2000). It will therefore be difficult to correct for bias when working from within the society that embodies those biases.

However, a workaround may be possible. The inherent flexibility of linked data might provide the means to design an interface capable of mitigating these biases. Instead of correcting for bias directly linked data could be used to combine different viewpoints and create a "mediating vocabulary" (Albrechtsen and Jacob 1998, 297). This user centred interface would improve access to information and soften potential conflicts that exist between Indigenous and colonial worldviews.

With this flexibility in mind and reflecting on the CFLA's call to decolonize library access and classification, this paper will explore "subject languages" (Svenonius 2000) and their role in providing access to information. It proposes the 'term circle' as a way to use linked data to compliment existing subject authority methodology and provide a "cognitively just" (Moulaison Sandy and Bossaller 2017) approach to subject access.

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* F. Tim Knight is an Associate Librarian and Head of Technical Services at the Osgoode Hall Law School Library of York University.

Languages, Cultures, Worldviews

The standards and methods for bibliographic organization have developed gradually over centuries and are deeply entrenched in contemporary cataloguing practices (Denton 2007; Lubetzky 1953; Svenonius 2000; Wright 2007). And while this is a rich heritage that has served libraries well, these Western[1] systems of classification and subject languages are cultural creations (Bowker and Star 1999; Christie 1994; Doyle, Lawson, and Dupont 2015; Morville 2014; Nakata 2004; Olson 1999; Svenonius 2000) that also reflect centuries of prejudice and bias.

For the library and cultural heritage communities these systems also represent an incredible cognitive investment that makes it difficult to entertain new or alternative ways of thinking. As Marisa Elena Duarte and Miranda Belarde-Lewis pointed out,

> "… it is precisely all of this structure that makes imagining alternative Indigenous approaches so elusive and frustrating, and as some have said, inconvenient. The structure becomes epistemologically self-referential; few catalogers can imagine a world, practice, and bibliographic universe parallel to, much less prior to, the innovation of Library of Congress, Dewey, and the *Anglo-American Cataloguing Rules* (AACR)" (2015, 681).

It is therefore important to recognize that while a knowledge organization system may be the result of carefully structured and rigorous processes, they are also an expression of the worldview from which it originated.[2]

As a colonial institution, the library is the embodiment of the colonial intent to "impose a new order" (Smith 2012, 72).[3] And so, from the context of information and knowledge organization, there will always be a "potential for intellectual colonization" (Olson 1999, 108) where Western philosophies are considered universally applicable. This propensity to impose order makes the practice of cataloguing and classification a technique of colonization (Duarte and Belard-Lewis 2015, 682).[4] It is therefore unlikely that there are any modifications capable of transforming contemporary cataloguing praxis into something other than a colonial process.

However, it may not be necessary to modify these practices directly, at least not in the short-term. Maybe the place to start is to cultivate a better understanding of Indigenous epistemologies and how worldviews affect knowledge and knowledge management practices. With this understanding in place the application of these practices can at least be improved.

Leroy Little Bear, a member of the Blood tribe of the Blackfoot Confederacy and a professor at the University of Lethbridge, provided a good starting point in his paper, "Jagged Worldviews Colliding":

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[1] Use of the term "Western" here refers to the Western European view of the world and its manifestation in Canadian and American culture. Also known as Eurocentrism or Britishcentrism when specific to Canada (Younging 2018, 1).

[2] "Metadata creators must possess awareness of their own historical, cultural, racial, gendered, and religious worldviews, and work at identifying where those views exclude other human experiences. Understanding inherent bias in metadata standards is considered a core competency for all metadata work." (CCTF 2017, 1)

[3] For more on "colonial approaches on knowledge" in libraries, see the discussion by Moulaison Sandy and Bollaser on the work of John Burgess (2005, 132).

[4] For an excellent overview of systemic problems evident in contemporary cataloguing practices see the conversation between Kelly Webster and Ann Doyle (2008).

"Culture comprises a society's philosophy about the nature of reality, the values that flow from this philosophy, and the social customs that embody these values. Any individual within a culture is going to have his or her own personal interpretation of the collective cultural code; however, the individual's worldview has its roots in the culture—that is, in the society's shared philosophy, values, and customs. If we are to understand why Aboriginal and Eurocentric worldviews clash, we need to understand how the philosophy, values, and customs of Aboriginal cultures differ from those of Eurocentric cultures" (2000, 77).

Recognizing that library users and information seekers bring different perspectives when engaging with the library catalogue is a necessary first step toward mitigating cultural bias.

And a key component of any worldview is language. And while language provides a way for community members to communicate, it also expresses and codifies societal values. And a society's perception of reality will be coloured by these values (Christie 1994; Hirschheim 1992; Kam 2007; Little Bear 2000). Consider this passage where Little Bear described categorization in relation to Indigenous languages:

"The languages of Aboriginal peoples allow for the transcendence of boundaries. For example, the categorizing process in many Aboriginal languages does not make use of the dichotomies either/or, black/white, saint/sinner. There is no animate/inanimate dichotomy. Everything is more or less animate. Consequently, Aboriginal languages allow for talking to trees and rocks, an allowance not accorded in English. If everything is animate, then everything has spirit and knowledge. If everything has spirit and knowledge, then all are like me. If all are like me, then all are my relations" (Little Bear 2000, 78).

Little Bear's description of Indigenous languages invokes an inclusive view of the world. The perspective expressed here is less about establishing conceptual boundaries and more about recognizing the whole and the connections that exist between all things.

The Crown Attorney Rupert Ross worked for many years with remote Indigenous communities in northern Ontario. One thing he came to realize through this work was the challenge when trying to use "one culture's words to describe another culture's concepts; if we lack the concept it is unlikely we have fashioned the words necessary to convey it accurately" (1992, 64).[5] It is important then to learn more about the nature of these conceptual differences and, with an improved awareness, begin to consider how one worldview interacts with another.

Indigenous Library Users

It is important to understand the diversity of Indigenous peoples represented throughout North America. In Canada, for example, there are over fifty First Nations made up of well over six hundred Indigenous communities (Lee 2011).[6] This description does not include the diversity of members of the Métis nations and Inuit peoples. This diversity is also true for Indigenous populations in the United States. "In theory," wrote Duarte and Belarde-Lewis, "if every tribal government had a library of their

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[5] See also Boven and Morohashi 2002, 12.
[6] See also Indigenous Peoples and Communities / Government of Canada https://www.rcaanc-cirnac.gc.ca/eng/1100100013785/1529102490303.

own, organized according to the local Indigenous epistemology or epistemologies (in the case of multiple peoples in one region), we would have over 600 distinct Indigenous knowledge organization systems" (2015, 678). Therefore, while it might be possible to identify some similarities between Indigenous worldviews[7] there is no single, pan-Indigenous view of the world. Having said that, it may be useful to consider some broad characteristics that have been observed in both Indigenous and Western worldviews as a way to frame some of the differences that exist between the two.

For example, Linda Tuhiwai Smith noted some characteristics of how Western research approached Indigenous peoples. She said that these studies brought a different "cultural orientation, a set of values, a different conceptualization of such things as time, space and subjectivity, different and competing theories of knowledge, highly specialized forms of language, and structures of power" (2012, 44). These are all useful criteria to use when comparing worldviews. Knudtson and Suzuki identified what they called "fundamental qualities of Native ecological perspectives" and compared these qualities to equivalent "conventional scientific" views of the world (1992, 13-15).[8] This is a valuable summary that is well worth studying (see Table 1 in Appendix A). The results clearly show how contrasting these perspectives can be especially concerning spirituality, relationships with nature, and one's perceived role in the world.

For the purposes of this paper a few characteristics have been selected that might reasonably be applied to the context of metadata and knowledge management. These are listed below with some relevant keywords and phrases italicized for emphasis.

Common qualities considered to be characteristics of Indigenous worldviews:
- The universe is made up of *dynamic*, *everchanging* natural forces
- The universe is viewed as a *holistic, integrative system* with a *unifying life force*
- Time is *circular* with *natural cycles* that sustain all life
- Human thought, feelings and words are inextricably *bound to all other aspects of the universe*
- The human role is *to participate in the orderly designs of nature*
- The proper human relationship with nature is viewed as a *continuous two-way, transactional dialogue*

The comparable characteristics of the Western worldview:
- The universe is made up of an array of *static physical objects*
- The universe is *compartmentalized* in *dualistic forms* and *reduced to progressively smaller conceptual parts*
- Time is a *linear chronology* of 'human progress'
- Human thought, feeling and words are formed *apart from the surrounding world*
- The human role is *to dissect, analyze and manipulate nature* for their own ends
- The relationship of humans to nature is viewed as *a one-way, hierarchical imperative*

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[7] Compare Little Bear (2000, 77): "Although I am referring to the philosophy of the Plains Indians, there is enough similarity among North American Indian philosophies to apply the concepts generally, even though there may be individual differences or differing emphases."

[8] Kawagley and Barnhardt compiled a useful list based on this comparison (1999, 120-121) which the author provided as Table 1 in Appendix A of this paper.

Picking up on just one of these examples, it follows that if one worldview considers human cognition, feelings, and language to be "inextricably bound to all other aspects of the universe," it would be difficult to express that perspective in a system derived from a worldview that considers human cognition, feelings, and language to be "formed apart from the surrounding world."

Michael John Christie, a linguist who worked with two Yolngu communities in Northeast Arnhem Land in Australia, illustrated this well in his thoughtful exploration of some differences he observed between Aboriginal and Western worldviews (1994). This is a particularly useful passage that speaks to differences in language, culture, and the conceptualization of reality:

> "… there are very few names at all which divide the world up into the sorts of macro categories which English speakers imagine are really real—a difficult fact to account for if we believe that the world is obviously and inherently structured, that hierarchy is a reality independent of human reasoning so obvious to any eye that all languages spoken by intelligent people could reasonably expected to encode it.
>
> The Yolngu system of naming points to the possibility of a reality in which we have no need to assume an atomistic, segmentary structure. The definition of something in terms of its boundedness, its discontinuity with all other realities, the borders between itself and all possible others, is only one way of talking about our experience" (1994, 26-27).

Like Little Bear, Christie observed an interpretation of the world that is inclusive, describing a worldview that connects rather than divides. The Western view of the world is almost diametrically opposed with a predisposition to separate and compartmentalize.

What a Concept

But isn't a separated, clearly defined, mutually exclusive approach one of the fundamental goals of any classification scheme? Isn't the very act of classification a means to provide a controlled vocabulary that expresses a set of clear, well defined concepts and thus reducing the "cognitive burden associated with storing and organizing knowledge" (Parsons 1996, 133)? Indeed, this has been an accepted objective of classification and subject heading vocabularies in Western library science (Beghtol 1998, 7; Haykin 1951; Svenonius 2000).

However, Jeffrey Parsons questions the claim that concepts can be both clearly defined and, like Christie's observations about the Yolngu, universally applicable and existing independent of human perception. This "'classical' view," he said, "has been shown to be inadequate to account for many concepts that have vague or indeterminate boundaries (1996, 133)." In addition, he noted that "different people (or the same person at different times) may organize knowledge about things according to a different set of classes or categories" (1996, 133).[9] Or, expressed in another way, "the context of information shifts in spite of its continuities" (Bowker and Star 1999, 290). However, it seems likely that while these shifting contexts make it difficult to draw firm boundaries around vague concepts this will also be true when defining concepts in general especially when these concepts are situated within a different worldview.

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[9] See also Hinton 2015, 96.

Therefore, when considering perspectives from different worldviews, it is important to realize that the conceptualisation of reality depends on the affects of language and culture (Hirschheim 1992, 13). As Doris Schoenhoff observed in her beautiful "exploratory journey," a lack of awareness can create the "mistaken sense that we have snared reality in our definitions" (1993, 160).

Subject Metadata as Interface

Subject metadata is intended to act as an interface that attempts to connect library users to relevant resources and fulfill their information needs. To facilitate these connections, when library cataloguers describe a resource, they imagine a common pathway between an idealized library user and the information resources they seek. In this scenario metadata acts like a bridge.

Joan Marshall, in a personal correspondence with Sandy Berman, commented on this imagined relationship between users and subject headings as expressed in David Judson Haykin's *Subject Headings: A Practical Guide* (1951).[10] Marshall noted that while Haykin considered the user to be the "focus in all cataloging principles and practice" (Haykin 1951, 7) the subject terminology was "determined by the majority of the readers' probable psychological approach" (Berman [1971] 1993, 18). Marshall goes on to point out that there are a few assumptions at play here.

> "The list's bias and illogicality are a reflection of its identification of the majority reader and the extrapolation from that identification that that reader is the norm. An examination of the list makes it clear that the 'majority reader' (and the norm)—as far as [the Library of Congress] is concerned—is white, Christian (usually Protestant), and male" (Berman [1971] 1993, 19).[11]

It is perhaps worth noting that in their most recently available annual report (2019) about 58 percent of the permanent staff at the Library of Congress identified as white. And while the specific demographics of the Cataloging Services staff are not available, it is likely that many of these "majority reader" attributes can be applied to those imagining this majority reader and making these connections.[12]

Because this mental model is also a cultural product both the imagined user and the connecting subject metadata reflects the worldview of the originating culture (Hjørland 2002; Olson 1999). It is not surprising then that library users with experiences and understandings gained outside of what Hope A. Olson called the "dominant culture" (1999, 109) may find this interface unfamiliar, biased, disrespectful and, at times, harmful (Doyle, Lawson, and Dupont 2015; Moulaison Sandy and Bollaser 2005). Rather than offering a positive iterative search process (Bates 1989) the subject interface instead "demeans the user" (Berman [1971] 1993) and becomes a barrier rather than a bridge.

The Library of Congress Subject Headings

The influence of LCSH grew considerably once the Library of Congress began distributing copies of their catalogue cards to interested libraries at the turn of the twentieth century. The Library of Congress

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[10] This guide informed cataloguing practice at the Library of Congress. It intended to provide the "rationale and basic rules of practice in the choice and use of subject headings" (Haykin 1951, v).

[11] Compare Berman's description of the idealized reader as "white-hued, at least nominally Christian (and preferably Protestant) in faith, comfortably situated in the middle- and higher-income brackets, largely domiciled in suburbia, fundamentally loyal to the Established Order, and heavily imbued with the transcendent, incomparable glory of Western civilization" (1993, 15).

[12] See https://loc.gov/about/reports-and-budgets/annual-reports/.

classification scheme and the subject heading list became a staple for information organization in libraries throughout North America. The LCSH have been criticized as problematic because the terminology often manifests extreme cultural biases that alienate many groups of people (Berman [1971] 1993; Knight 2017; Moulaison Sandy and Bollaser 2005). One of the most well known and vocal critics of the LCSH has been the "radical librarian" (Wikipedia 2021) and cataloguer Sandford Berman.

Berman often wrote to the Library of Congress and addressed the library profession directly through his many letters and comments published in well-read library journals. He identified questionable headings and explained with considerable detail how to handle biases he found with headings that dealt primarily with "people and cultures—in short, with humanity" ([1971] 1993, 15).

In 1971 Berman was invited to publish these findings in what was to become his seminal book, *Prejudices and Antipathies*, republished in 1993. In the preface to the 1993 edition Berman reflected on the work that had been done correcting bias in subject headings since 1971. He expressed some disappointed with the length of time it took for the Library of Congress to accept that changes were necessary and to then act and make the changes. He concluded that while some progress had been made there was still a lot of work to be done and he invited and challenged readers to "help finish the work started in 1971" ([1971] 1993, 6). It's unfortunate, but now, almost thirty years later, his invitation is still as relevant as ever.

The application of the LCSH to bibliographic resources has become routine and now, because of ubiquitous copy cataloguing practices and batch loading of catalogue record sets, it has perhaps also become an often-overlooked aspect of bibliographic description. Although inconsistent, and implemented poorly in library system platforms, the "subject-muck" (Berman [1971] 1993, 17) and flawed syndetic structure of LCSH (Spero 2008) is now generally accepted without much criticism. The quality of the terminology has been analysed by some, but it has been rare to find much reflection on the affect LCSH has had on the people who interact with it (Albrechtsen and Jacob 1998, 295; Bowker and Star 1999; Haykin 1951, 4; Smiraglia 2009; Schreur 2012). This is an unfortunate oversight because a library user's interaction with an information retrieval system is "fundamentally, social rather than technical" (Hirschheim 1992, 9). So much so that it might be better to refer to these as *social headings* rather than subject headings.

With a focus on Indigenous library users Heather Moulaison Sandy and Jenny Bossaller have provided some noteworthy critical scrutiny. They described Western knowledge systems as incompatible for Indigenous library users who possess "ways of knowing that fall outside of these systems' limitations" (2017, 131). For many, this means that the system fails to meet their needs because it does not capture or present knowledge from their point of view (2017, 131).

Subject Authority Control: One Path through Knowledge

Subject metadata schemes adhere to a mutually exclusive approach, where authoritative terms are established to represent unique concepts. To achieve this one term or phrase is deemed to be the preferred term, the term recommended when a subject search is performed in the catalogue. This "authorized access point"[13] sits hierarchically above any alternative "used for" (UF) headings.

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[13] RDA Toolkit: Glossary, https://access.rdatoolkit.org/Glossary.

Figure 1 shows a subject authority record with the authorized access point 'Traditional ecological knowledge'.[14] To find resources about 'Indigenous environmental knowledge' the authority record directs users to search instead with the authorized access point 'Traditional ecological knowledge.' Although performing a general keyword search using 'Indigenous environmental knowledge' will retrieve results in the catalogue a more accurate set of results would, theoretically, be retrieved if the authorized access point is used.

Traditional ecological knowledge ← Authorized access point
Here are entered works on the knowledge acquired by indigenous and local ← Scope note
peoples through direct contact with their environment over a long period of time.
UF   Indigenous ecological knowledge
        Indigenous environmental knowledge
        T.E.K. (Traditional ecological knowledge) ← Used for references
        TEK (Traditional ecological knowledge)
        Traditional environmental knowledge
BT   Ethnoscience
        Experiential learning
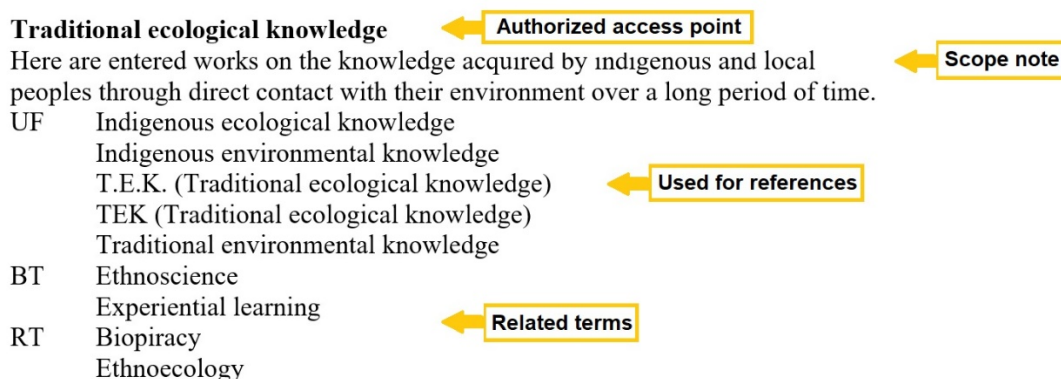RT   Biopiracy ← Related terms
        Ethnoecology

FIGURE 1: SUBJECT HEADING EXAMPLE

Unfortunately, library service platforms have not, and still do not, provide access to this useful additional information contained in authority records. Catalogue users are not guided by the used for headings provided.[15] They will also not benefit from seeing the references to related terms, or the scope notes that clarify the usage or meaning of the authorized heading. Instead, catalogue users only see the authorized access point as it appears, on its own, as a subject heading in a bibliographic record. And so, the user is left to deduce that one preferred heading can be used to retrieve related resources. However, even if library systems did provide access to all of the terms and relationships found in a subject authority record, the path drawn through the catalogue would still be limited to the "cultural practice of authority" (Olson 2000, 66) as determined by the Library of Congress.

Is Literary Warrant Warranted?

How then are these authorized access points determined? Where do these established terms come from? Svenonius cites Wyndam Hulme as the person who introduced the principle of "literary warrant." Simply stated literary warrant means that "the vocabulary of a subject language [is] derived from the literature it intends to describe" (Svenonius 2000, 135). This means that subject headings have been derived from the resources found in the library collection which have predominantly been from print books.

This presents a couple of problems: the subject language reflects the library collection and not reality; and it reinforces the biases found in the cultural record. It's a system that generates "a syntactic and semantic argument for its own view of the world and justifies this bias on the basis of some expressed or

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[14] To see this and other authority records visit the Library of Congress Authorities website, https://authorities.loc.gov/webvoy.htm.

[15] This is even more of a disservice when you consider Marshall's observation that these reference headings intend to "serve the needs of minorities" (Berman [1971] 1993, 18).

unexpressed cultural warrant" (Beghtol 2001, 105). For example, consider this statement by Howard Adams on the expression of colonial power in mainstream publishing practices:

> "Perhaps the most crucial issue one should realize about eurocentric publications is the support and encouragement they receive from government institutions and the media to fulfill their role as falsifiers of Aboriginal history. The eurocentric power structure, made of governments, universities, and the media, clearly believes that it is in its best interest to not only sustain but deepen Aboriginal oppression. When the Establishment attacks Native people, it encourages racism and eurocentricism" (Adams 1995, 32).

Adams made this observation only twenty-five years ago. Even if publishers have since drastically changed their practices a large part of contemporary library collections, and therefore the source for the subject language used in library catalogues, will be comprised of books that reflect this perspective.

Literary warrant therefore contributes to the marginalization of many groups of people (Littletree and Metoyer 2015, 642; Moulaison Sandy and Bossaller 2017, 133). And further, because the collected literature reflects a colonial perspective it is inappropriate for "Indigenous contexts due to historicization, omission, marginalization, lack of recognition of sovereign nations, lack of specificity, and lack of relevance" (Doyle, Lawson, and Dupont 2015, 111). In other words, subject languages derived from colonial library collections will lack the perspectives of Indigenous library users.

What is appropriate then, when thinking about possibly mitigating colonial biases, is to shift away from building subject languages based primarily on literary warrant. A warrant based on usage (Svenonius 2000, 135) or a user warrant, or more specifically, an "Indigenous warrant" (Doyle, Lawson, and Dupont 2015, 115-116), would provide better connections between Indigenous users and information resources. Moulaison Sandy and Bossaller described Indigenous warrant as terminology derived from the "worldview of the Indigenous peoples themselves, not from the dominant cultures who write about them or who search for information about them" (2017, 133). Collection building informed by Indigenous warrant would create information systems that support, represent and respect Indigenous knowledges and worldviews.

Systems and Standards

The systems and standards cataloguers work with also influence and impose limits on the way resources are described. Contemporary cataloguing practices continue to be guided by principles that were developed primarily in the nineteenth century (Coyle 2016, 5; Svenonius 2000, 30; Wright 2007, 165-182). The much-lauded Functional Requirements for Bibliographical Records (FRBR) was an examination of the attributes of catalogue *records* (IFLA [1997] 2009, 32). The result established a conceptual model and a consistent language that improved the understanding of what "the bibliographic record aims to provide information about, and what it is that we expect the record to achieve in terms of answering user needs" (IFLA [1997] 2009, 2). But nonetheless the analysis focussed on the bibliographic record.

And, while the FRBR infused Resource Description and Access (RDA)[16] attempted to rethink cataloguing descriptive practices, the status quo continues to be reinforced and boxed in by the MARC

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[16] Karen Coyle referred to RDA as "a cataloging standard based on an unproven conceptual model" (2016, 68).

format (Frederick 2017, 4-5).[17] In 2011 the Library of Congress established the Bibliographic Framework Initiative (BIBFRAME)[18] which set out to develop a replacement for MARC. While some progress has been reported a widespread adoption of BIBFRAME has yet to materialize. And a recent survey of Canadian libraries suggested that participants will not be ready to transition to this format "for some time" (Pretty 2021, 3). And, as a result, there will be no significant break from the traditional "record-centric" (Alemu et al. 2012; Smiraglia 2009) view of the bibliographic universe which continues to present an "imaginative barrier for some librarians" (Frederick 2017, 6).

To move past this "imaginative barrier" the cataloguing process needs to be conceptualized differently. Instead of creating bibliographic records Gordan Dunsire suggested thinking of this as the "disaggregation" and "re-aggregation" of bibliographic data (2008). If bibliographic data were described as a collection of RDF triples[19] in a linked data context they could be easily manipulated and connected to other data sources. And while RDA has aspired to be a "metadata standard optimized for a linked data environment" (Oliver 2021, 7) a truly multidimensional conceptualization of library data has failed to emerge.

Third Order of Order

David Weinberger called a system like the card catalogue, where surrogate records are used to represent objects, the "second order of order" (2007). The first order of order is the arrangement of the objects themselves, an activity that becomes increasingly difficult when the number of objects is large like the eleven million photographs he used in his example (2007, 17). By describing particular features and characteristics of information objects second order thinking allows data to be rearranged independently from the actual objects. It's easier to move a set of cardboard cards around, and order them by title or subject for example, than it is to try and navigate through a fixed arrangement of physical objects. And, in an online catalogue, where the physicality of the describing record is also removed, access can be enhanced by searching on any of facets or data elements used to describe the information object.

While keyword searches can be executed on different facets or combinations of facets in an online catalogue the second order of order does not do particularly well at identifying or inferring relationships that exist between information objects. While it seems freeing and magical it is still a linear approach even when sophisticated combinations of facets are employed. And unfortunately, uncontrolled keyword searches will often retrieve results containing a lot of noise, that is, results referring to unwanted and irrelevant things. But as the transition from physical to digital objects continues, and the "age of the miscellaneous" (Weinberger 2007, 102) is ushered in, a third order of order becomes possible.

The digitization of information resources meant that the limitations imposed by the "library's geography of knowledge" (Weinberger 2007, 57) were removed. Without those limitations different

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[17] John Attig observed that the "MARC is a communication format … It is simple to communicate records. It is very difficult to communicate *relationships*" [original emphasis] (1989, 141). For information on the Machine Readable Cataloguing (MARC) format see https://www.loc.gov/marc/bibliographic/.
[18] For more information see https://www.loc.gov/bibframe/.
[19] A "triple" is the data model used in the Resource Description Framework (RDF) which consists of individual data statements in the form of a subject-predicate-object relationship.

arrangements of objects in the information space are allowed to surface. Weinberger illustrated it this way:

> "In the third order of order, a leaf can hang on many different branches, it can hang on different branches for different people, and it can change branches for the same person if she decides to look at the subject differently. It's not that our knowledge of the world is taking some shape other than a tree or becoming some impossible-to-envision four-dimensional tree. In the third order of order, knowledge doesn't have *a* shape. There are just too many useful, powerful, and beautiful ways to make sense of our world." [original emphasis] (2007, 83)

In the third order of order, it is no longer necessary to directly impose a specific terminology arranged within a particular hierarchy.

> In the final paragraph of *Sorting Things Out* Bowker and Star also call for "flexible classifications":

> "We have argued that a key for the future is to produce flexible classifications whose users are aware of their political and organizational dimensions and which explicitly retain traces of their construction. In the best of all possible worlds, at any given moment, the past could be reordered to better reflect multiple constituencies now and then. Only then will we be able to fully learn the lessons of the past. In this same optimal world, we could tune our classifications to reflect new institutional arrangements or personal trajectories—reconfigure the world on the fly." (1999, 326)

The thought of tuning our classification systems is an attractive one that resonates strongly with this author. However, to free descriptive data and create a system of classification that "arranges itself according to your ways of thinking" (Weinberger 2007, 78) a move away from the record toward a data centric view will be necessary.

Hospitality and Flexibility

However, there seems to be a growing sense that colonial biases found in LCSH can be corrected in second order of order system by simply identifying and replacing problematic headings. This has led to suggestions that one solution is to create a "Native North American parallel to the LCSH, in which the range of Native North American epistemologies could be, in theory, reflected through a singular thesaurus" (Duarte and Belarde-Lewis 2015, 693). At best this process will only succeed in the "exchange of one set of limitations for another" (Schoenhoff 1993, 39). And while working through that process is a useful way to cultivate an awareness of these biases it is a solution that has emerged from a profession operating from within that biased system. It's also a reflection of a profession that is "hardwired to believe there's one right way to organize things" (Morville, 2014, 59).

While the methodology explored in this paper shares aspects of both of these views, it is rather a hybrid approach that falls somewhere between "replacing problematic terminology" and "developing a parallel subject language." The identification of biased LCSH subject headings is still an important part of this work but it can no longer be done in isolation. The identification process and any decisions regarding the choice of respectful terminology must be determined in consultation with local Indigenous communities.

Thankfully, some of this identification work was done by members of the Association for Manitoba Archives (AMA) in a project initiated to improve subject access in the Manitoba Archival Information Network (Bone et al. [2015] 2017; Bone 2016; Bone and Lougheed 2017). Notably, this work considered subject headings that were "culturally insensitive to Manitoba's Indigenous people" and aimed to provide terms that were respectful and accurately reflected their identity (Bone and Lougheed 2017, 2). The Working Group made the results of their good work freely available on the University of Manitoba's institutional repository in 2015 (Bone et al. [2015] 2017).

In addition to serving as a tool to identify problematic LCSH headings the working group provided valuable documentation concerning how the list was compiled, included consultation strategies, and the policies and rational used for decision making. Mindful of deviating too far from the subject authority standard it was decided that any proposed changes would have to "fit seamlessly back into LCSH" (Bone and Lougheed 2017, 3). And because library information systems do not exploit cross-references in subject authorities and the additional work required, they focussed on changes to the authorized access points. The final document contained proposals for modifying or deleting over one thousand headings as well as suggestions for establishing more than one hundred new subject headings.

The term circle approach proposed in this paper also looks back on the work done by the Library and Archives Canada and their attempt to accommodate Canadian concepts alongside similar subject headings established by the Library of Congress. These *Canadian Subject Headings* (CSH) provided an alternative subject heading list meant to be used "in tandem with LCSH."[20] Both the CSH and the work started by the AMA are inspirational starting points. A modern version of LCSH that is more hospitable flexible (Beghtol 1998, 8) could be achieved by incorporating advantages afforded by linked data.

The Circle as Metaphor

Another source of inspiration for term circles was the inclusive and cyclic qualities found in many Indigenous worldviews. While this is not universally accepted as a "traditional concept," respondents to Deborah Lee's survey on Indigenous knowledge organization commented that the circle represented the interconnectedness of life and knowledge, and the expression of a holistic learning system (2011, 21). Olson also considered the "circle of being" (1999, 114) as a way to conceptualize and connect the parts with the whole[21] rather than the Western notion of separation and individualism and its emphasis on logical, linear thinking. Little Bear also touched on a sense of fluidity and wholeness when he described "constant motion or flux" (Little Bear 2000, 78) as an inherent part of living on this Earth. He also suggested that everyone should have the "strength to be tolerant of the beauty of cognitive diversity" (Little Bear 2000, 80). This idea is very appealing and thinking of subject terminology as a term circle is one way that "cognitive diversity" might be embraced.

To illustrate, consider the relationships found in a typical LCSH subject authority record. A 'preferred term' is surrounded by a number of 'used for' terms (Figure 2, A). The second illustration (Figure 2, B) represents a user's query brought to a library information system. If the user's search terms match one of the used for terms provide in an authority record the user is directed to use the 'preferred term'

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[20] For more information about the Canadian Subject Headings see https://www.bac-lac.gc.ca/eng/services/canadian-subject-headings/Pages/about-csh.aspx.

[21] Doyle, Lawson and Dupont also noted the term *wholism* which has been used to describe "Indigenous understandings of the interconnectedness of everything in the universe as an epistemic and a spiritual principle (2015, 108).

illustrated in the centre of the third illustration (Figure 2, C). Providing one preferred term per concept is an attempt to create a consistent, universal, "second order of order" approach to information organization.
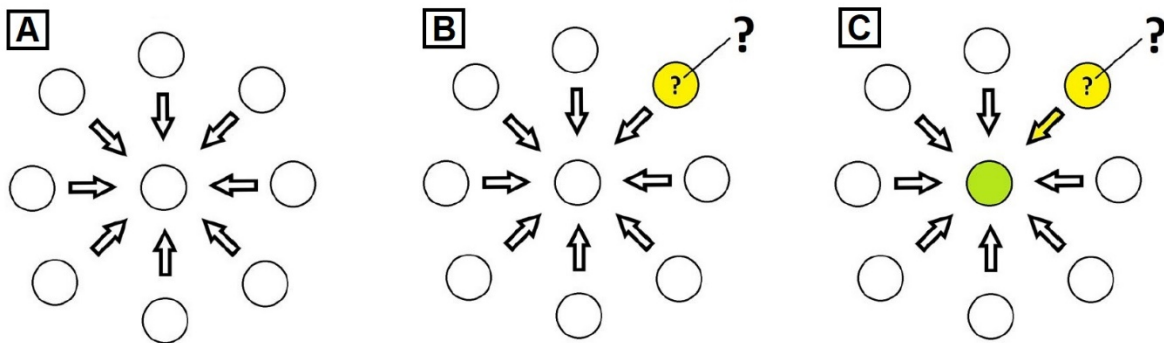

FIGURE 2: FUNCTION OF THE SUBJECT AUTHORITY

Figure 3 shows how a term circle approach might work. Here a number of related terms are presented where each term represents the concept equally (Figure 3, A). There is no single term considered to be preferred or more important than any other. These terms might be established collaboratively through a combination of professional and user perspectives. This time when a catalogue user presents a question or information need (Figure 3, B) their search might again match on one of the terms in the term circle. But instead of directing the user to a single preferred term the search combines all of the available terms in the term circle (Figure 3, C) and queries the information system to retrieve a set of relevant resources.[22]
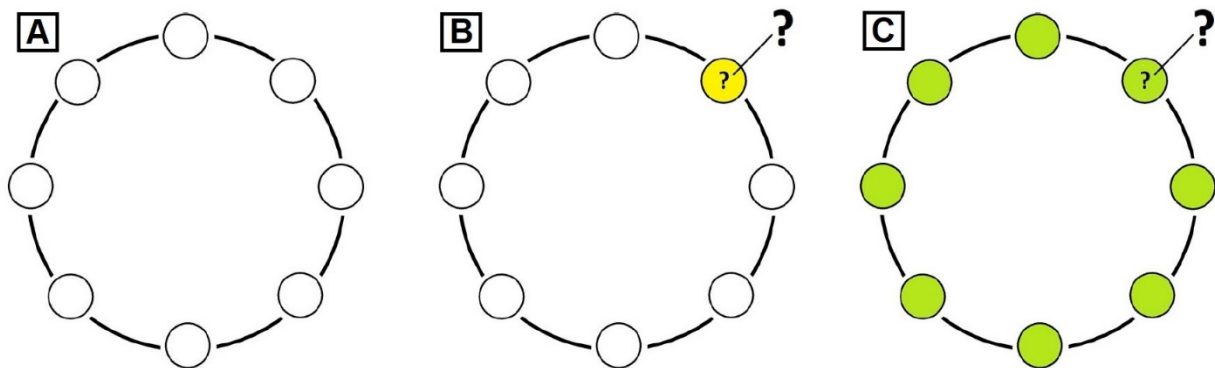

FIGURE 3: FUNCTION OF THE TERM CIRCLE

The search results will retrieve a broader set of relevant results because the query combines Indigenous community and legacy Western subject language terminology. And through label display configurations

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[22] Although outside of the scope of this paper this process is comparable to the WordNet "synonym set" or "synset": "Synonym sets convey meaning by relating groups of terms as synonyms. The term synset was essentially defined by WordNet, an effort that began in 1985 at Princeton University and aimed to provide a browser-friendly way of navigating through words related by meaningful connections" (King and Reinold 2008, 91). WordNet is a "semantic network interlinking words and groups of words by means of lexical and conceptual relations" (Fellbaum 2006, 665). See also https://wordnet.princeton.edu/.

in the term circle (see below) colonial bias could also be mitigated by showing only respectful terminology that compliments a user's worldview.

Liking Linked Data

Linked data takes advantage of the third order of order. It enables data to be expressed in a dynamic, integrative, continuous, and interconnected way all descriptors that invite parallels to some of the general characteristics used earlier to describe Indigenous worldviews. The flexibility afforded by linked data might therefore enable an information space that better reflects Indigenous worldviews and is capable of providing "cultural autonomy for Indigenous peoples" (Moulaison Sandy and Bossaller 2017, 163). Subject authority data could then be made to function more like a "boundary object" (Bowker and Star 1999).

Writing about distributed data structures for artificial intelligence Star described a boundary object as "those objects that are plastic enough to be adaptable across multiple viewpoints, yet maintain continuity of identity" (Star [1988] 2016). Olson touched on a similar idea when she explored what she called the "untapped potential" of the LCSH. She described a "dynamic space of passage between documents catalogued and library users" and one that "shapes the meaning" between library users and resources (Olson 2000, 66). However, unlike the imagined "majority reader" that excludes library users here subject authority data could become a "discursive arena facilitated by the library" (Albrechtsen and Jacob 1998, 310). In this dynamic space the meaning and relationships that links users to information resources could be negotiated.

Simple Knowledge Organization System

One way this might be accomplished is by using the Simple Knowledge Organization System (SKOS) which has become a popular vehicle for expressing controlled vocabularies as linked data. It is a particularly good match for LCSH because it can be cleanly mapped to the MARC subject authority format. Not surprising then, the focal point for SKOS is the "concept." The SKOS reference documentation nicely describes a concept as a "unit of thought" (Miles and Bechhofer 2009). Concepts in SKOS can be organized according to a particular scheme like LCSH, but this is not a requirement which also makes SKOS a suitable candidate for connecting different concept schemes. And, as one of the original proponents of the semantic web[23] James Hendler once observed, "it's all about ontologies pointing to other ontologies" (2011).

SKOS itself is not a "knowledge representation language" (Miles and Bechhofer 2009). Instead, it is a container into which such a language can be placed. Like standard subject authority control each concept can be described using a number of natural language labels. One of these labels can then be designated as the preferred label. And, while SKOS does not require a preferred label, it is recommended to provide an "optimum human-readable display." A notation or lexical code can also be assigned to uniquely identify each concept. SKOS also supports scope notes and other forms of contextual documentation to provide concept definitions, usage information, and the means to map and link related concepts to each other.

Data is encoded in SKOS using the Reference Description Framework (RDF) expressing each data element in the form of an RDF triple. A triple is a data statement that connects one thing to another

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[23] See Berners Lee, Hendler and Lassila 2001.

using a relationship to describes that connection. A simple example in this case being: 'concept1' *is related to* 'concept2'. Using the LCSH subject authority shown earlier in Figure 1: 'Traditional ecological knowledge' *is related to* 'Ethnobiology' is a triple.

The Library of Congress provides LCSH in a number of different formats, including MARC/XML.[24] Because SKOS and LCSH have similar data models the conversion of LCSH MARC/XML into a SKOS RDF/XML representation is a relatively straight forward process (Summers et al. 2008). Once expressed in SKOS the data can be disaggregated and stored as RDF triples. This enables potential connections among related data in the linked open data cloud[25] to be discovered and made available. Figure 4 is a simplified example of a subject authority encoded using SKOS in RDF/XML[26]:

```
<rdf:RDF>
    <rdf:Description rdf:about="http://id.loc.gov/authorities/subjects/sh2003006652">
        <skos:prefLabel xml:lang="en">Traditional ecological knowledge</skos:prefLabel>
        <skos:altLabel xml:lang="en">Indigenous ecological knowledge</skos:altLabel>
        <skos:altLabel xml:lang="en">Indigenous environmental knowledge</skos:altLabel>
        <skos:altLabel xml:lang="en">T.E.K. (Traditional ecological knowledge)</skos:altLabel>
        <skos:altLabel xml:lang="en">TEK (Traditional ecological knowledge)</skos:altLabel>
        <skos:altLabel xml:lang="en">Traditional environmental knowledge</skos:altLabel>
        <skos:note>Here are entered works on the knowledge acquired by indigenous and local
         peoples through direct contact with their environment over a long period of time.
        </skos:note>
        <skos:inScheme rdf:resource="http://id.loc.gov/authorities/subjects"/>
        <skos:broader rdf:resource="http://id.loc.gov/authorities/subjects/sh85046437"/>
        <skos:broader rdf:resource="http://id.loc.gov/authorities/subjects/sh96010624"/>
        <skos:related rdf:resource="http://id.loc.gov/authorities/subjects/sh2008000307"/>
        <skos:related rdf:resource="http://id.loc.gov/authorities/subjects/sh2001000104"/>
    </rdf:Description>
</rdf:RDF>
```

FIGURE 4: SKOS ENCODED IN RDF/XML

As mentioned SKOS encodes a mix of human readable content (e.g. `prefLabel`, `altLabel`, `note`) and Uniform Resource Identifiers (URI) (`rdf:about`, `rdf:resource`) actionable by machines. RDF triples are generated using the `rdf:about` tag as a unique connection point identifying the concept. Here, for example, are a couple of triples that might be generated from the above code:

```
http://id.loc.gov/authorities/subjects/sh2003006652 has the prefLabel
Traditional ecological knowledge

http://id.loc.gov/authorities/subjects/sh2003006652 is related to
http://id.loc.gov/authorities/subjects/sh2008000307
```

An important feature of SKOS is the potential to facilitate multilingual displays by assigning preferred labels in different languages for each concept. In Figure 4, for example, 'English' is expressed using an XML language attribute `xml:lang="en"`. Harper and Tillett touched on this as a way to globally share subject authorities using the "geographic context of the system" to trigger an appropriate language heading or to allow an "end-user to select the language and script used to display information about entities irrespective of system's default preference" (Harper and Tillett 2007, 14).[27]

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[24] For more information on LCSH formats see https://id.loc.gov/authorities/subjects.html.
[25] For more information see https://www.lod-cloud.net/.
[26] The fuller version is available at https://id.loc.gov/authorities/subjects/sh2003006652.skos.rdf.
[27] As an aside, compare this approach to QRpedia that delivers Wikipedia articles to users in their preferred language https://en.wikipedia.org/wiki/QRpedia.

Lee found that there was no consensus when it came to selecting a term to replace the LCSH subject heading 'Indians of North America'. She concluded that the choice of preferred term would therefore need to be "localized based on the users of each particular library" (Lee 2011, 1). Using SKOS and term circles this localization could be provided by associating preferred terms with particular Indigenous communities. An XML attribute representing Indigenous worldviews could be established that would make it possible to mitigate colonial bias in LCSH. This would be similar to presenting multilingual preferred labels based on location or user preference.

Term Circle Time

The resources required for an individual library to research, negotiate, and establish new alternative subject headings would be challenging at best. Switching costs on many levels would be enormous. However, given that the Library of Congress provides LCSH in a variety of linked data formats it should be possible to develop a hybrid KOS that builds on and connects to the existing, albeit flawed, LCSH infrastructure. Here is a simple example to illustrate how this might work.

'Turtle Island' appears in the creation stories of some Indigenous peoples and is an alternative term used to describe 'North America' (IPAC 2018, 100; Lee 2011, 2). In Figure 5 an XML attribute called `xml:worldview` has been added to the LCSH authority record encoded in SKOS RDF/XML.

```
<rdf:RDF>
    <rdf:Description rdf:about="http://id.loc.gov/authorities/subjects/sh85092455">
        <skos:prefLabel xml:lang="en" xml:worldview="Western">North America</skos:prefLabel>
        <skos:prefLabel xml:lang="en" xml:worldview="Anishinabe">Turtle Island</skos:prefLabel>
        <skos:prefLabel xml:lang="en" xml:worldview="Haudenosaunee">Turtle Island
        </skos:prefLabel>
    </rdf:Description>
</rdf:RDF>
```

FIGURE 5: THE WORLDVIEW XML ATTRIBUTE

The value 'Western' has been added to the original preferred label for the LCSH authority record for 'North America'. Two alternative 'Turtle Island' preferred labels have also been added with worldview attributes that indicate that these labels are appropriate for someone identifying as 'Anishinabe' or 'Haudenosaunee'.[28] Like the alternative language labels mentioned earlier, these preferred labels would appear for anyone who prefers to see preferred labels expressing the worldview for their Indigenous community.

Better Best Practices

The library profession has always been collaborative but there has also been a tendency for librarians and their institutions to wait for approval or guidance from other institutions or professional associations before they are ready to commit to making modifications that might benefit local users (White 2018, 7). And that's alright. This is important work, and it doesn't have to happen all it once. In a comment about culturally appropriate publishing practices Gregory Younging said, "Finding your way through requires thought, care, attention, and dialogue. It requires working with people. It requires the engagement and inclusion needed for a new conversation between Indigenous Peoples and settler

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[28] Ideally, and perhaps as part of a later phase of development, the terminology used for these labels could be expressed using the language of each Indigenous community. For an excellent account of a project incorporating Inuit language (including the use of syllabic script) see Carol Rigby's work with the Nunavut Libraries Online consortium "creating multilingual and multiscript MARC-compliant, Integrated Library System-compatible records that accurately reflect the multilingual content of material published in and about Nunavut and Inuit" (Rigby 2015).

society" (Younging 2018, 30). This is good advice and applicable when considering how best to start mitigating colonial subject bias in library catalogues.

What is needed then is guidance and yes, that guidance will likely have to come from a larger organization with adequate resources and dedicated to supporting fundamental change. To start, a set of best practices are needed that considers and recommends appropriate knowledge organization methodologies, community consultation practices, and technology design and infrastructure requirements. In the short term, a hybrid information system, like the term circle approach proposed here, will have to interoperate seamlessly with current library system platforms. It must also take advantage of the rich metadata available in subject authority records so that a reimagining of subject languages becomes possible. And, perhaps most importantly, local Indigenous communities must control the process from start to finish. This will not only ensure that this work is done in a "good way" (Ball and Janyst 2008) it will also be a step toward building lasting relationships rooted in trust.

Once a set of best practices is established Indigenous communities, libraries, and other cultural heritage institutions could begin working on small pilot projects that connect existing LCSH to alternative term circles controlled and maintained by Indigenous communities. From a technical perspective these pilot projects could be built on Wikibase open-source software which can provide the necessary infrastructure for multiple instances of community subject languages (Allison-Cassin 2018; Allison-Cassin et al. 2019; Miller 2018). Wikibase is considered particularly useful when "data and data models are highly specialized or there are considerations that require greater control over the data" (Allison-Cassin et al. 2019, 38) both important aspects of an Indigenous led subject language.

Later, as these smaller projects mature and develop, they could be stitched together to form a larger collaborative system where ownership and control of subject metadata continues to reside with local Indigenous communities. And, because Wikibase is the underlying software that runs Wikidata, these projects might also be integrated into that larger global network if considered desirable.

The resulting collaboration might be framed as an "information ecology" (Albrechsten and Jacob, 1998; Nardi and O'Day, 1996). Albrechsten and Jacob spoke, for example, about "heterogeneous sociotechnical networks" that enable dynamic information ecologies collectively controlled by many participants.

> "Because information ecologies are situated within human practice, they are dynamic and constantly changing. An information ecology cannot be controlled by any one single agency but evolves through the collaboration of heterogeneous sociotechnical networks, whose elements strive constantly to achieve coherence and wholeness. The notion of an information ecology also implies a collective view of information systems as striving to meet heterogeneous community goals rather than the goals of a single agency or individual." (1998, 300)

This might also be thought of as a "knowledge commons" where individuals actively contribute ideas rather than passively consume them (Joranson 2007, 66). The goal is to facilitate a way for Indigenous communities express their concepts, assert their rights, and become active, engaged participants in a collaborative information system.

An important project of this sort has been the ongoing collaborative research between the University of Alberta, the Inuvialuit Cultural Resource Centre, and Inuvialuit communities within the Inuvialuit

Settlement Region (ISR).[29] Working to develop a digital library infrastructure this project has been "exploring appropriate methodologies for treatment of cultural heritage information and creating a culturally appropriate metadata framework as a basis for resource description and discovery" (Farnel et al. 2017). Drawing on a variety of methods and working closely with six Inuvialuit communities this research distilled a set of "metadata principles" including the ability for users to contribute terminology and control the rights and usage of their resources (Farnel et al. 2017, 294-295). The process allows the communities an information space that provides ongoing iterative feedback. This is ground-breaking work that can serve to inform the development of better best practices and is an inspiration and model for similar collaborations between Indigenous and library and cultural heritage communities.

Conclusion

Classification schemes and subject headings are interfaces that attempt to connect library users to the information and resources they seek. However, Clare Begthol once observed that "modern systems have a greater need for hospitality and flexibility than they have for mutual exclusivity and joint exhaustivity" (1998, 8). The term circle model proposed in this paper provides an hospitable and collaborative approach to subject access. Rather than imposing an authoritative, colonial view of the world, the term circle encourages flexibility, an active role for library users, and supports and embraces cognitive diversity.

There is a new role for metadata that transforms libraries and other cultural heritage institutions from gatekeeper to "facilitator of connections" (Albrechtsen and Jacob 1998, 301). In that sense, metadata operates on a level similar to what Martin Nakata has described as a "cultural interface" (Nakata 2004). Indigenous researchers should no longer have to "make do with inaccurately and imprecisely organized documents" (Duarte and Belarde-Lewis 2015, 678).

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[29] While not an information retrieval system per se the recent Wikipedia project between the Atikamekw Nehirowisiw Nation and the Wikimedia Foundation is another example of a successful collaboration. Project member Nehirowisiw described the importance of the project: "It is a way to pass on ancestral knowledge using computers and it allows us to preserve traditional practices. It is an educational tool for all" (Rochon, Béland, and Casemajor 2017). See the result at Wikipetia Atikamekw Nehiromowin https://atj.wikipedia.org/wiki/Otitikowin.

Appendix A

Indigenous Worldviews	Western Worldview
Spirituality is imbedded in all elements of the cosmos	Spirituality is centered in a single Supreme Being
Humans have responsibility for maintaining harmonious relationship with the natural world	Humans exercise dominion over nature to use it for personal and economic gain
Need for reciprocity between human and natural worlds - resources are viewed as gifts	Natural resources are available for unilateral human exploitation
Nature is honoured routinely through daily spiritual practice	Spiritual practices are intermittent and set apart from daily life
Wisdom and ethics are derived from direct experience with the natural world	Human reason transcends the natural world and can produce insights independently
Universe is made up of dynamic, everchanging natural forces	Universe is made up of an array of static physical objects
Universe is viewed as a holistic, integrative system with a unifying life force	Universe is compartmentalized in dualistic forms and reduced to progressively smaller conceptual parts
Time is circular with natural cycles that sustain all life	Time is a linear chronology of 'human progress'
Nature will always possess unfathomable mysteries	Nature is completely decipherable to the rational human mind
Human thought, feelings and words are inextricably bound to all other aspects of the universe	Human thought, feeling and words are formed apart from the surrounding world
Human role is to participate in the orderly designs of nature	Human role is to dissect, analyze and manipulate nature for own ends
Respect for elders is based on their compassion and reconciliation of outer and inner-directed knowledge	Respect for others is based on material achievement and chronological old age
Sense of empathy and kinship with other forms of life	Sense of separateness from and superiority over other forms of life
View proper human relationship with nature as a continuous two-way, transactional dialogue	View relationship of humans to nature as a one-way, hierarchical imperative

TABLE 1: COMPARISON OF INDIGENOUS AND WESTERN WORLDVIEWS

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